TRP channels have emerged as key biological sensors functioning in many cellular processes including vision, taste, olfaction, hearing and touch. Despite their importance, virtually nothing is known about the folding and targeting of TRP channels during their biosynthesis. In the November 2011 issue of Neuron the Colley lab published work on a novel molecular chaperone, XPORT, which functions in the biosynthesis and trafficking of the *Drosophila* TRP channel and its G-protein coupled receptor, rhodopsin (Rh1).

This image shows the *Drosophila* compound eye, which is where the first TRP channel was discovered and characterized. In the background is an overlay of several immunofluorescently labeled tissue sections. XPORT protein is labeled in red. TRP or Rh1 are labeled in green, and nuclei are shown in blue.
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Dear Friends,

In this age of rapid change, Retina Research Foundation (RRF) is proud to say that the change we methodically advance is research into causes and cures for blindness. “Slow and steady wins the race” is true, but often scientific advancement comes from unexpected quarters and in seemingly random sequence. The scientific process requires pursuing a diversity of avenues to achieve maximum success. The pace of progress may be frustratingly slow at times, but may then leap ahead in great bounds if the groundwork has been laid.

As you will see on page four of this report, RRF works in collaboration with the most outstanding organizations worldwide. Like spokes in a wheel, these collaborating organizations allow RRF to have the strength and solid foundation on which to build a carefully designed, balanced program of retina research:

• Pilot studies conducted by highly regarded scientists at leading universities;
• Established ongoing studies conducted by internationally recognized award recipients;
• Research Chairs and Professorships at leading universities and institutions;
• International fellowships that provide advanced subspecialty training to young scientists, who return to their home countries following training;
• Young scientist development and career advancement programs.

This diversity of research programs is intended to cast a wide net of investigation into sight preservation. The research sites shown on page five of this report list the local, national, and international sites for research projects that RRF has supported through the years. Our influence is worldwide because blindness knows no boundaries.

The philosophy of RRF has been and continues to be achieving excellence each step along the way. These steps in excellence begin with the selection process for awards, grants or appointments and continue through the projects themselves that generate new insights and discoveries previously unknown, stimulating new avenues for scientific investigation.

One thing will never change – RRF is always striving to do better. In 2011, we completed a major redesign of our website, which we hope will be a window for you into our activities. An informed and supportive public is the best partner we can have as we work to achieve our mission of vision preservation.

With gratitude,

Alice McPherson, MD
President
Overview of Research - 2011

Retina Research Foundation supports an exemplary variety of programs in retina research around the world. Past and present RRF research sites now total 57 national and 51 international. The following is a brief recap of sites for RRF research funds in 2011, which illustrates the wide reach of RRF activities.

RRF Pilot Study Grants – Investigation of New Research Topics

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

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

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

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

RRF Macula Research Grant – Pilot Study Award

RRF Cox Research Project – administered by The Macula Society
  J. William Harbour, MD – Washington University School of Medicine, St. Louis, MO

Established Awards – Awards Recognizing Lifetime Achievement

RRF Award of Merit – presented by The Retina Society – Rome, Italy - Sept. 21 to 25
  Michael F. Marmor, MD – Eye Institute at Stanford, Stanford University, Palo Alto, CA

RRF Kayser International Award – presented by International Society for Eye Research (ISER)
  Will be presented again in 2012

RRF Pyron Award – presented by American Society of Retina Specialists (ASRS) – Boston, MA – Aug. 20 to 24
  Jean Bennett, MD, PhD – Stellar-Chance Labs, University of Pennsylvania, Philadelphia, PA
  Albert Maguire, MD – Scheie Eye Institute, University of Pennsylvania, Philadelphia, PA

C L Schepens MD/AAO Award – Co-Sponsored by RRF and Schepens International Society (SIS) – Orlando, FL - Oct. 21
  Stanley Chang, MD – Columbia University, New York, NY
RRF Gonin Lecturer – presented by Club Jules Gonin
    Will be presented again in 2012
RRF Gonin Medalist – presented by ICO with Club Jules Gonin
    Will be presented again in 2014

Research Chairs – Ongoing Proven Research Projects

University of Wisconsin, Madison, WI
    Curtis Brandt, PhD – Helmerich Chair
    Nader Sheibani, PhD – RRF Chair
    Daniel Albert, MD, MS – Humble Distinguished Directorship
    David Gamm, MD, PhD – Murfee Chair

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

Research Professorships – Ongoing Proven Research Projects

University of Wisconsin, Madison, WI
    Arnold E. Ruoho, PhD – Gamewell Professor
    Arthur S. Polans, PhD – MD Matthews Professor
    Bikash Pattnaik, PhD – RM Brown Professor

International Fellowships – Advanced Subspecialty Training

ICO/Helmerich International Fellowships - administered by International Council of Ophthalmology Foundation (ICOF)
    Lala Ceklic, MD, PhD – from Sarajevo to Bern University Hospital, Switzerland
    Afsun Sahin, MD – from Turkey to Schepens Eye Research Inst., Harvard Univ., Boston, MA
Gillingham Fellowships – administered by Pan-American Association of Ophthalmology (PAAO)
    Arturo Ramirez-Miranda, MD – from Mexico to Jules Stein Eye Institute, Los Angeles, CA
    Caio Vinícius Saito Regatieri, MD – from Brazil to Schepens Eye Research Institute, Harvard Medical School, Boston, MA

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)
    Nineteen vitreoretinal scientists representing schools in thirteen states traveled to the ARVO Annual Meeting to present their scientific research.
# Retina Research Sites

## Past and Present

### Texas: 11
- Baylor College of Medicine
- Center for Technology
- Houston Advanced Research Center
- UT MD Anderson Cancer Center
- Southwest Research Institute
- Texas A & M Health Science Center
- Texas Children’s Hospital
- The Methodist Hospital
- University of Houston
- University of Texas at Galveston
- University of Texas at Houston

### National: 46

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<td>Casey Eye Institute</td>
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<td>Kresge Eye Institute</td>
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<td>Eskisehir Osmangazi University</td>
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<td>Eye Foundation Hospital</td>
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<td>Hospital Ophthalmique Institute de la Vision</td>
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<td>Western General Hospital</td>
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## Pan American Countries: 21

- Buenos Aires, Argentina
- Curitiba, Argentina
- La Paz, Bolivia
- Belo Horizonte, Brazil
- São Paulo, Brazil
- Porto Alegre, Brazil
- Santiago, Chile
- Bogotá, Colombia
- Cali, Colombia
- San Juan, Costa Rica
- Santo Domingo, Dominican Republic
- San Salvador, El Salvador
- Port-au-Prince, Haiti
- San Lorenzo, Honduras
- Mexico City, Mexico
- Nuevo León, Mexico
- Asunción, Paraguay
- Lima, Peru
- San Juan, Puerto Rico
- Montevideo, Uruguay
- Caracas, Venezuela
RRF provided funding for 11 pilot study research projects conducted at leading research institutions. Pilot studies are experimental studies designed to “test the waters” or break new ground. Findings may lead to larger ongoing studies in the future. Eight of the projects have been named in recognition of generous support of gifts. This year the Carl G. Mueller, Jr. Research Project has been named in his memory and in honor of his long time leadership role and dedication to RRF.

**Named Basic Research Projects**

**Adolphe G. and Josephine Roberts Gueymard 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 is focused on molecular and synaptic mechanisms underlying retinal cell death in age-related macular degeneration (AMD) and glaucoma, and developing new gene therapy vectors for rescuing retinal degeneration in these diseases. His group has demonstrated that gene therapy prevents photoreceptor degeneration in a Bardet-Biedl Syndrome mouse model, and developed a new microinjection system for ocular delivery of pharmacological agents and viral/gene conjugates. His lab also designed new non-invasive devices for early detection of photoreceptor and ganglion cell dysfunction in animals and humans. They will use these new tools in conjunction with electrophysiological and pharmacological techniques to develop new treatment and prevention strategies. Dr. Wu’s recent publications report new discoveries on the first successful gene therapy that prevents photoreceptor degeneration in a BBS animal model, and on physiological, pharmacological and genetic properties of healthy and diseased mouse retinas.

**Emmett A. Humble Research Project**  
**Louise C. Strong, MD**  
Genetics  
University of Texas M.D. Anderson Cancer Center, Houston, TX  
*Genetic Etiology of Retinoblastoma*

The overall goal of Dr. Strong’s project 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 malignant neoplasm; it is also an important biologic question, as the retinoblastoma “pathway” is considered to be critical to the development of most if not all cancers, and understanding the interactions between the Rb protein (the product of the retinoblastoma gene), other proteins that interact with Rb, and other molecular pathways may provide further insights into tumor development and may identify potential targets for therapy. Dr. Strong’s program to date has ascertained some 127 hereditary retinoblastoma kindreds, including 36 in which at least one family member had a second malignant non-ocular neoplasm.
**Research**

**The Paul Kayser Research Project**

**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 the pathogenesis and immunohistochemical profile of ophthalmic lesions involving the eye and ocular adnexa. Recently he has collected approximately 35 conjunctival lesions that have been classified as dysplasia. The lesions are classified as mild, moderate, and severely using a monoclonal antibody (Ki-67) to determine the percent of Ki-67 positive nuclei within the foci of dysplasia. In 2011, Dr. Font’s laboratory completed a study of conjunctival lesion from a middle-aged woman who had Kaposi sarcoma of the conjunctiva associated with Human Herpes Virus type 8 (HHV-8), which was detected by immunohistochemical methods (the patient was HIV-positive). They collected 15 cases of microspordiosis of the cornea in which both eyes were simultaneously involved. The organisms (Vittaforma cornea) were identified mostly in the cytoplasm of the keratocytes and demonstrated quite nicely by the electron microscopy.

**Joe M. and Eula C. Lawrence Research Project**

**Milan Jamrich, PhD**

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. During eye development, the initially undifferentiated cells of the retina develop into a layered array of cell types with specific capabilities. The retinal gene Rx, initially isolated in Dr. Jamrich’s laboratory, plays a critical role in eye formation. In 2011, Dr. Jamrich’s laboratory strived to determine whether the two human RAX genes could rescue eye formation in mice lacking the mouse Rx gene. They made transgenic mice using two RAX genes. One of the transgenic mouse lines was carrying the human RAX1 gene, but this gene was not expressed in the transgenic mouse. The second line, carrying RAX2, was showing expression of this transgene but this gene was not able to rescue eye formation in Rx deficient mice.

**The W.O. Manning Research Project**

**Rui Chen, PhD**

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 and conduct functional analysis of genes involved in retinal development using model organism such as *Mus musculus* (house mouse). Understanding of molecular mechanisms of normal retina development is an essential part for better understanding the mechanisms and designing novel treatments of eye diseases. Dr. Chen’s laboratory has applied the cutting edge sequencing technology in cloning disease genes underlying Leber congenital amaurosis (LCA) and retinitis pigmentosa (RP) and performed whole exome sequencing on a large cohort of patients. In the past year, Dr. Chen’s group has made significant progress in identifying novel LCA/RP disease genes, including CEP164, KCNJ13, and NMNAT1. Follow up functional studies suggest potential novel disease mechanisms of LCA such as protein transportation and NAD homeostasis in photoreceptor cells function. Corresponding animal models are being established and will be used for further mechanistic studies and testing of potential treatments, including gene and drug therapy.
Dr. Colley’s laboratory is focused on using *Drosophila* (fruit fly) 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. *Drosophila* is a powerful animal model for studying inherited retinal degeneration disorders. In 2011, Dr. Colley conducted a large-scale forward genetic screen of both the second and third chromosomes to identify and characterize constituents of protein targeting and transport in *Drosophila* photoreceptor cells. Results identify XPORT (Exit Protein) as a key molecular chaperone for TRP (Transient Receptor Potential) and Rhodopsin. Defective transport of TRP and Rhodopsin occur when there are mutations in XPORT, which leads to retinal degeneration.

By one year of age, Spata7 mutant mice present with a severe loss of photoreceptors, as seen by the large reduction in the outer nuclear layer (ONL) of the retina. These mice fully recapitulate the human LCA disease phenotype and are now being used for gene therapy studies.
Retinoblastoma (Rb), an ocular cancer that affects young children, can be caused by an inherited mutation. Children treated with chemotherapy or radiation therapy have a significantly increased risk of developing other types of cancer later in life. Some disorders that cause retinal degeneration such as Stargardt’s Disease are also associated with errors in genetic material. These defects are manifest in the abnormal structure or function of proteins responsible for normal vision. If the mutation(s) in the affected gene is known, replacing the defective gene with a normally functioning gene could slow or even halt the degeneration. The vector systems that Dr. Hurwitz’s laboratory has developed for suicide gene therapy for retinoblastoma and gene replacement approaches for treating Stargardt’s Disease are being used to explore mechanisms of adenoviral-mediated transgene expression unique to the ocular environment.

Prevalence and Incident Changes in Retinal Vascular Caliber Associated with Medication and Supplement Use

Retinal vessel diameters (RVD) 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). A class of exposures that is often ignored in examining associations between cardiovascular endpoints and RVD is medications and supplements. Dr. Klein’s laboratory has been reviewing all medications previously used as well as those currently used in the population. This was done in order to include new drugs and also to reclassify some medications/supplements that have recently been reported to have effects on microvascular caliber.
Research

Basic Research Grants

Lih Kuo, PhD
Departments of Systems Biology and Translational Medicine and Ophthalmology
Scott & White Memorial Hospital
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 ischemia-associated retinal vascular dysfunction at molecular, cellular and intact tissue levels and to develop a therapeutic approach for disease treatment. Retinal vascular diseases are the leading causes of visual impairment in the USA, but the etiology and development of this vasculature-related ocular disease are not fully understood. Because the proper function of retina neuronal tissues depends upon the sufficient oxygen and nutrients supply via the microvascular system, the blood flow regulation by these microvessels is critically important and closely related to the disease development. Dr. Kuo’s laboratory has developed a clinically relevant animal model for retinal ischemia to support the critical role of ET-1 system and RhoA kinase/ROCK in the development of vascular pathophysiology.

Leonard Levin, MD, PhD
Dept. of Ophthalmology and Visual Science
University of Wisconsin, Madison, WI

Pharmacological Protection of Endothelial Cells For Retinal Vascular Disease

Many blinding retinal diseases result from abnormalities of blood vessels. In some diseases or as the result of radiation, the initial event is damage to endothelial cells, the cells that line the inside of the blood vessels. Dr. Levin has demonstrated that this endothelial cell death can be slowed down in a transgenic mouse where endothelial cell death is blocked with an anti-death protein. These drugs block endothelial cell death in tissue culture induced by radiation and by free radicals, helping protect cells that line blood vessels in the retina from radiation. The retinal damage from radiation has no effective treatment at present, and these new drugs are an encouraging sign that such a treatment may one day be possible. This study may eventually result in treatments for what is currently an incurable retinal disease and may also yield insights to other small vessel retinopathies such as diabetes.
The Margaret and Mills Cox Macula Research Project

J. William Harbour, MD
Director, Ocular Oncology Service
Washington University School of Medicine
St. Louis, MO

Development of a Blood Test to Diagnose Uveal Melanoma

Dr. Harbour’s research has contributed to the understanding of retinoblastoma, the main eye cancer of childhood, as well as ocular melanoma, the most common cancer of the eye in adults. Unfortunately, almost half of patients with ocular melanoma are at risk of dying from the fatal spread of this disease to other organs. Dr. Harbour’s group recently discovered that mutation of one specific metastasis suppressor gene seems to cause the melanoma to spread and become lethal. Having identified this genetic defect, Dr. Harbour’s group is developing new tests that will detect the spread of melanoma cells at a very early stage, when treatments are likely to be more effective.

Established Research Awards

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

The Award of Merit in Retina Research

Michael F. Marmor, MD
Byers Eye Institute at Stanford, Stanford University
Palo Alto, CA

The Art of Retina

In being chosen for the Award of Merit, Dr. Marmor gave the Charles L. Schepens Lecture on September 23 at the Annual Scientific Meeting of The Retina Society in Rome, Italy.

Dr. Marmor is known for pioneering work on the physiology and pathophysiology of the retina and RPE. In the early 1970s Dr. Marmor recognized the importance of the RPE as a vital tissue for retinal health. He played an important role in bringing this awareness to ophthalmology, writing many articles and the first comprehensive texts on the RPE. His clinical work has focused on retinal and macular dystrophies, toxic retinopathy and clinical electrophysiology.

Another aspect of Dr. Marmor’s work lies at the interface between vision and art. He has written a number of articles and three books on art that explore the nature of vision and the effects of eye disease with respect to art. He also has written about ophthalmic history.
Established Research Awards

**Gertrude Pyron Award for Outstanding Achievement in Retina Research**

**Jean Bennett, MD, PhD**  
Professor of Ophthalmology  
University of Pennsylvania School of Medicine  
Philadelphia, PA

**Albert Maguire, MD**  
Scheie Eye Institute  
Department of Ophthalmology  
University of Pennsylvania School of Medicine  
Philadelphia, PA

*The Evolution of Retinal Gene Therapy: From DNA to FDA*

As the Pyron Award recipients, Dr. Bennett and Dr. Maguire presented their lecture on August 21 at the Annual Meeting of the American Society of Retina Specialists (ASRS), which was held in Boston, Massachusetts.

Dr. Bennett and Dr. Maguire worked as a team to accomplish one of the first successful demonstrations of gene therapy in humans. Dr. Bennett bred a virus to carry to the gene, and Dr. Maguire injected it into the eye. The team successfully restored much of the vision in patients who have Leber’s congenital amaurosis, in which a mutated gene prevents the retina from manufacturing a nutrient vital to eye health. The hardest part was finding a virus that would deliver normal copies of the defective gene – harmlessly. The technique eventually could be tried to treat macular degeneration.

**Charles L. Schepens, MD/AAO Award**

**Stanley Chang, MD**  
Edward S. Harkness Professor  
Chairman of Ophthalmology  
Columbia University  
New York, NY

*Is Double Peeling for Epiretinal Membranes Necessary?*

In being selected for the Charles L. Schepens, MD/AAO Award, Dr. Chang gave the Charles L. Schepens, MD/AAO Lecture at the Retina Subspecialty Day of the American Academy of Ophthalmologists (AAO) Annual Meeting in Orlando, Florida, on October 21.

Dr. Chang has developed and pioneered the use of several revolutionary surgical approaches to treat complex forms of retinal detachment, improving outcomes for patients worldwide. He was the first to use perfluoropropane gas in the management of retinal detachments made worse by scar tissue proliferation (PVR), and developed use of perfluorocarbon liquids during vitreoretinal surgery. With this development, the treatment of giant retinal tears and large relaxing retinotomies became a routine procedure.
Research Chairs and Professorships

Five chairs in retina research provide funds to vision scientists engaged in original excellent research that has the potential to increase understanding of the retina or retinal diseases. Four chairs have been established at University of Wisconsin and one at Baylor College of Medicine. Funding is provided by gifts from Margaret and Mills Cox, Gertrude D. Pyron, W. H. Helmerich, III, Kathryn and Latimer Murfee, and gifts given in honor of Emmett A. Humble, RRF Board Chairman for many years.

Walter H. Helmerich Chair
Curtis R. Brandt, PhD
Ophthalmology and Visual Science
University of Wisconsin School of Medicine and Public Health, Madison, WI

Gene Therapy for Retinal Degenerative Diseases

Viral-based gene delivery vectors are being extensively investigated for therapeutic use in a wide variety of ocular diseases. Because many viruses are human pathogens, our host defense systems can be activated even when replication-defective viruses are used for gene delivery. This response has a number of negative consequences that can affect therapeutic use of the vector, including activation of an immediate inflammatory response. For ocular gene therapy to move forward in people, developing strategies to block the effect by identifying the cause of the inflammatory response is necessary. Dr. Brandt’s lab is studying several pre-inflammatory signaling molecules that could be the signal that initiates the process.

RRF Chair
Nader Sheibani, PhD
Ophthalmology and Visual Science
University of Wisconsin School of Medicine and Public Health, Madison, WI

Understanding the Molecular and Cellular Mechanisms that keep Retinal Vascularization in Check

The growth of new blood vessels from pre-existing capillaries (angiogenesis) contributes to the pathogenesis of many diseases, including retinopathy of prematurity, diabetic retinopathy, and age-related macular degeneration. Understanding the molecular and cellular mechanisms that regulate angiogenesis and how their alterations contribute to growth of new blood vessels, has significant clinical impact. Dr. Sheibani is working to develop new modalities to treat a variety of eye diseases with a neovascular component.
Research Chairs and Professorships

**Emmett A. Humble Distinguished Directorship**

**Daniel Albert, MD, MS**

Director, Eye Research Institute
University of Wisconsin, Madison, WI

Dr. Albert is the founding Director of the UW Eye Research Institute, which fosters a multi-disciplinary community of scholars working in collaboration to advance knowledge about the science and art of vision and apply it to the prevention of blindness. Bringing together scientists and scholars from diverse disciplines stimulates scientific progress through contact with new or disparate perspectives, exchange of ideas and insights, and application of innovative technologies and advanced methodologies.

Dr. Albert’s research focuses on ocular tumors, specifically melanoma and retinoblastoma. His work with retinoblastoma utilizes transgenic mouse models of the tumor to investigate the molecular biology of the disease and to learn whether vitamin D analogs produce tumor regression in these animal models. He also studies melanoma in a transgenic mouse model. His other interests include medical ethics and the history of medicine and ophthalmology.

**Kathryn and Latimer Murfee Chair**

**David M. Gamm, MD, PhD**

UW Eye Research Institute
University of Wisconsin, Madison, WI

*Deriving Photoreceptors from Human Embryonic Stem Cells*

Dr. Gamm’s research focus is the study of inherited and acquired eye diseases that culminate in the degeneration of photoreceptors and retinal pigment epithelium. Dr. Gamm has established a subretinal transplant system within a newly developed animal research facility complete with surgical stations and specialized equipment needed to conduct this work. This system allows him to test strategies for replacing retinal cells, such as photoreceptors, in rat models of retinal degenerative disease.

Dr. Gamm’s laboratory has succeeded in creating structures from the most primitive stage of retinal development using embryonic stem cells and stem cells derived from human skin. His success in producing multiple retinal cell types from induced pluripotent stem (iPS) cells has led to development of human retinal disease-specific models, advancing stem cell-based therapies and could lead to better treatment methods for patients as a result. These iPS lines will aid in the study of the pathogenesis of retinal dystrophies and provide a means to test pharmacologic agents and develop customized stem cell treatment strategies.

The RRF Chair at Baylor College of Medicine has yet to be named.
Research Chairs and Professorships

**Edwin and Dorothy Gamewell Professor**
**Arnold E. Ruoho, PhD**
UW Eye Research Institute
University of Wisconsin, Madison, WI

*Retinal Neuroprotection by the Sigma-1 Receptor Chaperone*

Dr. Ruoho’s research is directed at understanding the molecular mechanisms underlying neurotransmitter release and receptor activation. He has discovered a new class of compounds that are high-affinity inhibitors of the Sigma-1 receptor, a transmembrane chaperone protein expressed in many different tissue types and particularly concentrated in multiple layers of the retina. Sigma-1 may be utilized to diminish neurodegeneration of retinal photoreceptors and ganglion cells. His 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.

**M.D. Matthews Research Professor**
**Arthur S. Polans, PhD**
UW Eye Research Institute
University of Wisconsin, Madison, WI

*Studies of the Resveratrol-Stimulated Calcium Response in Endothelial Cells*

There are significant problems associated with current treatment regimens for cancer, such as the use of radiation and chemotherapy agents. Dr. Polans’ lab has demonstrated that resveratrol, a natural plant product, can inhibit tumor growth in different mouse models of uveal melanoma, retinoblastoma and other types of cancer and can cause tumor regression when the bioavailability of the compound is increased. The same compounds that are useful in reducing tumor growth may now be used to treat other neovascular diseases of the eye, including forms of AMD, diabetic retinopathy and retinopathy of prematurity.

**Rebecca Meyer Brown Professor**
**Bikash Pattnaik, PhD**
UW Eye Research Institute
University of Wisconsin, Madison, WI

*Mechanisms Underlying Kir 7.1 Mutation Causing Snowflake Vitreoretinal Degeneration (SVD)*

Macular degenerative diseases are hard to study because the aging process and consequences are hard to replicate in a laboratory setup. Studying disease mechanism of genetic eye diseases with parallel retinal degenerative phenotype is the best possible alternative. Snowflake vitreoretinal degeneration (SVD) is a genetic disorder due to a mutation in the RPE potassium channel causing pigment appearance on the retina. Dr. Pattnaik has made significant advances in understanding of the disease cause in SVD.
**International Fellowships**

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

** ICO/Helmerich International Fellowships**

The International Council of Ophthalmology (ICO), in cooperation with the International Council of Ophthalmology Foundation (ICOF), and Retina Research Foundation have 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 who are committed to returning to a position at a teaching institution or public service hospital in their home country following the fellowship.

**2011 Helmerich Fellows:**

**Lala Ceklic, MD, PhD,** from Bosnia and Herzegovina, for training in retina and vitreoretinal surgery at Bern University Hospital in Switzerland. After fellowship Dr. Ceklic will return to the position of Chief of the Eye Department “Kasindo” Clinical Center of Eastern Sarajevo.

**Afsun Sahin, MD,** from Turkey, for training in corneal disease and surgery at the Schepens Eye Research Institute at Harvard University. After fellowship Dr. Sahin will return to teaching and research at the University Medical School in Eskisehir, Turkey.

**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.

**Caio Vinícius Saito Regatieri, MD**  
From São Paulo, Brazil  
Harvard Medical School, Schepens Eye Research Institute, Boston, MA  
Training in Retina (Retina Stem Cell) with Michael Young, PhD

**Arturo Ramírez-Miranda, MD**  
From Mexico City, Mexico  
Jules Stein Eye Institute, UCLA, Los Angeles, CA  
Training in Cornea, External Disease & Refractive Surgery with Anthony Aldave, MD
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 2011 funding for this program was $45,020.

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 the students to attend the ARVO Annual Meeting in May in Ft. Lauderdale, FL, to present their papers or posters.

Nineteen ophthalmology students were selected from these schools in 2011:

- Case Western Reserve University – Cleveland, OH
- Cincinnati Children’s Hospital – Cincinnati, OH
- Columbia University College of Physicians & Surgeons – New York, NY
- Indiana University – Bloomington, IN
- Purdue University Indiana – West Lafayette, IN
- John Hopkins School of Medicine – Baltimore, MD
- John Hopkins University – Baltimore, MD
- Massachusetts Eye and Ear Infirmary, Harvard Medical School – Boston, MA
- National Eye Institute – Bethesda, MD
- National Institutes of Health – Bethesda, MD
- Oregon Health & Science University – Portland, OR
- Texas A&M Health Science Center – Temple, TX
- University of California Berkeley – Berkeley, CA
- University of Colorado Anschutz Medical Center – Denver, CO
- University of Illinois at Chicago – Chicago, IL
- University of Oklahoma Health Sciences Center – Oklahoma City, OK
- University of Utah – Salt Lake City, UT
- Vanderbilt University – Nashville, TN

Retina Research Foundation   Joseph M. and Eula C. Lawrence Travel Grant Recipients
### Retina Research Foundation

#### Combined Statement of Financial Position

**December 31, 2011**

(With Summarized Information as of December 31, 2010)

<table>
<thead>
<tr>
<th></th>
<th>General Funds</th>
<th>Endowment Funds</th>
<th>2011 Total</th>
<th>All Funds</th>
<th>2010 (Memorandum Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and Cash Equivalents</td>
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<td>$75,000</td>
<td>$561,160</td>
<td>$326,320</td>
<td>$326,320</td>
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<tr>
<td>Contributions Receivable</td>
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<td>$10,000</td>
<td>$32,720</td>
<td>$32,720</td>
<td>$32,720</td>
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<td>Investments</td>
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<td>$1,066,920</td>
<td>$2,133,840</td>
<td>$2,659,585</td>
<td>$2,659,585</td>
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<tr>
<td>Furniture and Equipment, Net of Accumulated Depreciation of $5,282)</td>
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<td>-</td>
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<td>-</td>
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<tr>
<td>Charitable Remainder Trust</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Intangible Assets</td>
<td>$12</td>
<td>-</td>
<td>$12</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Total Assets</strong></td>
<td>$1,888,882</td>
<td>$85,000</td>
<td>$1,973,882</td>
<td>$2,659,585</td>
<td>$2,659,585</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>General Funds</th>
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<th>2011 Total</th>
<th>All Funds</th>
<th>2010 (Memorandum Only)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liabilities and Net Assets</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>$2,324</td>
<td>-</td>
<td>$2,324</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Liabilities and Net Assets</strong></td>
<td>$1,888,882</td>
<td>$85,000</td>
<td>$1,973,882</td>
<td>$2,659,585</td>
<td>$2,659,585</td>
</tr>
</tbody>
</table>

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

## NET ASSETS

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

FOR THE YEAR ENDED DECEMBER 31, 2011  
(With Summarized Financial Information for the Year Ended December 31, 2010)

<table>
<thead>
<tr>
<th>General Funds</th>
<th>Endowment Funds</th>
<th>Total</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>Temporarily</td>
<td>Restricted</td>
<td>Temporarily</td>
<td>Restricted</td>
</tr>
<tr>
<td>Contributions</td>
<td>$135,725</td>
<td>$41,000</td>
<td>$176,725</td>
<td>$ -</td>
</tr>
<tr>
<td>Interest, Dividend and Distribution Income</td>
<td>27,496</td>
<td>-</td>
<td>27,496</td>
<td>68,373</td>
</tr>
<tr>
<td>Realized and Unrealized Gains (Losses) on Investments, Net</td>
<td>(40,976)</td>
<td>-</td>
<td>(40,976)</td>
<td>(102,142)</td>
</tr>
<tr>
<td>Mineral Interest Income and Other Income</td>
<td>123,037</td>
<td>-</td>
<td>123,037</td>
<td>-</td>
</tr>
<tr>
<td>Change in Value of Split-Interest Agreement</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Income Transferred from Endowment Fund Investments</td>
<td>897,531</td>
<td>75,000</td>
<td>972,531</td>
<td>(67,420)</td>
</tr>
<tr>
<td>Net Assets Released from Restrictions-Satisfaction of Program Restrictions</td>
<td>186,000</td>
<td>(136,000)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Revenues</strong></td>
<td>$1,328,813</td>
<td>(70,000)</td>
<td>$1,258,813</td>
<td>(101,189)</td>
</tr>
</tbody>
</table>

**EXPENSES:**

Program Services:
- Research Projects and Grants | 946,255 |
- Public Education | 36,090 |
- Career Development and Awards | 79,843 |
- **Total Program Services** | 1,062,188 |

Supporting Services:
- Management and General | 96,112 |
- Fund Raising | 28,807 |
- **Total Supporting Services** | 124,919 |

**Total Expenses** | 1,187,107 |

**Changes in Net Assets**
- Net Assets, Beginning of Year | 1,444,852 |
- **Net Assets, End of Year** | $1,586,558 |

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