In order to deliver a corrective gene to a site within the eye where it can take the place of a defective gene and function properly, scientists must have an appropriate delivery agent, or vector. As we reported in 2009, RPB-supported researchers successfully packaged a normal version of a gene missing in Leber's congenital amaurosis (LCA) inside a genetically engineered vector, called an adeno-associated virus (AAV). The vector delivered the gene to cells in the retina, where the gene produces an enzyme that restores light receptors.

Recently, the researchers further improved eyesight in three of those treated patients by applying therapy in their other eye, without adverse effects. The patients were “able to walk around at night, shop for groceries and recognize people’s faces—all things they couldn’t do before,” according to the researchers.

“However, to broaden our ability to treat inherited eye diseases, we will need a larger vector toolkit,” says Jean Bennett, MD, PhD, a lead member of the team and recipient of RPB support for 15 years.

Pictured on the cover is evidence that they have taken a major stride in that direction. Using a second-generation AAV technology, they delivered a green fluorescent protein transgene to retinal pigment epithelial cells and photoreceptor cells, the problem area for other retinal diseases such as retinitis pigmentosa. In the image, cell nuclei are labeled blue and cone photoreceptors are labeled red.
A Tradition of Innovation

Innovation is and always has been at the heart of RPB’s activities. From day one, our broad mission has been to serve as a catalyst for vision science, with a far-reaching strategy designed to evolve to meet academic research needs. Our first innovation was to place unrestricted funds in the hands of a department chair to fill financial gaps, equip labs and pursue original ideas. Many more have followed, all with the intent of freeing the investigator to break new scientific ground.

In 2011, we carried that tradition forward with the launch of a new grant category, specifically created to facilitate out-of-the-box research, and named, aptly, the RPB Innovative Ophthalmic Research Award. With this award category, RPB will provide the means for departments of ophthalmology to develop collaborations with researchers working in other basic scientific disciplines, as part of an effort to bring new technologies and cutting-edge translational science into ophthalmology. We are already excited by the innovative proposals from our first awardees in this category (see pages 10 - 11).

2011 was also the beginning of a transitional period for RPB. David F. Weeks, who served as RPB’s Chairman and/or senior executive for 50 years, retired. David was tireless in his pursuit of the mission he inherited from RPB’s founder, Dr. Jules Stein: to develop, sustain and enhance a national community of visionary vision scientists.

Throughout the coming transition, RPB will continue to award grants to qualifying departments of ophthalmology and promising vision researchers at all stages of their careers. We will listen to the needs of the vision research community and find new ways to address them. By staying true to our mission and harnessing the passion of the researchers whom we support, we can ensure that we—the greater We—are always moving closer to the prevention of blindness and the restoration of sight.

Diane S. Swift
Chairman
Advances in Eye Research

There is a flexibility that we encourage in the application of RPB funds that generates the plethora of advances in eye research that we report yearly.

“The power of an RPB grant is that it provides a department with unrestricted funds to support various research projects at the chair’s discretion,” says Nicholas J. Volpe, MD, chairman of the Department of Ophthalmology, Northwestern University Feinberg School of Medicine. “With an RPB grant a department is able to provide startup for small projects, initiate bridge funding for ongoing research, facilitate collaborations and invest strategically in research areas that are novel and not easily funded.”

For a complete bibliography of the 1,322 peer-reviewed, published studies supported by RPB in 2011, visit www.rpbusa.org/rpb/research/search.

Macular Degeneration and Retinal Disorders

A collaborative investigation at three RPB-supported institutions revealed that steroids attached to nanoparticles formed an injectable, sustained-release drug delivery system that may preserve vision for those with dry age-related macular degeneration (AMD) and retinitis pigmentosa.

In another promising, sustained-treatment approach to treating AMD, scientists report that gene therapy using a protein called protectin significantly reduced uncontrolled blood vessel growth and cell death.

In a discovery that may prevent geographic atrophy (the end stage of dry AMD), an RPB-supported laboratory has developed two promising therapies for the prevention of the condition. This study also elaborates, for the first time, a disease-causing role for a large section of the human genome once regarded as non-coding "junk DNA."

A recent clinical trial, on a single patient with Stargardt macular dystrophy, using a gene vector that is novel in its application in ophthalmology, may pave the way for further use of gene therapy for conditions of the eye as well the rest of the body.

Following successful pre-clinical, long-term safety studies involving the use of adult, bone marrow-derived stem cells as
therapy for patients with retinal disorders, the first clinical trial will be initiated in 2012. This approach may treat patients with previously irreversible blindness from age-related macular degeneration, retinal vein occlusion, diabetic retinopathy or retinitis pigmentosa.

An RPB-supported study cites the possible influence of awareness-driven changes in behavior—stopping smoking, improving diet, increasing physical activity, controlling blood pressure—as causes behind a decline in the overall prevalence of AMD among adults age 40 and older, across approximately the last 20 years.

Ocular Cancer
The same RPB scientists who previously developed a screening test to predict whether the cancer, uveal melanoma, would spread to the liver and other parts of the body have identified a drug, commonly used to treat seizures, which may make eye tumors less likely to grow.

RPB investigators have identified the mechanism that makes retinoblastoma so aggressive, as well as a new treatment target and possible therapy. This childhood eye cancer can cause death if not addressed early, and researchers are working toward treatments that preserve vision without radiation or surgical removal of the eye.

Infectious Eye Diseases
An RPB-supported report links antibiotic eye drops, which are routinely prescribed after intraocular injections to treat AMD, to resistant strains of ocular bacteria as well as multiple-drug resistance. The researchers suggest “the need for more judicious use of ophthalmic antibiotics.”

An RPB study suggests that Ganciclovir ophthalmic gel may be an effective treatment for human adenovirus conjunctivitis, the most common cause of viral “pink eye,” for which there currently is no topical treatment.

Ocular Cancer
The same RPB scientists who previously developed a screening test to predict whether the cancer, uveal melanoma, would spread to the liver and other parts of the body have identified a drug, commonly used to treat seizures, which may make eye tumors less likely to grow.

RPB investigators have identified the mechanism that makes retinoblastoma so aggressive, as well as a new treatment target and possible therapy. This childhood eye cancer can cause death if not addressed early, and researchers are working toward treatments that preserve vision without radiation or surgical removal of the eye.

Advances in Technology
A 3D image reveals that several cysts, which appeared separate with conventional imaging, are actually connected.

As potential treatments for dry AMD and other retinal disorders move closer to availability, scientists are using advanced imaging technology to learn more about the development of drusen (yellowish deposits within the retina indicative of dry AMD), leaky blood vessels and other structures associated with those conditions. The enhanced information will guide the timing and extent of treatments.

RPB investigators are exploring the development of a novel technology that would use light pulses to deliver drugs across the tough surface of the back of the eye, non-invasively, offering many advantages over intravitreal injections.

The first images of the rod photoreceptor mosaic were obtained by RPB scientists, representing a major step forward in using retinal imaging tools to study the living human retina.

A device that uses the tongue to transmit visual signals to the brain, called the BrainPort, could become a lower-cost, non-invasive alternative to retinal implants. Wearing a tiny video camera mounted to eyeglasses and connected by wire to an electrode sensor held in contact with their tongue, participants in the study were able to identify, sense and avoid objects in front of them and improve their walking speed.

www.rpbusa.org
An RPB researcher is developing a training program—for patients who have lost half of their visual field—to use expansion prism glasses (above) to correctly identify the location of objects. At the end of the study, the training regimen will be available in rehabilitation centers.

**Cornea**

Creating ways to promote corneal healing after LASIK surgery is emerging as of paramount importance to millions of people. The corneal wound created by LASIK never heals completely, resulting in a dramatic decrease in the strength of the ocular surface and an increased risk for corneal swelling and loss of vision. The aging, post-LASIK cornea may be even more vulnerable to serious complications. Data from RPB studies suggest that low concentrations of a growth factor called TGFβ1 may be useful in treating non-healing corneal wounds.

Corneal nerves can be damaged in a number of ways, including laser vision correction, keratoplasty, and cataract surgery; infections (herpes simplex and zoster); trauma; and dry eye syndrome. Loss of corneal nerve sensation may lead to severe ocular surface disease and even blindness. RPB researchers are investigating ways to repair corneal nerves and return their sensitivity after injury.

**Dry Eye**

Building on earlier work, an RPB scientist reports groundbreaking clinical and laboratory research that indicates thymosin beta 4 is much closer to becoming a side effect-free therapy for corneal wound healing, inflammatory and dry eye disorders.

**Myopia**

A team of RPB researchers suggests that the recent, worldwide epidemic of myopia may be due to an imbalance in red-green cone stimulation caused by artificial lighting, computer monitors, tablet PCs and video games, particularly in genetically susceptible individuals. In the United States alone, more than one third of children become nearsighted during their school years. A small, pilot clinical trial to test this concept revealed that using red-free glasses can slow the growth of the eye in children with early myopia.

**Glasses with special tinted lenses to prevent nearsightedness.**

**Cataract**

An RPB-supported lab has developed a polymer-based device that fits on the side struts of any type of intraocular lens and releases long-term antibiotics after cataract surgery. The device may be particularly helpful in the developing world, where provision of antibiotics is limited after cataract surgery.

**Glaucoma**

Even though laser surgery (trabeculoplasty) and prostaglandin analog eye drops (such as Xalantan, Latanoprost, Lumigan) both are effective options for managing open-angle glaucoma, trabeculoplasty may be the better choice in patients at risk for poor medication adherence. Studies have demonstrated that nearly...
a third of all patients with glaucoma are not able to adhere to their medication regimens, due to forgetfulness, cost, side effects, difficulty with eye drop administration, and other reasons.

Beyond the Eye
Findings from an RPB-funded study illuminate how the nervous system linking the eyes and brain develops. The study may also shed light on how to counteract faulty wiring in neuro-developmental diseases such as autism, or lead to treatments to re-establish neural connections after injury to the nervous system.

Online Test for Amblyopia
RPB supported the development of a 15-minute, online test that allows parents to screen their children for amblyopia. The test, found at lazyeyetest.org, does not, however, replace a visit to an eye care specialist, which remains the best way to determine if a person has amblyopia.

Test for Best Antibiotics
A newly developed test, designed to improve ocular infection treatment, measures the ability of antibiotics to associate with ocular tissues, which RPB researchers hypothesize is an additional indicator of therapeutic effectiveness. Standard antibiotic testing evaluates only the interaction between the bacteria and the drug. The test, which is not yet commercially available, suggests azithromycin and erythromycin provide cellular protection, bacitracin does not, and tetracycline is toxic to two ocular epithelial cell lines.

Home Test for Macular Degeneration
Available and emerging treatments for AMD are most effective before substantial vision loss has occurred. A home monitoring device for individuals at high risk of progression of AMD could prompt these patients to return to their retina specialist for assessment and timely treatment.
The RPB Grants Program was designed to maximize every grantee’s freedom to pursue groundbreaking research. RPB awards can be applied, creatively, to advance multiple research endeavors and to provide continuous support.

“My RPB Senior Scientific Investigator Award (SSI) proved to be invaluable. It allowed me to accept an MD/PhD student into my lab. My school’s MD/PhD program requires that the potential mentor have at least three years of guaranteed support for the student. My non-RPB grants could only guarantee two years but my RPB SSI covered the other year. Similarly, when two of my major National Eye Institute grants ended, I was able to provide ‘bridge’ funding to my junior faculty and technicians until I was funded for four years. These personnel continued generating data necessary for approval of nanoceria as an ‘Investigational New Drug’ for use in clinical trials for preserving vision and preventing blindness in humans. That data resulted in the additional documentation necessary for generating manuscripts, which were subsequently published.”

—James F. McGinnis, PhD, University of Oklahoma Health Sciences Center

### 2011 RPB Ad Hoc Committee

RPB Ad Hoc Committees convene each spring and fall to conduct initial reviews of all RPB grant applications. The Committees are comprised of selected ophthalmology department heads whose recommendations are forwarded to the Scientific Advisory Panel for further evaluation. Membership on the Committee changes from meeting to meeting. 2011 participants were:

**Judie F. Chariton, MD**  
*West Virginia University School of Medicine*

**Thomas W. Hejkal, MD, PhD**  
*University of Nebraska College of Medicine*

**Dale K. Heuer, MD**  
*Medical College of Wisconsin*

**John A. Hoepner, MD**  
*State University of New York, Upstate Medical University*

**Dan B. Jones, MD**  
*Baylor University College of Medicine*

**Henry J. Kaplan, MD, FACS**  
*University of Louisville School of Medicine*

**Jonathan H. Lass, MD**  
*Case Western Reserve University School of Medicine*

**Douglas R. Lazzaro, MD, FACS, FAAO**  
*State University of New York, Downstate Medical Center*

**Thomas F. Mauger, MD**  
*The Ohio State University Medical Center*

**Nelson Sabates, MD, FACS**  
*University of Missouri-Kansas City School of Medicine*

**Joel S. Schuman, MD, FACS**  
*University of Pittsburgh School of Medicine*

**James Tsai, MD, FACS**  
*Yale University School of Medicine*

**Russell Van Gelder, MD, PhD**  
*University of Washington School of Medicine*

**Nicholas J. Volpe, MD**  
*Northwestern University Feinberg School of Medicine*
2011 RPB Scientific Advisory Panel

The Scientific Advisory Panel (SAP) includes distinguished scientists representing a broad range of scientific disciplines and interests. Their recommendations are presented to the RPB Board of Trustees for final approval.

HAROLD F. SPALTER, MD
Chairman Emeritus, RPB Scientific Advisory Panel
Emeritus Professor of Clinical Ophthalmology
Columbia University College of Physicians & Surgeons

ROBERT EUGENE ANDERSON, MD, PhD
Professor, Departments of Cell Biology & Ophthalmology
Director of Research, Dean A. McGee Eye Institute
University of Oklahoma Health Sciences Center

JOHN E. DOWLING, PhD
Gordon and Lura Gund Professor of Neurosciences
Department of Molecular and Cellular Biology, Harvard University

ROBERT FOLBERG, MD
Founding Dean, Oakland University
William Beaumont School of Medicine
Professor, Departments of Biomedical Sciences, Pathology and Ophthalmology

EVE HIGGINBOTHAM, SM, MD
Visiting Scholar in Health Equity
Association of American Medical Colleges

RODERICK R. McINNES, CM, MD, PhD, FRSC
Director, Lady Davis Research Institute, Jewish General Hospital
Alva Chair in Human Genetics, Professor of Biochemistry
McGill University

ANTHONY MOORE, MA, FRCS, FRCOPHTH, FMEDECI
Duke-Elder Professor of Ophthalmology, Institute of Ophthalmology
Division of Inherited Eye Disease, University College of London

KRZYSZTOF PALCZEWSKI, PhD
Professor & Chair, Department of Pharmacology
Case Western Reserve University

STEPHEN J. RYAN, MD
President, Doheny Eye Institute
Beardsley Distinguished Professor of Ophthalmology
Keck School of Medicine of the University of Southern California

SHEILA K. WEST, PhD
Professor, Departments of Epidemiology & Ophthalmology
Vice Chair for Research, Wilmer Eye Institute
The Johns Hopkins University School of Medicine

RPB Chairman Steps Down

Since its inception, Research to Prevent Blindness (RPB) has been recognized as the leading public foundation in support of eye research, a period of success and accomplishment that coincided with the presence of David F. Weeks, who stepped down as Chairman at the end of 2011. Weeks was employed as RPB’s first executive officer in 1961, later became President, and has directed the organization as Chairman since 2003.

Mr. Weeks was a constant and driving force behind the changes in the field of ophthalmic research ushered in by RPB – from the establishment of the National Eye Institute, to the creation and expansion of dynamic departments of ophthalmology across the country, to the development of a nationwide corps of groundbreaking vision scientists and the construction of major vision research facilities. During his tenure, the organization contributed to the development of nearly every significant advance in eye care in the last half-century.

“I have been privileged to be associated with pioneers in eye research who have created the arsenal of treatments used today by eye care specialists to enhance the quality of life for patients suffering from vision loss,” said Weeks. “And I am proud that RPB has been a catalyst in creating a vibrant community of scientists who are demonstrating that many forms of blindness will be prevented and cured in the future.”

Chair of RPB’s SAP Retires

Dr. Harold Spalter has chaired RPB’s Scientific Advisory Panel of medical science leaders (including five Nobel Prize laureates), since 1966. Along with a rotating Ad Hoc Committee of ophthalmology department chairs—also under Dr. Spalter’s guidance—these distinguished individuals have overseen the allocation of more than $295 million to leading scientific institutions in the United States. Dr. Spalter was also an important participant in RPB’s push toward the creation of a freestanding National Eye Institute. He will continue to monitor RPB’s Scientific Advisory Panel as Chairman Emeritus.
New Grants

The world’s population is growing and aging, increasing the prevalence of eye diseases and the need for new treatments for blinding disorders. The lingering effects of the economic recession are placing research dollars at a premium, particularly at the government level. Everywhere in medical research, the pressure to deliver clinically applicable outcomes is mounting. At the same time, the path to scientific innovation remains the same: observation and creative speculation followed by controlled trial and error.

With all of these factors in mind, RPB has rebalanced its Grants Program to place an even greater emphasis on innovation and collaboration. At the same time, we significantly increased the dollar amount of our Career Development, Senior Scientific Investigator and Physician-Scientist Awards.

In 2011, RPB funded 91 new grants, and actively supported 154 scientists at 56 departments of ophthalmology at medical schools across the United States.

RPB INNOVATIVE OPHTHALMIC RESEARCH AWARDS

Launched in 2011, RPB Innovative Ophthalmic Research Awards provide $100,000 to basic scientists (PhD or MD/PhD) actively engaged in innovative, out-of-the-box research, in collaboration with the school’s department of ophthalmology. This award is intended to bring basic science into ophthalmology and/or new collaborations between ophthalmology and other scientific disciplines. New technologies and cutting-edge translational research will be funded by this award.

James T. Schwiegerling, PhD
University of Arizona College of Medicine

“My research program seeks to advance technologies with the long-term goal of providing superior clinical diagnosis and better options for patients. The first area of study involves low-cost imaging of the retina to provide a means for the early diagnosis and treatment of retinal disease. The second investigation will develop a new kind of intraocular lens to produce a substantial change in power and, hopefully, better treatment of presbyopia, an age-related disorder in which the eye’s lens becomes less flexible, leading to an inability to focus on near objects.”
Retinitis pigmentosa (RP) is a leading cause of inherited and incurable blindness, affecting mostly young people. Developing a general therapy for this devastating disease has been difficult because diverse mutations in many genes can cause the disease, making a general gene therapy difficult to pursue. RP is characterized by progressive loss of rod photoreceptor cells, followed by cone photoreceptor cells. Given our dependence on cones in daily activities, a therapeutic approach to save the cones would be generally useful for all patients with RP. A substance called rod-derived cone viability factor (RdCVF) is secreted by rods and has a direct effect on cone survival. Although RdCVF is known to bind to the cone cell surface, how it signals to cones and acts as a survival factor is still unknown. My lab has developed new techniques that overcome the major limitations of existing techniques to identify cell-surface receptors. This project aims to identify the signaling receptor and signaling pathway for RdCVF, which may lead to new therapeutic strategies to promote cone survival in RP patients.

Optical imaging plays a major role in both basic research and clinical diagnostics. The Holy Grail for bio-optics is to create a device that provides non-invasive diagnostic capability through imaging, giving ‘functional’ information about biological tissue. Optical coherence tomography (OCT) is a rapidly growing field that is currently revolutionizing ophthalmic practice. I have invented multiple functional OCT-extension techniques, the most notable of which include full-range OCT and optical, three-dimensional microangiography (OMAG). We hypothesize that OMAG can be developed to non-invasively image, quantify, and characterize retinal blood perfusion and at a resolution of capillary level. The immediate outcome of this research will be a new imaging tool that can be useful in both the clinic and in research, ultimately facilitating diagnosis, monitoring, and therapeutic interventions of retinal diseases that have vascular involvement.
The Lew R. Wasserman Merit Award provides $60,000 to a mid-career scientist, creating a continuum of financial resources to build on earlier work and maintain a research career.

Douglas C. Dean, PhD
University of Louisville School of Medicine
A model of retinal stem cell transplantation.

Raymond S. Douglas, MD, PhD
The Regents of the University of Michigan School of Medicine
The cellular makeup and bioactivity of orbital tissues of patients with Grave’s disease.

W. Rowland Taylor, PhD
Oregon Health & Science University School of Medicine
The physiological properties of bipolar cells that provide input to parasol ganglion cells (in order to inform development of visual prostheses).

Xiangyun Wei, PhD
University of Pittsburgh School of Medicine
"There are many genetic disorders that affect the survival of photoreceptors. Gene therapies are powerful ways to restore the lost functions by expressing rescuing genes in photoreceptors. This therapeutic strategy requires the utilization of promoters with photoreceptor specificity. We are determining if a zebrafish promoter maintains its expression activity in mammals. If so, this promoter might be useful for gene therapy in humans."

The RPB Walt and Lilly Disney Award for Amblyopia Research was created through a pledge from The Walt and Lilly Disney Foundation and provides funds to respected ophthalmic scientists for research into improved detection, treatment or cures for amblyopia. Amblyopia affects two to four percent of U.S. children and is the leading cause of childhood vision loss. It can be extremely difficult to detect due to the age of the patient, who may not be able to communicate the nature of his or her vision problem.

Jonathan C. Horton, MD, PhD
University of California, San Francisco, School of Medicine
"Often, my laboratory research is inspired and guided by patients. My ultimate goal is to explain how visual perception occurs in the human brain. In strabismus and amblyopia, visual function becomes impaired early in life, yet the visual pathway suffers no destructive physical lesion. If one can determine exactly which cells and connections have been disrupted by abnormal sensory experience in subjects with amblyopia or strabismus, one will presumably have discovered properties and pathways vital for normal perception."
RPB CAREER DEVELOPMENT AWARDS
In 2011, RPB Career Development Awards provided $250,000 over four years to outstanding young clinical and basic scientists conducting research in departments of ophthalmology. The award is a valuable recruiting tool for department chairs.

Alfredo Dubra Suarez, PhD  
Medical College of Wisconsin  
Non-invasive retinal cellular imaging for early diagnosis of retinal disorders and the development of biomarkers for early diagnosis of neuro-ophthalmic disorders.

Pedram Hamrah, MD  
Harvard Medical School  
“Corneal transplantation, the most common form of organ transplantation, offers the last resort for restoring vision to millions of people worldwide with blinding corneal disease. Currently, immunosuppressive therapy can prevent and salvage rejecting grafts, but is associated with significant side effects. My studies will provide new and highly specific molecular targets for pharmacological intervention in inflammatory and immune diseases.”

Jeremy Keenan, MD, MPH  
University of California, San Francisco, School of Medicine  
Testing therapeutic agents for a future clinical trial of treatment for acanthamoeba keratitis.

Daniel Kerschensteiner, MD  
Washington University in Saint Louis School of Medicine  
The pathogenesis of dominant optic atrophy.

Vinit Mahajan, MD, PhD  
University of Iowa Carver College of Medicine  
Novel DNA chip-based methods for the identification of gene mutation and key targets for therapeutic intervention.

Matthew A. Smith, PhD  
University of Pittsburgh School of Medicine  
The relationship between eye movements and visual perception—laying the foundation for a cortical visual prosthetic.

James Chee Hian Tan, MD, PhD  
Keck School of Medicine of the University of Southern California  
How cells mediate trabecular meshwork contractility and regulate eye pressure in glaucoma.

Shusheng Wang, PhD  
University of Texas Southwestern Medical Center at Dallas  
MicroRNA mechanisms of retinal vascular development and disease in AMD.
RPB PHYSICIAN-SCIENTIST AWARDS
RPB Physician-Scientist Awards provide $100,000 each to nationally recognized MDs who bring to the laboratory a practical understanding of patients’ needs while their research efforts yield new knowledge in treating patients.

Susan B. Bressler, MD
The Johns Hopkins University School of Medicine
Early detection of choroidal neovascularization, using a home vision monitoring device, in individuals at high risk of progression of AMD.

Thomas W. Gardner, MD, MS
The Regents of the University of Michigan School of Medicine
A test of the hypothesis that Type 1 diabetes causes an early sensory neuropathy of the retina concomitant with other sensory neuropathies.

Victor L. Perez, MD
University of Miami Miller School of Medicine
“Graft vs. Host Disease (GVHD) is a severe, immune reaction in patients who receive a human stem cell allograft for the treatment of different cancers. It develops as a rejection reaction induced by donor T cells in the recipient’s tissue. One of the main tissues affected by this condition is the ocular surface of the eye. These patients develop severe dry eye and the care of this is as frustrating as the care of their malignancy. The goal of this work is to develop a preventive therapy for rejection-reaction dry eye.”

RPB SENIOR SCIENTIFIC INVESTIGATOR AWARDS
RPB Senior Scientific Investigator Awards provide $150,000 to extend the productivity of seasoned vision scientists who can play a crucial role in training the next generation of vision scientists.

► Daniel J. J. Carr, PhD
University of Oklahoma Health Sciences Center
“Herpes simplex virus type 1 (HSV-1) is the leading cause of infectious corneal blindness in the industrialized world. The development of vaccines to HSV-1 has proven difficult, with no current candidate vaccine under trial. I propose to evaluate a novel vaccine, developed by a former graduate student, to determine its ability to suppress virus replication and spread, and to characterize optimum sites for vaccine inoculation.”

James Chodosh, MD, MPH
Harvard Medical School
The relationship between the evolution of human adenoviruses and their capacity to induce corneal inflammation.

Gregory S. Hageman, PhD
University of Utah Health Sciences Center
Development of a therapy that will halt or delay the onset of AMD and treat other major co-segregating diseases.

James T. Handa, MD
The Johns Hopkins University School of Medicine
Creation of a library of the important oxidative stress byproducts and the pattern recognition receptors that help protect the fundus against their dangerous accumulation during the onset of AMD.

J. William Harbour, MD
Washington University in Saint Louis School of Medicine
An effective therapy for patients with metastatic uveal melanoma.
RPB SPECIAL SCHOLAR AWARDS

RPB Special Scholar Awards recognize promising young scientists of exceptional merit and are given in honor of former RPB Trustees and others who have made generous contributions of time, energy and financial resources in support of eye research.

△ Peter Bex, PhD
Ernest & Elizabeth Althouse Scholar
Harvard Medical School

“Existing screening methods such as letter charts and visual field tests generally test a limited number of retinal locations with an inefficient testing process. We have developed novel computer algorithms and tasks that improve the efficiency and accuracy with which vision is tested. For AMD patients, we are comparing functional data to driving behavior in a driving simulator. For glaucoma patients, our algorithms test the visual field with moving as well as static images. These data increase the information available to clinicians for making diagnosis and treatment decisions.”

Michael H. Elliott, PhD
Sybil B. Harrington Scholar (AMD)
University of Oklahoma Health Sciences Center

The role that caveolin-1 plays in the pathogenesis of retinal inflammation.

Markus H. Kuehn, PhD
Sybil B. Harrington Scholar
University of Iowa Carver College of Medicine

Endoplasmic reticulum stress in trabecular meshwork cells in normal primary open angle glaucoma.

Ashok Kumar, PhD
William & Mary Greve Scholar
Wayne State University School of Medicine

Novel molecular targets for the development of new therapeutics to prevent ocular surgery-associated bacterial endophthalmitis.

Pradeep Y. Ramulu, MD, MHS, PhD
Robert & Helen Schaub Scholar
The Johns Hopkins University School of Medicine

Measuring the impact of glaucoma and other eye diseases on the life of an individual, and conveying this impact in understandable units that can be useful to doctors, patients, and policy-makers.

Joshua Harris Singer, PhD
Margaret Nelson Trust Scholar
Northwestern University Feinberg School of Medicine

The extent to which inner retinal neurons are capable of transferring visual signals following photoreceptor death.
RPB MEDICAL STUDENT EYE RESEARCH FELLOWSHIPS

RPB Medical Student Eye Research Fellowships, of $30,000 each, enable students to take a year off from their usual course of studies to pursue a laboratory research project within a department of ophthalmology.

**Joseph Christenbury**
Duke University School of Medicine
The impact of excess complement activation on the onset and progression of AMD-like ocular defects.

**Robi N. Maamari**
University of California, San Francisco, School of Medicine
Design and demonstrate an inexpensive and simple-to-use mobile phone-based funduscopic camera capable of imaging the retina.

**Mamta Shah**
Harvard Medical School
The prevalence of and risk factors for prostaglandin-associated periorbitopathy, a side effect of long-term topical prostaglandin analogue use in glaucoma.

**Kevin Tozer**
Keck School of Medicine of the University of Southern California
Test the hypothesis that melanopsin retinal ganglion cells are more robust to metabolic stressors than regular retinal ganglion cells due to underlying structural, functional, or genetic factors.

**Jessica Weinstein**
University of Miami Miller School of Medicine
Why retinal ganglion cells fail to survive and regenerate after injury.

**David Xu**
Cleveland Clinic Lerner College of Medicine of CWRU
Identify optimal outcome markers and imaging modalities to track progression of non-exudative AMD.

RPB INTERNATIONAL RESEARCH SCHOLAR AWARD

RPB International Research Scholar grants enable foreign researchers to travel to the U.S. for collaboration with U.S. researchers.

**Tang-Long Shen, PhD**
University of Cincinnati College of Medicine
The role of focal adhesion kinase in a variety of pathophysiological conditions of the cornea.
RPB’s National Network of Eye Research

RPB’s unrestricted grant support is available to departments of ophthalmology across the U.S. with a demonstrated commitment to clinical, basic and translational research. The flexible grants can be used to amplify restricted grant work from other sources, to promote collaborations with other schools, and to explore innovative ideas. The following list includes U.S. medical schools that received new departmental grants, or new awards for individual investigators, in 2011.

<table>
<thead>
<tr>
<th>State</th>
<th>RPB Grantee Institutions</th>
<th>Total Grants 2011</th>
<th>Total Support Including 2011</th>
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<tr>
<td>ALABAMA</td>
<td>University of Alabama at Birmingham School of Medicine</td>
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<td>$3,635,000</td>
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<td>2,045,000</td>
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<td>CALIFORNIA</td>
<td>University of California, Davis, School of Medicine</td>
<td>100,000</td>
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<td></td>
<td>David Geffen School of Medicine at UCLA</td>
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<td>University of California, San Francisco, School of Medicine</td>
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<td>University of Florida College of Medicine</td>
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<td>ILLINOIS</td>
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<td></td>
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<td>LOUISIANA</td>
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<tr>
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<tr>
<td></td>
<td>Harvard Medical School</td>
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<td></td>
<td>Tufts University School of Medicine</td>
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<tr>
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<tr>
<td>MINNESOTA</td>
<td>Wayne State University School of Medicine</td>
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<td>3,693,000</td>
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<tr>
<td>MISSOURI</td>
<td>University of Minnesota, Academic Health Center, Medical School</td>
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<td></td>
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<td>NEBRASKA</td>
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<td>NEW YORK</td>
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<td></td>
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<td></td>
<td>Weill Medical College of Cornell University</td>
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<td></td>
<td>SUNY at Buffalo School of Medicine &amp; Biomedical Sciences</td>
<td>100,000</td>
<td>680,000</td>
</tr>
<tr>
<td></td>
<td>SUNY Downstate Medical Center</td>
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<td>220,000</td>
</tr>
<tr>
<td></td>
<td>SUNY Upstate Medical University</td>
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<td>NORTH CAROLINA</td>
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<td>OHIO</td>
<td>Case Western Reserve University School of Medicine</td>
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<td></td>
<td>Cleveland Clinic Lerner College of Medicine</td>
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<td></td>
<td>University of Cincinnati College of Medicine</td>
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<td></td>
<td>University of Cincinnati College of Medicine</td>
<td>103,500</td>
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<td>OREGON</td>
<td>Oregon Health &amp; Science University School of Medicine</td>
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<td>4,122,150</td>
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<td>PENNSYLVANIA</td>
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<td></td>
<td>University of Pittsburgh School of Medicine</td>
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<td>Medical University of South Carolina</td>
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</tr>
<tr>
<td>TENNESSEE</td>
<td>University of Tennessee Health Science Center</td>
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</tr>
<tr>
<td></td>
<td>Vanderbilt University School of Medicine</td>
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<td>2,350,500</td>
</tr>
<tr>
<td>TEXAS</td>
<td>Baylor College of Medicine</td>
<td>100,000</td>
<td>4,104,060</td>
</tr>
<tr>
<td></td>
<td>University of Texas Health Science Center at Houston</td>
<td>220,000*</td>
<td>3,075,000</td>
</tr>
<tr>
<td></td>
<td>University of Texas Southwestern Medical Center at Dallas</td>
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<td>3,896,000</td>
</tr>
<tr>
<td>UTAH</td>
<td>University of Utah Health Sciences Center</td>
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<td>WASHINGTON</td>
<td>University of Washington School of Medicine</td>
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<td>3,262,638</td>
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<tr>
<td>WISCONSIN</td>
<td>Medical College of Wisconsin</td>
<td>350,000*</td>
<td>4,114,215</td>
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<td></td>
<td>University of Wisconsin-Madison School of Medicine</td>
<td>100,000</td>
<td>4,258,750</td>
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</tbody>
</table>

* Includes a four-year $250,000 RPB Career Development Award, payable at the rate of $62,500 per year.

# RPB Challenge Grant, payable at the rate of $55,000 per year.
**Financials**

RPB’s long-term assets are invested in accordance with sound investment practices, with an emphasis on long-term investment fundamentals. RPB’s investment strategy is consistent with its objective to optimize the grant-purchasing power of endowment assets held in perpetuity, while also providing additional growth through investment return and new gifts.

The strength of RPB’s financial position, as reflected herein, allows the organization to apply gifts effectively, and in their entirety, toward eye research.

In 2011, RPB awarded $9,923,500 in new grant support, including: $100,000 Unrestricted Grants to 51 medical schools; RPB Challenge Grants ($220,000 across four years) to two promising departments of ophthalmology; and 38 individual grants to scientists.

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**Eye on Research**

**RPB 2011 NEW RESEARCH SUPPORT**

- AMD - $935,000
- Amblyopia - $100,000
- Cataract - $65,000
- Cornea - $803,500
- Diabetic Retinopathy - $100,000
- Dry Eye - $100,000
- Glaucoma - $335,000
- Graves Disease - $60,000
- Imaging - $130,000
- Low Vision - $75,000
- Neuro-Ophthalmology - $445,000
- Ocular Cancer - $150,000
- Optic Atrophy - $250,000
- Presbyopia - $50,000
- Retinitis Pigmentosa - $100,000
- Uveitis - $310,000
- Visual Prosthesis - $250,000
- Unrestricted and Challenge Grants - $5.54 million
# Research to Prevent Blindness
## Combined Statement of Activities
### Year Ended December 31, 2011

A complete set of RPB's combined financial statements, along with the report of independent accountants, may be obtained by contacting RPB at 1-800-621-0026.

## Public Support and Revenue

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributions</td>
<td>$930,522</td>
<td>$ —</td>
<td>$930,522</td>
<td>$200,000</td>
<td>$2,813</td>
<td>$1,133,335</td>
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<td>Combined Federal Campaign</td>
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<td>40,091</td>
<td>—</td>
<td>—</td>
<td>40,091</td>
</tr>
<tr>
<td>Ophthalmological associate memberships</td>
<td>133,500</td>
<td>—</td>
<td>133,500</td>
<td>—</td>
<td>—</td>
<td>133,500</td>
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<td>Donated investments</td>
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<td>—</td>
<td>1,751</td>
<td>—</td>
<td>—</td>
<td>1,751</td>
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<tr>
<td><strong>Total public support</strong></td>
<td>1,105,864</td>
<td>—</td>
<td>1,105,864</td>
<td>200,000</td>
<td>2,813</td>
<td>1,308,677</td>
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### Revenue

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest and dividends</td>
<td>9,322,570</td>
<td>—</td>
<td>9,322,570</td>
<td>580,695</td>
<td>7,235</td>
<td>9,910,500</td>
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<tr>
<td>Other revenue</td>
<td>1,292</td>
<td>—</td>
<td>1,292</td>
<td>—</td>
<td>—</td>
<td>1,292</td>
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<tr>
<td><strong>Total revenue</strong></td>
<td>9,323,862</td>
<td>—</td>
<td>9,323,862</td>
<td>580,695</td>
<td>7,235</td>
<td>9,911,792</td>
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### Public support and revenue

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction of program restrictions or designations</td>
<td>2,236,971</td>
<td>(1,383,948)</td>
<td>853,023</td>
<td>(853,023)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Satisfaction of Matching Fund restrictions</td>
<td>1,000,000</td>
<td>—</td>
<td>1,000,000</td>
<td>(1,000,000)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Total net assets released from restrictions or designation</strong></td>
<td>3,236,971</td>
<td>(1,383,948)</td>
<td>1,853,023</td>
<td>(1,853,023)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Total public support and revenue</strong></td>
<td>13,666,697</td>
<td>(1,383,948)</td>
<td>12,282,749</td>
<td>(1,072,328)</td>
<td>10,048</td>
<td>11,220,469</td>
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## Expenses

### Program Services

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research grants, net of refunded and canceled grants of $619,512 in 2011</td>
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<td>—</td>
<td>9,278,874</td>
<td>—</td>
<td>—</td>
<td>9,278,874</td>
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<tr>
<td>Direct research support</td>
<td>428,025</td>
<td>—</td>
<td>428,025</td>
<td>—</td>
<td>—</td>
<td>428,025</td>
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<tr>
<td>Program development to stimulate laboratory expansion and eye research activities</td>
<td>319,181</td>
<td>—</td>
<td>319,181</td>
<td>—</td>
<td>—</td>
<td>319,181</td>
</tr>
<tr>
<td>Scientific symposia, seminars and surveys</td>
<td>287,268</td>
<td>—</td>
<td>287,268</td>
<td>—</td>
<td>—</td>
<td>287,268</td>
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<tr>
<td>Laboratory construction support projects</td>
<td>12,007</td>
<td>—</td>
<td>12,007</td>
<td>—</td>
<td>—</td>
<td>12,007</td>
</tr>
<tr>
<td>Public and professional information</td>
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<td>587,419</td>
<td>—</td>
<td>—</td>
<td>587,419</td>
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<tr>
<td><strong>Total program services</strong></td>
<td>10,912,774</td>
<td>—</td>
<td>10,912,774</td>
<td>—</td>
<td>—</td>
<td>10,912,774</td>
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### Supporting Services

<table>
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<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
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</thead>
<tbody>
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<td>Management and general</td>
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<td>1,275,312</td>
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<td>Fund-raising</td>
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<td><strong>Total supporting services</strong></td>
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<td>1,361,795</td>
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<td>—</td>
<td>1,361,795</td>
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<tr>
<td><strong>Total expenses</strong></td>
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<td>12,274,569</td>
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<td>12,274,569</td>
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### Excess (Deficiency) of Revenue over Expenses before Realized Gain and Change in Unrealized Appreciation of Investments

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realized gain and change in unrealized appreciation of investments</td>
<td>1,392,128</td>
<td>(1,383,948)</td>
<td>8,180</td>
<td>(1,072,328)</td>
<td>10,048</td>
<td>(1,054,100)</td>
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### Increase (Decrease) in Net Assets

<table>
<thead>
<tr>
<th>Description</th>
<th>General Operating</th>
<th>Designated</th>
<th>Total</th>
<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Increase (Decrease) in net assets</td>
<td>3,164,311</td>
<td>(1,383,948)</td>
<td>1,780,363</td>
<td>(1,023,189)</td>
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### Net Assets, Beginning of Year

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<th>Description</th>
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<th>Temporarily Restricted</th>
<th>Permanently Restricted</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td><strong>Net assets, end of year</strong></td>
<td><strong>$147,298,805</strong></td>
<td><strong>43,780,580</strong></td>
<td><strong>$191,079,385</strong></td>
<td><strong>$9,999,157</strong></td>
<td><strong>$53,348,840</strong></td>
<td><strong>$254,427,382</strong></td>
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</tbody>
</table>

A complete set of RPB's combined financial statements, along with the report of independent accountants, may be obtained by contacting RPB at 1-800-621-0026.
RPB is committed to stimulate, sustain and intensify a concerted research assault, with the goal of developing more effective treatments, preventives and cures for all diseases of the visual system that damage and destroy sight. RPB mobilizes financial resources in support of eye research making available essential laboratory space, scientific personnel and advanced technological equipment in its mission, which seeks to preserve vision and restore sight.