Dr. Ruoho believes that the S1R (shown in green) is critical in reducing the oxidative stress in retinal cells and plays an important role in reducing retinal neurodegeneration.
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Hunter Martin and Emmett Humble

Rich Walton and Henry Gissel

Shara Fryer and Suzanne Miller

Dede Weil and Jacque Royce

Kapryce Manchester and Ames Smith

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

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

Baylor College of Medicine, Houston, TX
- 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.

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.
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<th>COLLABORATING ORGANIZATIONS</th>
<th>AWARD</th>
<th>DATE OF FIRST COLLABORATION WITH RRF</th>
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<tr>
<td>RETINA SOCIETY</td>
<td>RRF Award of Merit in Retina Research</td>
<td>1978</td>
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<tr>
<td>ARVO Assoc. for Research in Vision and Ophthalmology</td>
<td>RRF Lawrence Travel Awards</td>
<td>1984</td>
</tr>
<tr>
<td>ISER International Society for Eye Research</td>
<td>RRF Paul Kayser International Award</td>
<td>1986</td>
</tr>
<tr>
<td>ASRS American Society of Retina Specialists</td>
<td>RRF Pyron Award</td>
<td>1988</td>
</tr>
<tr>
<td></td>
<td>Paul Kayser/RRF Global Award</td>
<td>2012</td>
</tr>
<tr>
<td>AAO American Academy of Ophthalmology</td>
<td>Educational Trust Fund</td>
<td>1993</td>
</tr>
<tr>
<td>MACULA SOCIETY</td>
<td>RRF Cox Research Project</td>
<td>1993</td>
</tr>
<tr>
<td>CLUB JULES GONIN</td>
<td>RRF Gonin Lecturer</td>
<td>1996</td>
</tr>
<tr>
<td>ICO International Council of Ophthalmology with University</td>
<td>Gonin Medalist</td>
<td>1998</td>
</tr>
<tr>
<td>of Lausanne and Swiss Ophthalmological Society</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAYLOR Baylor College of Medicine</td>
<td>Research Chair</td>
<td>1998</td>
</tr>
<tr>
<td>UW University of Wisconsin School of Medicine and Public</td>
<td>Research Chairs and Professorships</td>
<td>1998</td>
</tr>
<tr>
<td>Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MERI McPherson Eye Research Institute</td>
<td>Research Chairs and Professorships</td>
<td>2007</td>
</tr>
<tr>
<td>AAO American Academy of Ophthalmology with SIS Schepens</td>
<td>Charles L. Schepens, MD/AAO Award</td>
<td>2008</td>
</tr>
<tr>
<td>International Society</td>
<td></td>
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</tbody>
</table>
### TEXAS : 11
- Baylor College of Medicine
- Center for Technology
- Houston Advanced Research Center
- UT MD Anderson Cancer Center
- Southwest Research Institute
- Texas A & M Health Science Center
- Texas Children’s Hospital
- The Methodist Hospital
- University of Houston
- University of Texas at Galveston
- University of Texas at Houston

### PAN AMERICAN : 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

### INTERNATIONAL : 32
- Asahikawa Medical College
- Bern University Hospital
- Eskisehir Osmangazi University
- Eye Foundation Hospital
- Hospital Ophthalmique
- Institut de la Vision
- Kasindo Eye Clinic
- Keio University
- L V Prasad Eye Institute
- Lariboisiere Hospital
- Lidcombe Hospital
- Lund University
- Magrabi ICO Cameroon Eye Institute
- Mashhad University Medical Services
- McGill University
- Melles Cornea Clinic
- Montreal General Hospital
- Moorfields Eye Hospital
- Osaka Medical School
- Research Institute of Ophthalmology
- Royal College of Ophthalmologists
- Sankara Nethralaya Eye Hospital
- University of Cambridge
- University of Iceland
- University of Osaka
- University of Oxford
- University of Paris
- University of Erlangen-Nuremberg
- University of Leipzig
- University of Regensburg
- University of Tübingen
- Western General Hospital
- Asahikawa, Japan
- Bern, Switzerland
- Eskisehir, Turkey
- Laos, Nigeria
- Lausanne, Switzerland
- Paris, France
- E. Sarajevo, Bosnia and Herzegovina
- Tokyo, Japan
- Hyderabad, India
- Paris, France
- Sydney, Australia
- Lund, Sweden
- Yaounde, Cameroon
- Mashhad, Iran
- Montreal, Canada
- Rotterdam, Netherlands
- Montreal, Canada
- London, England
- Osaka, Japan
- Cairo, Egypt
- Edinburgh, Scotland
- Chennai, India
- Cambridge, England
- Reykjavik, Iceland
- Osaka, Japan
- Oxford, England
- Paris, France
- Erlangen, Germany
- Leipzig, Germany
- Regensburg, Germany
- Tübingen, Germany
- Edinburgh, Scotland

### NATIONAL : 50
- Bascom Palmer Eye Institute
- Beaumont Hospital
- California Institute of Technology
- Casey Eye Institute
- Cleveland Eye Clinic/Foundation
- Cole Eye Institute
- Columbia University
- Cornell University Medical College
- Dean McGee Eye Institute
- Duke University Medical School
- Emory University Eye Center
- Eye Research Institute
- Eye Tech Pharmaceuticals
- Georgia Regents University
- Greater Baltimore Medical Center
- Harvard Medical School
- Indiana University
- Johns Hopkins University Medical School
- Joslin Diabetes Center
- Jules Stein Eye Institute
- Kresge Eye Institute
- Massachusetts Eye & Ear Infirmary
- Massachusetts Institute of Technology
- McPherson Eye Research Institute
- Medical University of South Carolina
- National Eye Institute
- Northwestern University
- Rockefeller University
- Schepens Eye Research Institute
- Shee Eye Institute
- Shiley Eye Center, UC San Diego
- St. Joseph’s Hospital
- Stanford University Medical School
- Tulane University Medical School
- Thomas Jefferson University
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of California
- University of Michigan
- University of Nebraska HSC
- University of Nebraska Medical Center
- University of Pennsylvania
- University of Pittsburgh
- University of Southern California
- University of Wisconsin Medical School
- Vanderbilt University
- Washington University
- Wills Eye Hospital
- Wilmer Eye Institute
- Miami, FL
- Royal Oak, MI
- Pasadena, CA
- Portland, OR
- Cleveland, OH
- Cleveland, OH
- New York, NY
- Ithaca, NY
- Oklahoma City, OK
- Durham, NC
- Atlanta, GA
- Boston, MA
- Boston, MA
- Boston, MA
- Boston, MA
- Detroit, MI
- Boston, MA
- Madison, WI
- Charleston, SC
- Bethesda, MD
- Evanston, IL
- New York, NY
- Boston, MA
- Philadelphia, PA
- La Jolla, CA
- Baltimore, MD
- Palo Alto, CA
- New Orleans, LA
- Philadelphia, PA
- Berkeley, CA
- Los Angeles, CA
- San Francisco, CA
- Gainesville, FL
- Kansas City, KS
- Miami, FL
- Omaha, NE
- Pittsburg, PA
- Los Angeles, CA
- Seattle, WA
- Madison, WI
- Nashville, TN
- St. Louis, MO
- Philadelphia, PA
- Baltimore, MD
RRF provided funding for 13 pilot study research projects conducted at leading research institutions. Nine of the projects were named in recognition of generous support through gifts and years of exceptional service to the Foundation. Pilot studies are experimental studies designed to “test the waters” or break new ground. Findings may lead to larger ongoing studies in the future.

Named Basic Research Projects

The Kathryn and Latimer Murfee Macular Degeneration Project

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

Gene therapy for retinal degenerative diseases

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 NFkB 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.
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, \( \Delta I_{Cl} \) and \( \Delta I_{C} \), 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 Kcnj13), 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 Kcnj13. A detailed understanding of Kcnj13 function could have broad implications for our ability to diagnose, prevent, and treat retinal diseases.
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.
**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.

**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**

**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.

**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**

**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 homoisoflavonone 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.
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.

**Research Chairs and Professorships**

**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.](image)

**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).
**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.

**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

**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.

**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 angiomatosus proliferation (RAP) and acute idiopathic maculopathy (AIM).

**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.

**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.
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.

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

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.

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.
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:

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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
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New York University Medical Center, College of Medicine, New York, NY
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RRF 44th Anniversary Luncheon, May 15, 2013

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President, The University of Texas MD Anderson Cancer Center, Houston, Texas
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**December 31, 2013**

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

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<th>Endowment Funds</th>
<th>2012 Total All Funds</th>
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<td>Unrestricted</td>
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<td><strong>Assets</strong></td>
<td></td>
<td>Restricted</td>
<td>Total</td>
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<tr>
<td>Cash and cash equivalents</td>
<td>$ 591,928</td>
<td>$ 132,500</td>
<td>$ 724,428</td>
</tr>
<tr>
<td>Contributions receivable</td>
<td>32,400</td>
<td>5,000</td>
<td>37,400</td>
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<tr>
<td>Investments</td>
<td>1,430,782</td>
<td>-</td>
<td>1,430,782</td>
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<tr>
<td>Furniture and equipment, net of accumulated depreciation of $5,282</td>
<td>14,342</td>
<td>-</td>
<td>14,342</td>
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<tr>
<td>Charitable remainder trust</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>12</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$ 2,069,464</td>
<td>$ 137,500</td>
<td>$ 2,206,964</td>
</tr>
<tr>
<td><strong>Liabilities and net assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable</td>
<td>$ 177</td>
<td>-</td>
<td>177</td>
</tr>
<tr>
<td><strong>Total liabilities and net assets</strong></td>
<td>$ 2,069,287</td>
<td>$ 137,500</td>
<td>$ 2,206,787</td>
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</tbody>
</table>

**Combined Statement of Financial Position**

**December 31, 2013**

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

<table>
<thead>
<tr>
<th>Revenues</th>
<th>General Funds</th>
<th>Endowment Funds</th>
<th>2013 Total All Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temporarily</td>
<td>Permanently</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Unrestricted</td>
<td>Restricted</td>
<td>All Funds</td>
</tr>
<tr>
<td>Contributions</td>
<td>$165,527</td>
<td>$45,000</td>
<td>$210,527</td>
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<tr>
<td>Interest, dividend and distribution income</td>
<td>32,282</td>
<td>-</td>
<td>32,282</td>
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<tr>
<td>Realized and unrealized gains on investments, net</td>
<td>186,410</td>
<td>-</td>
<td>186,410</td>
</tr>
<tr>
<td>Mineral interest and other income</td>
<td>106,180</td>
<td>-</td>
<td>106,180</td>
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<tr>
<td>Change in value of split-interest agreement</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Income transferred from Endowment Fund investments</td>
<td>897,609</td>
<td>102,500</td>
<td>1,000,109</td>
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<tr>
<td>Net assets released from restrictions-satisfaction of program restrictions</td>
<td>83,000</td>
<td>(83,000)</td>
<td>-</td>
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<tr>
<td>Total revenues</td>
<td>1,471,008</td>
<td>64,500</td>
<td>1,535,508</td>
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<tr>
<td>Expenses</td>
<td>General Funds</td>
<td>Endowment Funds</td>
<td>2013 Total All Funds</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>-----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>Temporarily</td>
<td>Permanently</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Unrestricted</td>
<td>Restricted</td>
<td>All Funds</td>
</tr>
<tr>
<td>Program services</td>
<td>Research projects and grants</td>
<td>991,921</td>
<td>-</td>
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<tr>
<td>Public education</td>
<td>30,399</td>
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<td>Career development and awards</td>
<td>80,850</td>
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<tr>
<td>Total program services</td>
<td>1,103,170</td>
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<td>Supporting services</td>
<td>Management and general</td>
<td>91,253</td>
<td>-</td>
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<td>Fund raising</td>
<td>27,910</td>
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<td>27,910</td>
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<tr>
<td>Total supporting services</td>
<td>119,163</td>
<td>-</td>
<td>119,163</td>
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<tr>
<td>Total expenses</td>
<td>1,222,333</td>
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<tr>
<td>Changes in net assets</td>
<td>248,675</td>
<td>64,500</td>
<td>313,175</td>
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<td>Transfer (Note 4)</td>
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<tr>
<td>Net assets, beginning of year</td>
<td>1,820,612</td>
<td>73,000</td>
<td>1,893,612</td>
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<tr>
<td>Net assets, end of year</td>
<td>$2,069,287</td>
<td>$137,500</td>
<td>$2,206,787</td>
</tr>
<tr>
<td>Board of Directors</td>
<td>Advisory Trustees</td>
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<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------</td>
<td></td>
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<tr>
<td><strong>2010s</strong></td>
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<td>Harry E. Bovay, Jr.</td>
<td>Eveline T. Boulaferdis</td>
<td>Walter H. Helmerich, III</td>
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<tr>
<td>Jake Kamin</td>
<td>June Bowen</td>
<td>Charles P. Moreton</td>
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<tr>
<td>Carl G. Mueller, Jr.</td>
<td>William E. Carl</td>
<td>Helen Record</td>
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<tr>
<td>Cecil C. Rix, PhD</td>
<td>James T. Cox</td>
<td>John Van Ramshorst, Jr.</td>
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<tr>
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<td>James A. Elkins, III</td>
<td>Gerald de Schrenck Sill</td>
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<td><strong>2000s</strong></td>
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<td>Thomas D. Anderson</td>
<td>Dorothy Adams</td>
<td>Michael Halbouty</td>
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<tr>
<td>Harry Austin</td>
<td>Samuel Brochstein</td>
<td>Esther Janca</td>
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<td>August Bering, III</td>
<td>Donald E. Brown</td>
<td>Willard M. Johnson</td>
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<td>Miles Glaser</td>
<td>Earl A. Brown</td>
<td>Eleanor McCollum</td>
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<td>Saunders Gregg</td>
<td>Lillian Cooley</td>
<td>Vaughan Meyer</td>
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<td>E.J. Hagstette</td>
<td>Lucyille Rowan Dawson</td>
<td>Charles Milby</td>
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<tr>
<td>Baine Kerr</td>
<td>Vernon W. Frost</td>
<td>Anthony Mierzwa</td>
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<td>Bertha Miller</td>
<td>Margaret Gillingham</td>
<td>Rush Record</td>
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<td>Richard Rolle</td>
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<td>Ellen Gover</td>
<td>Katherine Tyson</td>
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<td></td>
<td>Adolphe G. Gueymard</td>
<td>JP Watson</td>
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<td><strong>1990s</strong></td>
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<tr>
<td>James M. Barr</td>
<td>Buck Arnold</td>
<td>Winona Loeffler</td>
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<tr>
<td>Laura Lee Blanton</td>
<td>Faith Bybee</td>
<td>William O. Manning</td>
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<td>Ted Bowen</td>
<td>Norman A. Binz</td>
<td>Harold J. McKenzie</td>
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<td>E.C. Japhet</td>
<td>Jack Cooley</td>
<td>Robert E. Moroney</td>
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<td>Alfred Knapp</td>
<td>Marcus Ginsburg</td>
<td>James R. Ording</td>
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<td>Fred Wallace</td>
<td>Mona Griswold</td>
<td>Milton Potts</td>
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<td>Henry Weaver</td>
<td>Claire L. Johnson</td>
<td>Hattie Lel Red</td>
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<tr>
<td></td>
<td>Elizabeth Jobst</td>
<td>George Reed</td>
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<td></td>
<td>Albert P. Jones</td>
<td>Selma Scheps</td>
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<td></td>
<td>Max Levine</td>
<td>Tom H. Wharton</td>
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<td></td>
<td>Lee Loeffler</td>
<td>Herbert W. Varner</td>
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<td><strong>1980s</strong></td>
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<td>John C. Dawson, Sr.</td>
<td>Valient Baird</td>
<td>Aubrey C. Martindale</td>
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<td>Arthur A. Draeger</td>
<td>Harry I. Battelstein</td>
<td>Latimer Murfee</td>
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<tr>
<td>Donald Griswold</td>
<td>Herbert R. Gibson, Sr</td>
<td>R. Bryon Robinson</td>
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<tr>
<td>Frank R. Jobst</td>
<td>Opie B. Leonard</td>
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<tr>
<td><strong>1970s</strong></td>
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<td>Harold Link</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>John H. Miracle</td>
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</tr>
</tbody>
</table>
Rich Walton, Dr. Ben Orman and Dr. Bernie Hicks

Dr. Frank Eggleston, Dr. Art Willis and John Dawson

Emmett Humble and Shane Hudson

Bettie Lee and Shara Fryer

Rich Walton, Dr. Ben Orman and Dr. Bernie Hicks