



RETINA

RESEARCH
FOUNDATION

2013 annual report



Retina Research Foundation Board of Directors



Dr. Art Willis and Dr. Frank Eggleston



Dr. Alice McPherson and Malcolm Wooley



Dr. Ben Orman, Ames Smith and Dr. Jim Key

Cover photo courtesy of Arnold E. Ruoho, PhD

Department of Neuroscience, McPherson Eye Research Institute and University of Wisconsin-Madison

Dr. Ruoho believes that the SIR (shown in green) is critical in reducing the oxidative stress in retinal cells and plays an important role in reducing retinal neurodegeneration.

Retina Research Foundation

Annual Report

2013

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Hunter Martin and Emmett Humble



Kapryce Manchester and Ames Smith



Rich Walton and Henry Gissel



Shara Fryer and Suzanne Miller

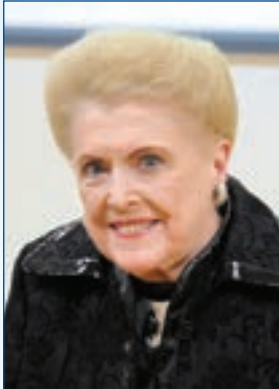


Dede Weil and Jacque Royce



Mike Patrick, Dr. Petros Carvounis and Dr. Jim Key

President's Message



Dear Friends,

In 1969 a dedicated group of prominent Houstonians, joined in common purpose, was invited to form the nucleus of a new Foundation that would support the search for the causes and cures of retinal disease. Step by step, the guiding principles were put into place that are followed to this day. Led by a strong Board of Directors, raising funds from private sources without government assistance, and choosing to work through and with the finest collaborating organizations became the model that allowed us to grow by design.

Beginning with a few pilot study grants in the early years, the scientific program has grown in a calculated fashion over the years to now encompass the whole spectrum of avenues to eradicate blindness. Now in our 45th year, RRF programs include pilot study grants, research chairs and professorships, established awards recognizing outstanding achievement in vision research, international fellowships providing advanced subspecialty training to young ophthalmologists in developing countries, and research initiatives that make it possible for young investigators to improve their knowledge and skills.

Our programs range from local projects in the Houston area to awards and fellowships on a global scale. Our scientists range from young investigators to world-renowned innovators. Our first major award, the Award of Merit, was given 35 years ago, and our most recent major award, the Paul Kayser/RRF Global Award, was first presented this year. There is a continuity of purpose over the years, always with the emphasis on excellence. This annual report is only a snapshot of RRF activities, but a careful review will give you a sense of the depth and scope of our efforts.

My patients have always been my inspiration. Early on I realized that combining the best medical care I could give them with a relentless effort to find the answers to the questions of retinal disease would be my life's work. We haven't conquered blindness yet, but we're well on the way to a world in which more people are able to preserve their sight. New advances in patient care of tomorrow are possible when we work together, thanks to research and educational programs of today.

With gratitude,

A handwritten signature in blue ink that reads "Alice R. McPherson M.D." in a cursive script.

Alice R. McPherson, MD
President

Overview of Research - 2013

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 2013, 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

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

- Curtis Brandt, PhD - Murfee Macular Degeneration Project
- Leonard Levin, MD, PhD - Basic Research Project
- Christine Sorenson, PhD - Basic Research Grant

Indiana University, Indianapolis, IN

- Timothy Corson, PhD – Basic Research Grant

Georgia Regents University, Augusta, GA

- Ming Zhang, MD, PhD – Basic Research Grant

RRF Cox Macula Society Research Grant – administered by The Macula Society

- Kang Zhang, MD, PhD – Shiley Eye Center, UC San Diego, La Jolla, CA

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
- Christine Sorenson, PhD, has been named RRF Dan Albert Chair at McPherson Eye Research Institute beginning in 2014.

Baylor College of Medicine, Houston, TX

- Ching-Kang Jason Chen, PhD, has been named RRF Research Chair beginning in 2014.

Overview of Research - 2013

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 – Beverly Hills, CA – Sept. 28

Cynthia A. Toth, MD – Duke Eye Center, Durham, NC

RRF Kayser International Award – presented by International Society for Eye Research (ISER); will be presented again in 2014

RRF Pyron Award – presented by American Society of Retina Specialists (ASRS) – Toronto, Canada – August 25

George A. Williams, MD – Beaumont Eye Institute, Royal Oak, MI

CL Schepens MD/AAO Award – presented by American Academy of Ophthalmology (AAO) and Schepens International Society (SIS) – New Orleans, LA – November 15

Lawrence A. Yannuzzi, MD – Vitreous-Retina-Macula Consultants, New York, NY

RRF Gonin Lecturer – presented by Club Jules Gonin; will be presented again in 2014

Gonin Medal – presented by International Council of Ophthalmology in affiliation with University of Lausanne and Swiss Ophthalmological Society

Alice R. McPherson, MD, has been named 2014 Gonin Medalist.

Paul Kayser/RRF Global Award – Inaugural Award presented by Pan-American Association of Ophthalmology (PAAO) – Rio de Janeiro, Brazil – August 7

Eduardo Buchele Rodrigues, MD – Federal Univ. of São Paulo, São Paulo, Brazil

International Fellowships – Advanced Subspecialty Training

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

David Rivera de la Parra, MD - from Mexico City to Jules Stein Eye Institute, Los Angeles, CA

Bruna Vieira Ventura, MD - from Brazil to Baylor College of Medicine, Houston, TX

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

Carlos Quesada Ruiz, MD - from Mexico to McGill University, Montreal, Canada

Johanna Matilde Gonzalez Rodriguez, MD - from Mexico to Toronto Western Hospital, Toronto, Canada

Research Initiatives – Educational and Travel Scholarships

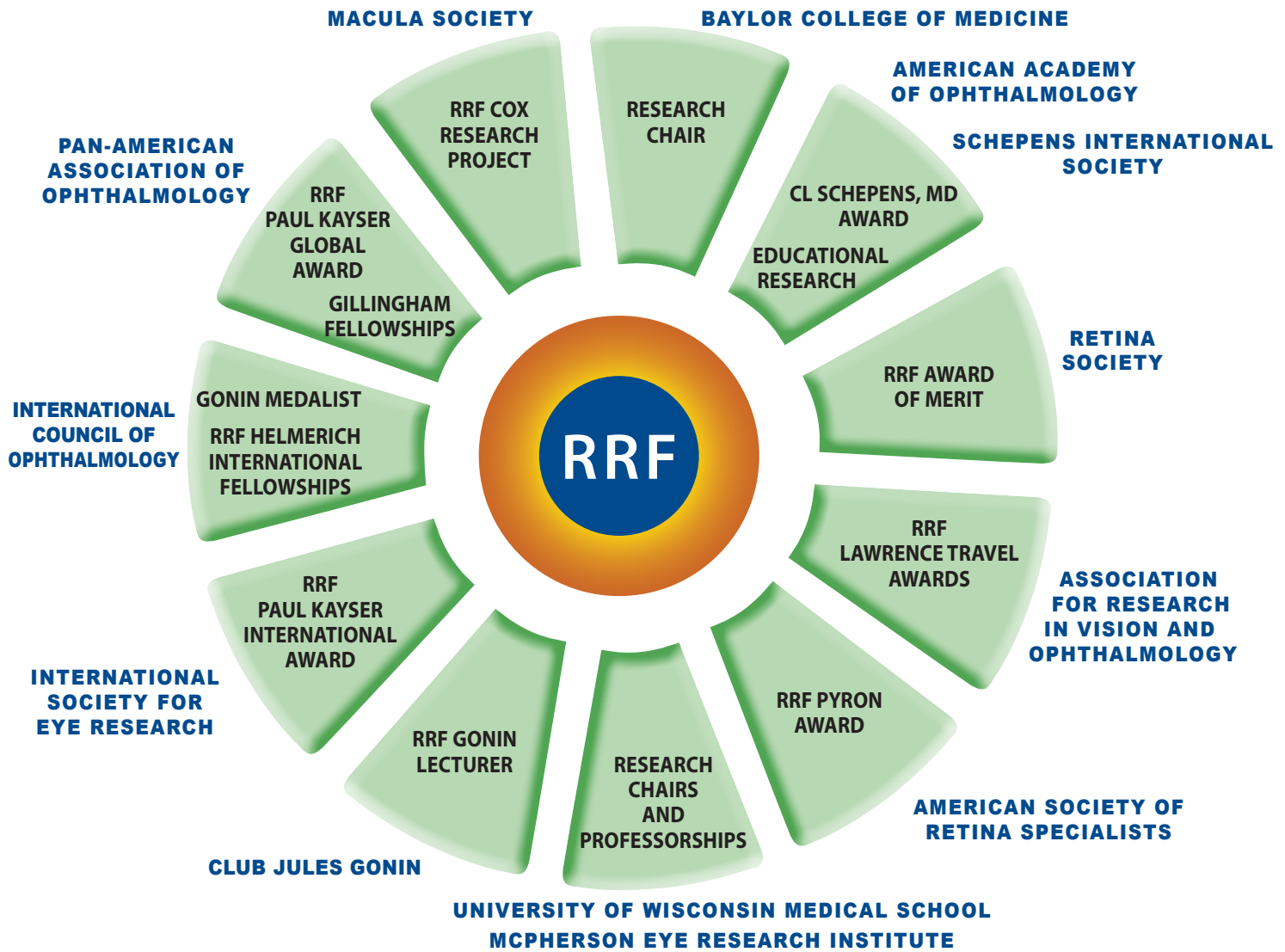
AAO Educational Trust Fund – administered by The Foundation of the American Academy of Ophthalmology (FAAO)

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)

Eighteen vitreoretinal scientists representing schools in 10 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 : 21

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
São Paulo, Brazil	Mexico City, Mexico
Porto Alegre, Brazil	Nuevo León, Mexico
Santiago, Chile	Asunción, Paraguay
Bogotá, Colombia	Lima, Peru
Cali, Colombia	San Juan, Puerto Rico
San Juan, Costa Rica	Montevideo, Uruguay
	Caracas, Venezuela

INTERNATIONAL : 32

Asahikawa Medical College	Asahikawa, Japan
Bern University Hospital	Bern, Switzerland
Eskisehir Osmangazi University	Eskisehir, Turkey
Eye Foundation Hospital	Laos, Nigeria
Hospital Ophthalmique	Lausanne, Switzerland
Institut de la Vision	Paris, France
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
McGill University	Montreal, Canada
Melles Cornea Clinic	Rotterdam, Netherlands
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
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 : 50

Bascom Palmer Eye Institute	Miami, FL
Beaumont Hospital	Royal Oak, MI
California Institute of Technology	Pasadena, CA
Casey Eye Institute	Portland, OR
Cleveland Eye Clinic/Foundation	Cleveland, OH
Cole Eye Institute	Cleveland, OH
Columbia University	New York, NY
Cornell University Medical College	Ithaca, NY
Dean McGee Eye Institute	Oklahoma City, OK
Duke University Medical School	Durham, NC
Emory University Eye Center	Atlanta, GA
Eye Research Institute	Boston, MA
Eye Tech Pharmaceuticals	Worcester, 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
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	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 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	Pittsburg, PA
University of Southern California	Los Angeles, CA
University of Washington	Seattle, WA
University of Wisconsin Medical School	Madison, WI
Vanderbilt University	Nashville, TN
Washington University	St. Louis, MO
Wills Eye Hospital	Philadelphia, PA
Wilmer Eye Institute	Baltimore, MD

Research

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

Named Basic Research Projects



Photo by Andy Manis

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

Recently, several groups have brought us closer to the use of gene delivery to prevent retinal degenerative diseases such as retinitis pigmentosa (RP) and macular degeneration, and the technology of gene delivery vectors continues to advance. The goal of Dr. Brandt’s project is to determine the cause of the transient inflammatory response induced by vector injection into the primate eye. Dr. Brandt’s recent experiments implied that HSV-1 may be utilizing the Toll-Like Receptor 9 (TLR9) signaling pathway to activate NFκB during its replication cycle. More recent experiments with inhibitory TLR9 oligonucleotides indicate that the oligos decreased viral replication in both TLR9 positive and TLR9 negative cells.



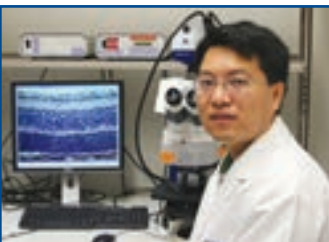
Joe M. and Eula C. Lawrence Research Project

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. Identification of these genes and molecular processes will lead to the better understanding of eye diseases. It is the aim of this study to determine the mode of action of Rx gene during formation and survival of retinal cells. To test the possibility that Rx acts during retinal development by interacting with other known transcriptional regulators, he analyzed genetic interactions between Rx and other transcription factors known to be involved in early steps of retinal formation. Dr. Jamrich has found genetic evidence that Rx interacts with the transcription factor Lhx2.



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

The goal of Dr. Chen’s project is to identify novel genes involved in human retinal disorders, conduct functional analysis, and develop therapy of these disease genes using model organism such as *Mus musculus*. He has collected DNA samples from 38 consanguineous families with recessive Leber congenital amaurosis (LCA) as well as 800 sporadic cases in order to clone additional LCA disease genes. His laboratory has applied the cutting-edge sequencing technology in cloning disease genes underlying LCA and performed whole exome sequencing on a large cohort of LCA patients. Dr. Chen’s lab has identified several novel mutation and candidate novel disease genes for which validation and functional analysis is currently underway.

Research



The Paul Kayser Research Project

Samuel Wu, PhD

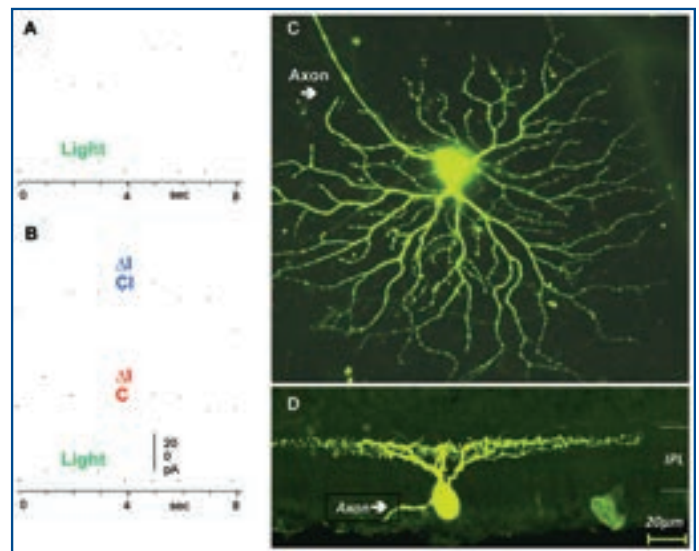
Cullen Eye Institute, Neurosensory Center
Baylor College of Medicine, Houston, TX

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

Dr. Wu's research project is focused on molecular, cellular and genetic mechanisms underlying retinal cell death in glaucoma and age-related macular degeneration (AMD). During the past year, his lab published four papers in top international journals including *Investigative Ophthalmology and Visual Sciences*, and *Journal of Physiology*.

These publications report new discoveries on new animal models for glaucoma, AMD and retinitis pigmentosa (RP), as well as physiological and pharmacological properties of healthy and diseased retinal neurons. Dr. Wu and his lab members gave four presentations at the Association for Research in Vision and Ophthalmology (ARVO) 2013 annual meeting in Seattle, and presented two keynote lectures at two International Symposia of Ophthalmology in November, 2013, in Guangzhou and Beijing, China.

Light-evoked spike response (A, black trace) recorded with a loose patch electrode, light-evoked chloride and cation current responses (B, ΔI_{Cl} and ΔI_C , blue and red traces, respectively) recorded with a whole-cell voltage clamp electrode from a sustained alpha ganglion cell in a dark-adapted flat-mounted mouse retina. Panels (C) and (D) are the cell morphology revealed by Lucifer Yellow (filled with the whole cell electrode) fluorescence in the flat-mounted retina and in vertical retinal section. IPL: inner plexiform layer.



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), which accounts for more than 5% of all retinal diseases. His laboratory has recently identified a new gene associated with LCA (named *Kcgn13*), which encodes an inwardly rectifying potassium channel but for which no animal models have been established. His preliminary evidence suggests that his mouse mutation may be homozygous lethal. In addition to characterizing this allele in more detail, he also generated conditional alleles of *Kcgn13*. A detailed understanding of *Kcgn13* function could have broad implications for our ability to diagnose, prevent, and treat retinal diseases.

Research



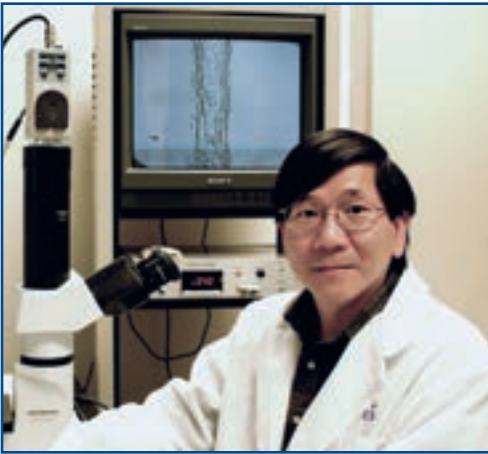
Emmett A. Humble Research Project

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.



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 and diabetes-associated retinal vascular dysfunction at molecular, cellular and intact-tissue levels and to develop a therapeutic approach for disease treatment. He addresses whether cardiovascular risk factors C-reactive protein (CRP) and endothelin-1 (ET-1), in association with oxidative stress, play an adverse role in retinal arteriolar function in diabetes. Dr. Kuo has recently established a pig model of retinal microvascular dysfunction induced by type-1 diabetes, which he has shown to resemble humans in retinal vascular physiology and pathophysiology. He continues to utilize the pig model to test central hypothesis that CRP/diabetes can activate endothelin converting enzyme activity leading to endothelial dysfunction and impaired vasodilation in retinal arterioles.



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

Research



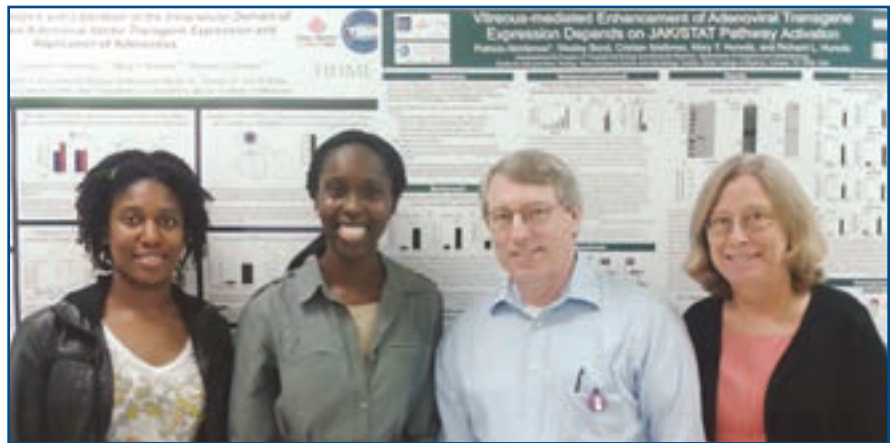
Mary Ellen Wilson Research Project

Richard L. Hurwitz, MD

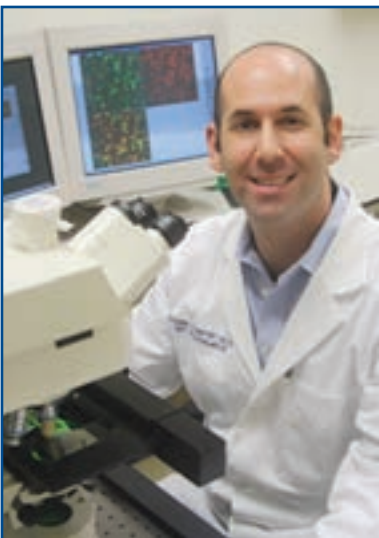
Dept. of Pediatrics, Ophthalmology, Molecular and Cellular Biology
Co-Director, Retinoblastoma Center
Texas Children's Cancer Center
Center for Cell and Gene Therapy
Baylor College of Medicine, Houston, TX

Immune consequences of gene therapy for ocular disorders

Dr. Hurwitz 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 a locally toxic agent) to treat children with advanced Retinoblastoma (Rb). The successful reduction of vitreous seeds has encouraged him to continue his laboratory initiatives to improve this innovative therapy. Additionally, he would like to better understand the differences between invasive and non-invasive tumors and to identify and characterize the Rb tumor stem cell. Dr. Hurwitz is also interested in developing gene therapy options for retinal degenerative disorders such as Stargardt Disease. His strategy for either application of gene therapy uses a special nonpathogenic virus to deliver the correct genetic material to selected cells in the eye.



Dr. Richard Hurwitz and Dr. Mary Hurwitz Lab Group



Carl G. Mueller, Jr. Research Project

Benjamin J. Frankfort, MD, PhD

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

Impact of elevated intraocular pressure on retinal function in mice

The primary goal of Dr. Frankfort's research is to understand the visual function change in glaucoma that is caused by damage to retinal ganglion cells (RGC). His lab has developed a technique by which the IOP can be mildly elevated in a mouse with a simple, reproducible, and rapid surgical technique. Dr. Frankfort has performed basic characterizations of retinal ganglion cell death and changes in retinal activity as measured with the electroretinogram (ERG) following IOP elevation. These studies indicate that electrical activity of several parts of the retina is disturbed prior to retinal ganglion cell death, and suggest that retinal dysfunction, including a decrease in mouse vision, precedes cell loss. Dr. Frankfort's results have been published in *Investigative Ophthalmology and Visual Science*.



Basic Research Grants



Photo by Andy Manis

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

Damage to endothelial cells, which line the inside of the blood vessels, is the initial event in some blinding retinal diseases. Dr. Levin has demonstrated that endothelial cell death can be slowed down in a transgenic mouse where endothelial cell death is blocked with an anti-death protein. His 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” for which there is currently no effective treatment.



Photo by Andy Manis

Christine M. Sorenson, PhD

University of Wisconsin Dept. of Pediatrics
McPherson Eye Research Institute
Madison, WI

Retinal vessel rarefaction and Bim expression

Dr. Sorenson hypothesizes that enhanced astrocytic Bim expression, in response to hyperoxia, facilitates retinal vascular rarefaction either locally during remodeling or on a larger scale during retinopathy of prematurity (ROP). Her published studies demonstrate protection of the developing retinal vasculature from hyperoxia-mediated vessel obliteration, cessation of vascularization of the inner retina and ischemia-driven neovascularization in the absence of Bim. She has found that Bim deletion in endothelial cells and/or pericytes

was insufficient to prevent hyperoxia-mediated vessel obliteration. Dr. Sorenson’s project tests the hypothesis that Bim expression in astrocytes facilitates normal and pathologic retinal vessel remodeling. Enhancing astrocyte survival and function through decreasing Bim expression should prevent the first phase of ROP when normal blood vessels are being destroyed, preserving neuronal integrity and function.

Research



Dr. Corson (far right) and his lab group

Photo by Vicki Hermansen, Glick Eye Institute

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's laboratory investigated a class of natural products, homoisoflavonoids, as antiangiogenic molecules. He synthesized a novel isomer (SH-11052) of a naturally occurring, antiangiogenic homoisoflavanone derived from a medicinal orchid species and showed antiangiogenic activity of SH-11052 in vitro. In the course of these studies, Dr. Corson's laboratory developed a compound SH-11037, a novel therapeutic lead based on the natural product, but with improved efficacy and specificity. SH-11037 potently and specifically blocks human retinal microvascular endothelial cell (HRMVEC) proliferation, migration, and tube formation in vitro by a molecular mechanism distinct from other homoisoflavonoids, but has little cytotoxic effect on other ocular cell lines and does not promote apoptosis. In a small pilot experiment, SH-11037 showed antiangiogenic activity in the oxygen-induced retinopathy (OIR) model of ROP.



Ming Zhang, MD, PhD

Georgia Regents University
Augusta, GA

Autophagy and NLRP3 inflammasome in acute retinal necrosis (ARN)

The primary objective of Dr. Zhang's research program is to understand the pathogenesis of herpes simplex virus 1 induced acute retinal necrosis (ARN) and cytomegalovirus retinitis by using mouse models and organotypic retinal culture models. Currently his group is studying the mechanism by which autophagy activates the innate immune response during HSV-1 retinal infection and how autophagy balances the beneficial and harmful effects of inflammatory host responses by interacting with NLRP3 inflammasome components. His lab is exploring methods to control ocular HSV-1 infection by stimulating anti-HSV-1 innate immune responses and by reducing neuronal cell death by apoptosis. He published his results in Journal of Neuroimmunology in 2013.

Grant Recipient from The Macula Society



The RRF Margaret and Mills Cox Macula Society Research Project

Kang Zhang, MD, PhD

Shiley Eye Center, UC San Diego
La Jolla, CA

Using AMD Patient iPSCs for RPE Differentiation and Disease Modeling

Dr. Zhang's clinical and research focuses are on novel disease gene targets and treatment, gene and stem cell based therapies in age related macular degeneration, diabetic retinopathy, and inherited retinal degeneration. His research centers on the use of molecular genetic techniques to identify genes that predispose patients to retinal diseases and developing drug therapies to prevent these diseases. Dr. Zhang has published or co-authored more than 100 peer reviewed manuscripts in top journals – covering a wide range of topics in genetics, molecular biology, stem cell, and clinical trials in ophthalmology.

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. This year RRF has established the Daniel M. Albert Chair at McPherson Eye Research Institute, University of Wisconsin-Madison, in honor of Dr. Albert, Founding Director of the McPherson ERI. Establishment of the Albert Chair was made possible by an estate gift from John Van Ramshorst, Jr.



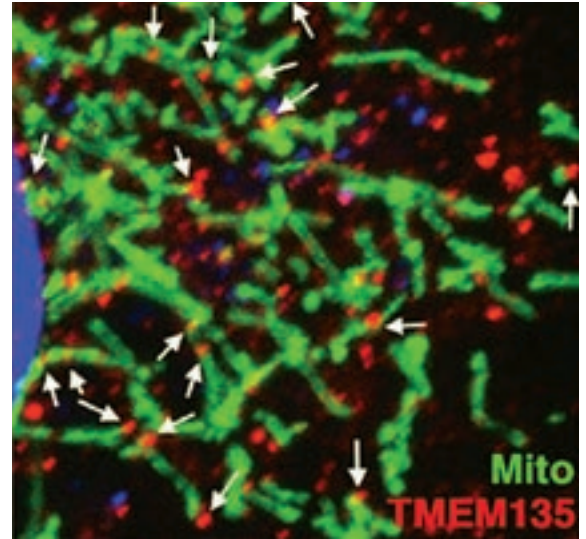
Walter H. Helmerich Chair

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 a mouse model to study the molecular mechanisms of aging and age-related diseases of the retina. He has obtained interesting results about his mouse model showing early aging phenotypes. This mouse mutant exhibits similar symptoms as observed in age-related macular degeneration (AMD) patients. Continuing to work with this mouse model, Dr. Ikeda has obtained evidence that the gene mutated in this mouse model is involved in mitochondrial dynamics and oxidative stress.



The molecule mutated in a mouse model with AMD-like symptoms (red) is localized at mitochondria (green; arrows show the localization), organelles regulating energy metabolism of the cell.



RRF Research Chair

Nader Sheibani, PhD

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

Regulation of Ocular Vascular Development and Neovascularization

Dr. Sheibani's work on the development of peptide mimetics to slow abnormal blood vessel growth in the eye holds enormous promise for the treatment of age-related macular degeneration, diabetic retinopathy, and retinopathy of prematurity. In collaboration with Dr. Christine Sorenson, he has published studies on a major molecular pathway that contributes to retinal blood vessel damage in diabetes (reported in *J Diabetes Metab.* 2013 May and *Cell Death and Disease* 2014 Jan).

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

Research Chairs and Professorships



Photo by Andy Manis

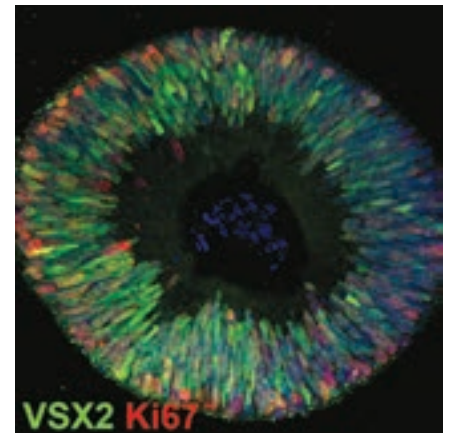
Emmett A. Humble Distinguished Directorship

David M. Gamm, MD, PhD

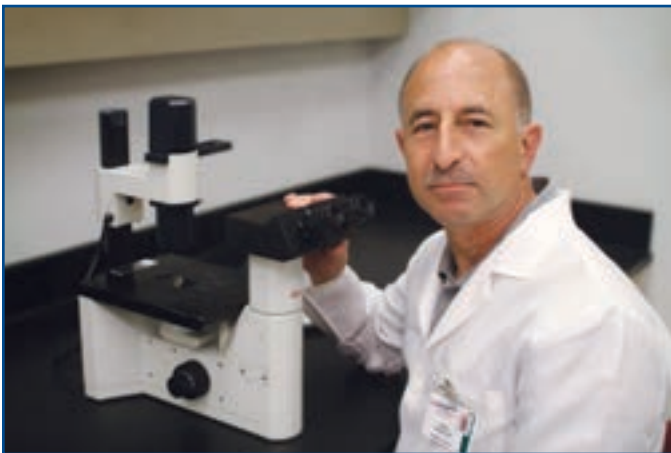
Director, McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Modeling and Treating Retinal Disease with Human Induced Pluripotent Stem Cells (hiPSCs)

Dr. Gamm's laboratory has pioneered the application of human pluripotent stem cell technology to the study and treatment of retinal degenerative diseases. They have demonstrated how human iPS cells can be used to model human retinal diseases, test drugs, and develop strategies to replace the retinal pigment epithelium (RPE) and photoreceptors lost in the course of the disease. Working in collaboration with biologists, bioengineers, and chemists, his group is making meaningful inroads toward the treatment of retinal degenerative diseases.



Shown is a cross-section of developing retinal tissue ("optic vesicle") from a member of a family with a rare disease that causes formation of small, nonfunctional eyes and abnormal retinas. Green cells contain a protein called VSX2 that is important in retinal development; those that are also red are undergoing replication.



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

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. His studies demonstrate that resveratrol and related natural products can safely reduce the growth of harmful blood vessels in a mouse model of choroidal neovascularization.

Daniel M. Albert Chair

Christine M. Sorenson, PhD, has been named the Daniel M. Albert Chair at McPherson Eye Research Institute beginning in 2014.

RRF Research Chair

Ching-Kang Jason Chen, PhD, has been named the RRF Research Chair at Baylor College of Medicine beginning in 2014.

Research Chairs and Professorships



Photo by Andy Manis

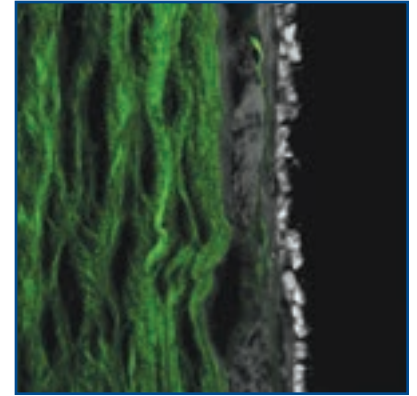
Edwin and Dorothy Gamewell Professor

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

Dr. Rogers focuses on development of new optical instrumentation and imaging methods for vision research that will aid basic research or lead to improved diagnostic capabilities. Spectral scattering, although long-studied as a scientific phenomenon, has only recently shown promise as a method for studying the eye. Dr. Rogers sees tremendous potential in complimenting existing imaging methods with the development of spectral scattering techniques and tools for non-invasive study and screening of eye diseases, including age-related macular degeneration.



Autofluorescence image of RPE, choroid, and sclera with overlay of second harmonic generation to isolate collagen in green.



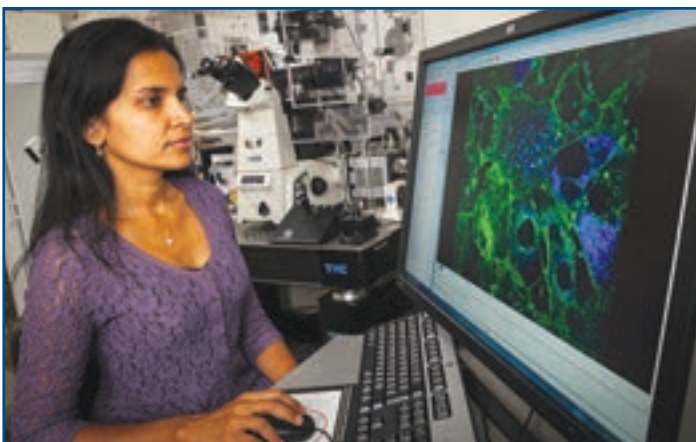
M.D. Matthews Research Professor

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

The overall objective of Dr. Colley's research program is to study hereditary human blinding diseases such as retinitis pigmentosa (RP) and age-related macular degeneration (AMD). Her research focuses on rhodopsin biosynthesis and signal transduction in the photoreceptors of *Drosophila* (fruit fly). She has demonstrated that mutations in constituents of protein transport, rhodopsin function and phototransduction lead to severe retinal defects and retinal degeneration in *Drosophila*.



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 cellular mechanisms underlying age-related macular degeneration (AMD). In particular, she is interested in how cells of the retinal pigment epithelium (RPE), the initial site of damage in AMD, cope with aging and cellular stress. Using a state-of-the-art live imaging system, she follows processes such as cellular clearance, membrane repair and immune-mediated inflammation within the RPE and the retina. Her goal is to identify early deficits in the RPE that promote vision loss and use this information to identify novel therapeutics or novel uses for existing drugs to target AMD.

Established Research Awards

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



The Award of Merit in Retina Research

Cynthia A. Toth, MD

Duke Eye Center
Durham, NC

New Views of Retinal Microanatomy at the Bedside and in Surgery will Transform Retinal Practice

In being chosen for the Award of Merit, Dr. Toth gave the Charles L. Schepens Lecture at the 46th Annual Scientific Meeting of The Retina Society in Beverly Hills, CA, which was held in September.

Dr. Toth has developed surgical techniques and instrumentation for macular translocation and other vitreoretinal surgery and treats adults, children and infants with complex vitreoretinal disorders. She has extended OCT applications outside of conventional clinical settings such as in the neonatal nursery or for real-time use during vitreoretinal surgery. Her novel OCT applications and analytic software are used in premature infants, children, and in adults to improve the identification of disease and delays or anomalies in development.



RRF Pyron Award for Outstanding Achievement in Retina Research

George A. Williams, MD

Beaumont Eye Institute
Royal Oak, MI

Pharmacologic Vitreolysis: Past, Present and Future

Dr. Williams presented the RRF Pyron Award lecture at the 31st Annual Meeting of the American Society of Retina Specialists (ASRS), which was held in Toronto, Canada, in August.

Dr. Williams has published over 200 articles and book chapters in the field of vitreoretinal surgery. He has participated as principal investigator or co-investigator in over 20 clinical trials. His special interest is advanced vitreoretinal surgery for complex retinal detachment and diabetic retinopathy.

Established Research Awards



Charles L. Schepens, MD/AAO Award

Lawrence A. Yannuzzi, MD

Vitreous-Retina-Macula Consultants
New York, NY

Acute Zonal Occult Outer Retinopathy

In being selected for the Charles L. Schepens, MD/AAO Award, Dr. Yannuzzi gave the Charles L. Schepens, MD/AAO Lecture at the Retina Subspecialty Day of the American Academy of Ophthalmologists (AAO) Annual Meeting in New Orleans, LA, on November 15.

Dr. Yannuzzi has made numerous, original, innovative and lasting contributions in imaging (fluorescein angiography and indocyanine-green angiography), drug development (first non-steroid anti-inflammatory drop) and therapeutic modalities, retinal krypton laser photocoagulation. He has discovered new medical-retinal diseases, including polypoidal CNV, retinal angiomatous proliferation (RAP) and acute idiopathic maculopathy (AIM).



Dr. David Parke, Dr. Alice McPherson and Dr. Lawrence Yannuzzi following the Schepens Lecture



Paul Kayser/RRF Global Award

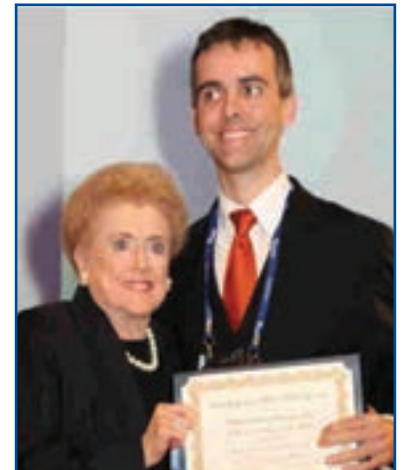
Eduardo Buchele Rodrigues, MD

Federal University of São Paulo
São Paulo, Brazil

Lutein: A new dye for chromovitrectomy

The 30th Pan-American Congress, held in Rio de Janeiro in August, was the setting for Dr. Rodrigues's lecture as recipient of the inaugural Paul Kayser/RRF Global Award. Dr. Rodrigues is co-author of the first comprehensive book devoted to pharmacologic agents and their rationale and mechanisms of action in selected retinal and uveitic diseases.

This award recognizes outstanding achievement in visual science with preference given in the specialized field of research on the retina and vitreous. RRF established this award in memory of Paul Kayser and to honor his interest in international solutions to the prevention of blindness.



Dr. McPherson with Dr. Rodrigues, the Inaugural Paul Kayser/RRF Global Award Recipient



2014 Gonin Medalist

Alice R. McPherson, MD, has been selected 2014 Gonin Medalist by the International Council of Ophthalmology (ICO) Board of Trustees in collaboration with the University of Lausanne and the Swiss Ophthalmological Society.

International Fellowships

RRF funds two programs of international fellowships, one a 12-month fellowship and the other a six-month fellowship.

ICO - RRF Helmerich International Fellowships

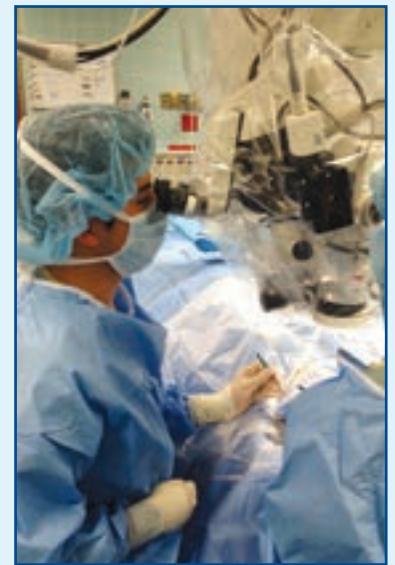
The International Council of Ophthalmology (ICO), in cooperation with the International Council of Ophthalmology Foundation (ICOF), and Retina Research Foundation, has established two international fellowships with income from an endowment created by Walter H. Helmerich, III. These two, 12-month fellowships 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.



David Rivera De La Parra, MD, from Mexico, for training in retina at Jules Stein Eye Institute at University of California, Los Angeles with Dr. Steven D. Schwartz. Following fellowship Dr. Rivera will return to teach medical students, ophthalmology residents and fellows, and to treat patients at the Instituto de Oftalmologia, Mexico City.

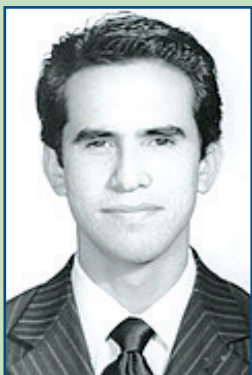


Dr. Rivera with Dr. Bradley Straatsma



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.



Carlos Quesada Ruiz, MD, from Mexico for training in pathology at McGill University Henry C. Witelson Ocular Pathology Lab in Montreal, Canada, with Bruno F. Fernandez, MD.



Bruna Vieira Ventura, MD, from Brazil, for training in cornea, cataract and refractive surgery at Baylor College of Medicine in Houston, Texas, with Dr. Douglas D. Koch. After fellowship Dr. Ventura will return to her training center at Altino Ventura Foundation in Recife, Brazil.

Johanna Matilde Gonzalez Rodriguez, MD from Mexico for training in glaucoma at Toronto Western Hospital in Toronto, Canada, with Graham Trope, MD.

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 2013 funding for this program was over \$48,000.

RRF Lawrence Travel Scholarships

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



In 2013, eighteen ophthalmology students were selected from these schools:

- Viral Immunology Center, Georgia State Univ., Atlanta, GA
- Keck School of Medicine of Univ. Southern Calif., Los Angeles, CA
- University of Utah School of Medicine, Salt Lake City, UT
- Vanderbilt University, Nashville, TN
- Duke University, Durham, NC
- University of Oklahoma Health Sci. Ctr., Oklahoma City, OK
- University of Illinois at Chicago, Chicago, IL
- Moran Eye Institution, University of Utah School of Medicine, Salt Lake City, UT
- Harvard Medical School, Boston, MA
- Weill Cornell Medical College, New York, NY
- University of Houston College of Optometry, Houston, TX
- New York University Medical Center, College of Medicine, New York, NY
- University of Southern California, Los Angeles, CA
- UC Santa Cruz, Santa Cruz, CA
- USC / Doheny Eye Institute VMR Institute, Los Angeles, CA
- University College London, Harvard Medical, Boston, MA
- The Raymond and Ruth Perelman School of Medicine, Philadelphia, PA
- SUNY Downstate Medical Center SUNY Eye Institute, Brooklyn, NY

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RRF 44th Anniversary Luncheon, May 15, 2013



Ronald A. DePinho, MD
*President, The University of Texas MD Anderson
Cancer Center, Houston, Texas*
RRF Lecturer "Understanding and Reversing Aging"

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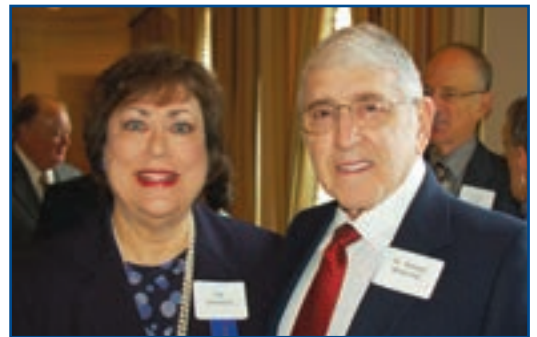
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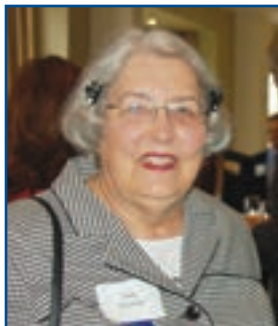
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RETINA RESEARCH FOUNDATION

COMBINED STATEMENT

FINANCIAL POSITION

December 31, 2013

(with summarized financial information as of December 31, 2012)

	General Funds			Endowment Funds				2013 Total All Funds	2012 Total All Funds (Memorandum Only)
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total		
Assets									
Cash and cash equivalents	\$ 591,928	\$ 132,500	\$ 724,428	\$ -	\$ 2,249,773	\$ -	\$ 2,249,773	\$ 2,974,201	\$ 1,833,948
Contributions receivable	32,400	5,000	37,400	-	-	450,000	450,000	487,400	1,011,246
Investments	1,430,782	-	1,430,782	3,281,883	24,913,788	18,128,540	46,324,211	47,754,993	41,930,251
Furniture and equipment, net of accumulated depreciation of \$5,282)	14,342	-	14,342	-	-	-	-	14,342	13,070
Charitable remainder trust	-	-	-	-	-	329,953	329,953	329,953	312,374
Intangible assets	12	-	12	-	-	-	-	12	12
Total assets	\$ 2,069,464	\$ 137,500	\$ 2,206,964	\$ 3,281,883	\$ 27,163,561	\$ 18,908,493	\$ 49,353,937	\$ 51,560,901	\$ 45,100,901
Liabilities and net assets									
Accounts payable	\$ 177	\$ -	\$ 177	\$ -	\$ 86,177	\$ -	\$ 86,177	\$ 86,354	\$ 75,052
Commitments and contingencies									
Net assets	2,069,287	137,500	2,206,787	3,281,883	27,077,384	18,908,493	49,267,760	51,474,547	45,025,849
Total liabilities and net assets	\$ 2,069,464	\$ 137,500	\$ 2,206,964	\$ 3,281,883	\$ 27,163,561	\$ 18,908,493	\$ 49,353,937	\$ 51,560,901	\$ 45,100,901

RETINA RESEARCH FOUNDATION

COMBINED STATEMENT

NET ASSETS

For the year ended December 31, 2013
 (with summarized financial information for the year ended December 31, 2012)

	General Funds			Endowment Funds				2013 Total All Funds	2012 Total All Funds (Memorandum Only)
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total		
<i>For the year ended December 31, 2013</i>									
Revenues									
Contributions	\$ 165,527	\$ 45,000	\$ 210,527	\$ -	\$ -	\$ 138,000	\$ 138,000	\$ 348,527	\$ 1,481,086
Interest, dividend and distribution income	32,282	-	32,282	69,260	948,696	-	1,017,956	1,050,238	1,078,849
Realized and unrealized gains on investments, net	186,410	-	186,410	427,581	5,848,559	-	6,276,140	6,462,550	3,418,755
Mineral interest income and other income	106,180	-	106,180	-	-	-	-	106,180	99,487
Change in value of split-interest agreement	-	-	-	-	-	17,579	17,579	17,579	6,070
Income transferred from Endowment Fund investments	897,609	102,500	1,000,109	(68,079)	(932,030)	-	(1,000,109)	-	-
Net assets released from restrictions-satisfaction of program restrictions	83,000	(83,000)	-	-	-	-	-	-	-
Total revenues	1,471,008	64,500	1,535,508	428,762	5,865,225	155,579	6,449,566	7,985,074	6,084,247
Expenses									
Program services									
Research projects and grants	991,921	-	991,921	-	-	-	-	991,921	1,102,802
Public education	30,399	-	30,399	-	-	-	-	30,399	28,509
Career development and awards	80,850	-	80,850	-	-	-	-	80,850	77,073
Total program services	1,103,170	-	1,103,170	-	-	-	-	1,103,170	1,208,384
Supporting services									
Management and general	91,253	-	91,253	20,172	293,871	-	314,043	405,296	365,337
Fund raising	27,910	-	27,910	-	-	-	-	27,910	10,419
Total supporting services	119,163	-	119,163	20,172	293,871	-	314,043	433,206	375,756
Total expenses	1,222,333	-	1,222,333	20,172	293,871	-	314,043	1,536,376	1,584,140
Changes in net assets	248,675	64,500	313,175	408,590	5,571,354	155,579	6,135,523	6,448,698	4,500,107
Transfer (Note 4)	-	-	-	-	(1,000,000)	1,000,000	-	-	-
Net assets, beginning of year	1,820,612	73,000	1,893,612	2,873,293	22,506,030	17,752,914	43,132,237	45,025,849	40,525,742
Net assets, end of year	\$ 2,069,287	\$ 137,500	\$ 2,206,787	\$ 3,281,883	\$ 27,077,384	\$ 18,908,493	\$ 49,267,760	\$ 51,474,547	\$ 45,025,849

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Retina Research Foundation
1977 Butler Boulevard
Houston, Texas 77030 - 4101
713-797-1925

email: rrf@retinaresearchfnd.org
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