

University of Pennsylvania  
Department of Ophthalmology

Scheie Eye Institute

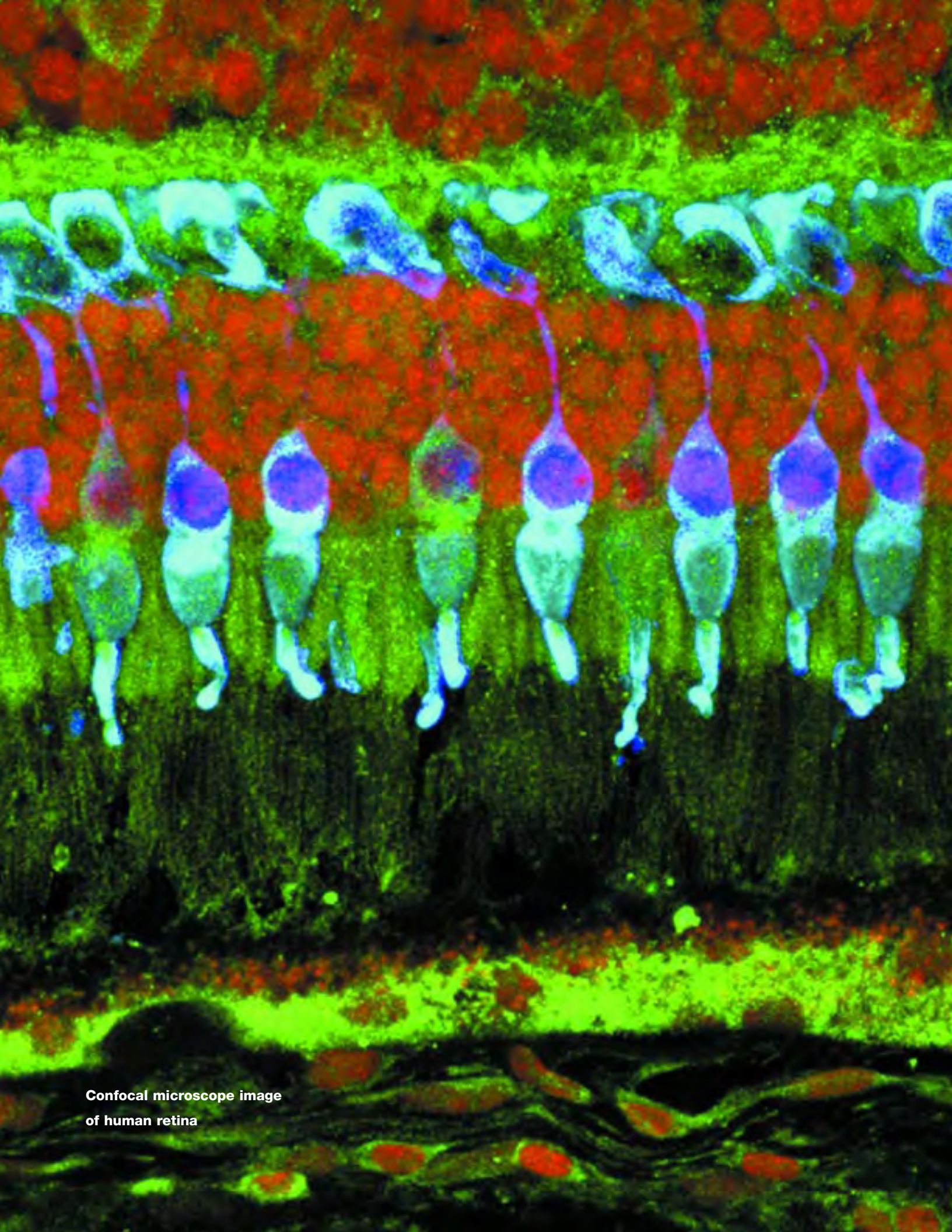
Imagine a world  
without **blindness**



**PENN Eye Care**

Scheie Eye Institute 

University of Pennsylvania Health System



Confocal microscope image  
of human retina

GENE THERAPY

MACULAR DEGENERATION

DIABETIC RETINOPATHY

GLAUCOMA

MYOPIA

PATIENT CARE

EDUCATION



Vision scientists at  
The Scheie Eye Institute have a goal—to  
develop new treatments for blinding diseases  
that will help patients worldwide.

What is it like to see for the first time? Patients with LCA look forward to the first human trial of a remarkable gene therapy.

## a major breakthrough in gene therapy



**Scheie physician-scientists**  
**Eric A. Pierce, MD, PhD**  
**Samuel G. Jacobson, MD, PhD**  
**Albert M. Maguire, MD**  
**Artur V. Cideciyan, PhD**  
**Jean Bennett, MD, PhD**  
**and Tomas S. Aleman, MD**

Imagine the heartbreak for the parents of an otherwise healthy infant upon learning that their child is blind from a rare inherited retinal disorder. Leber congenital amaurosis (LCA) is one type of inherited retinal degeneration caused by a single faulty gene. When the faulty gene is present, retinal cells fail to produce a protein essential for converting light into a signal to the brain.

Researchers at Scheie Eye Institute, in collaboration with scientists at the University of Florida and Cornell University, took a giant step forward when they successfully injected good copies of this faulty gene into the eyes of Briard dogs that were blind from birth with LCA. The normal gene replaced the faulty one, giving the dogs sight.

This dramatic result demonstrates what can happen in an environment where creativity and collaboration are encouraged. At Scheie's F. M. Kirby Center for Molecular Ophthalmology, physician-scientists Jean Bennett, Eric Pierce, and Albert Maguire generate new research ideas that will continue to lead to breakthroughs for patients with retinal degeneration.

At Scheie's Center for Hereditary Retinal Degeneration, physician-scientists Samuel Jacobson, Artur Cideciyan, and Tomas Aleman work closely with F. M. Kirby Center investigators in planning clinical trials to evaluate promising new treatments. There are at present no treatments for LCA, but retinal gene therapy offers the tantalizing prospect of a cure.



Young LCA patients are good candidates for gene therapy.

Confocal microscope image of a druse in a human macula with early age-related macular degeneration. Retinal deposits (drusen) are an early feature of AMD.

Why do vision cells die when the person remains healthy otherwise?

## we are determined to improve treatment for macular degeneration

Older adults enjoy seeing their grandchildren smile. But age-related macular degeneration (AMD), which affects the central part of the retina (macula), can make such activities difficult or even impossible. The risk for AMD increases after age 60. In the U.S. alone, AMD causes loss of central vision in more than 200,000 people annually.

In the more common dry form of AMD, vision cells die prematurely. Physician-scientist Joshua Dunaief uses donor eyes to study how oxidative stress such as light causes cell death. His work helps to explain why anti-oxidant vitamins are useful for some patients with AMD.

To better understand why cell death occurs in dry AMD and why abnormal blood vessels develop in wet AMD, Scheie installed a new microscope in the F. M. Kirby Confocal Microscopy Laboratory. This high-powered microscope provides new insights into the 3-D ultrastructure of the retina and its blood vessels and substantially extends the research capability of Scheie scientists.

In the clinical arena, Scheie faculty orchestrated a 22-center treatment study sponsored by the National Eye Institute. Led by Stuart Fine and Maureen Maguire, the Complications of Age-Related Macular Degeneration Prevention Trial will determine whether treating the macula with a laser can prevent vision loss in patients with early AMD. This nationwide trial has potential for an enormous public-health benefit: if this preventive measure is even 30% effective, the rate of legal blindness from AMD may be reduced by half.



Alexander J. Brucker, MD, Maureen G. Maguire, PhD, and Joshua L. Dunaief, MD, PhD collaborate on new treatments for AMD.



Patients continue to go blind despite widely available treatments.

## diabetic retinopathy attacking cell biology and social issues

Michael J. Tolentino, MD  
performing surgery

Although diabetic retinopathy is a preventable form of blindness, thousands lose their eyesight annually because they do not seek treatment in time. Bleeding and scarring of the retina from abnormal blood vessel growth cause vision loss in people with diabetes. This blood vessel growth can be controlled by laser treatment.

The 4Sight Blindness Prevention Program is a community-based outreach project created by Stuart Fine as a result of his concern that many people with diabetes lose their sight despite the availability of laser treatment. The 4Sight staff members educate people with diabetes about the dangers of diabetic retinopathy and facilitate access to sight-saving care. The primary goal of 4Sight is to reduce blindness in

the medically underserved population of West Philadelphia. 4Sight expects that other programs will emulate its model and extend this format to communities throughout the U.S. and worldwide.

Retinal surgeon and scientist Michael Tolentino performs laser treatment and surgery on his patients with diabetic retinopathy. Not satisfied with just controlling the disease, his ultimate goal is to find the underlying cause of abnormal blood vessel growth and to develop a cure. Along with other scientists at the F. M. Kirby Center for Molecular Ophthalmology, he is testing several promising solutions to the problem of new blood vessel growth, the major cause of vision loss in diabetic retinopathy and AMD.



Evelina DiFranco and  
Sydrick Rabusa with  
4-Sight patients in  
West Philadelphia.



**Jody R. Piltz-Seymour, MD,**  
treats a glaucoma patient.

**Scheie Eye Institute is heavily invested in research and ranks #2 among all departments of ophthalmology in the United States in funding from the National Eye Institute.**

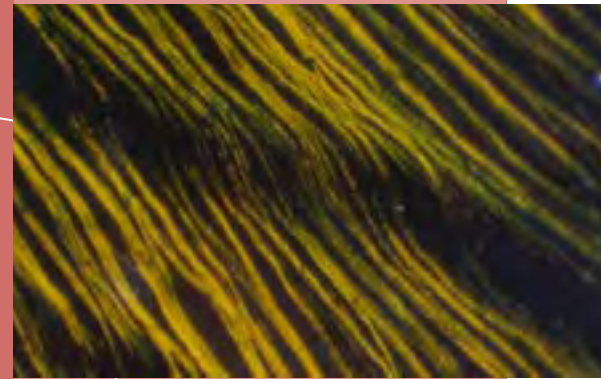
## arresting **glaucoma** before it steals sight

Glaucoma damages the optic nerve and steals sight without warning. It afflicts millions of Americans and tens of millions worldwide. Jody Piltz-Seymour, director of Scheie's Glaucoma Service, was a principal investigator in a five-year, nationwide study of a treatment to reduce the risk of developing the most common form of glaucoma. The study showed that eye drops could prevent the development of glaucoma in some patients with elevated eye pressure. In this trial, the Ocular Hypertension Treatment Study, the treatment halved the rate of glaucoma in patients at risk.

The frequency of glaucoma and the response to treatment differ between African Americans and Caucasians. For example, African

Americans are five times more likely to develop the disease than are Caucasians. Scheie's Eydie Miller-Ellis participated in studies that quantified these differences. Miller-Ellis was a principal investigator in the nationwide Advanced Glaucoma Intervention Study, which suggested a need for more aggressive treatment of African American patients with glaucoma.

In glaucoma, damage to the optic nerve resembles damage after eye injury. Alan Laties and co-workers are using a traumatic-injury model to search for methods to protect the optic nerve from the shock of injury. A goal is to stimulate the optic nerve to regenerate and form proper connections in the brain.



**Image of optic nerve fibers (yellow) crossing over a blood vessel (black).**

**Myopia is the most common vision problem. Severe myopia is a risk factor for glaucoma and retinal diseases. Early-phase trials of new drugs may prevent progressive myopia.**

## myopia: chasing nature and nurture

Myopia (nearsightedness) is merely an inconvenience for people who can wear glasses or contact lenses to see clearly. But when severe, myopia is a major cause of vision loss in the world. Our doctors are probing the basis of nearsightedness. Is it genetics, the environment, or both?

Dwight Stambolian, at the F. M. Kirby Center for Molecular Ophthalmology, studies populations with a homogeneous genetic makeup to identify genetic mutations that can cause myopia. Stambolian's team gathers data during home visits in Asian American and Orthodox Jewish communities (high rates of myopia) and in Pennsylvania Amish communities (low rates of myopia). Terri Young, another Scheie physician-scientist, already has identified several genes responsible for severe nearsightedness.

Environmental factors such as light exposure also may play a role. Scheie's Richard Stone is working with colleagues at Children's Hospital in Philadelphia to find mechanisms that control eye growth and refraction. They found a potentially useful drug to block myopia that is now in clinical trials in the U.S. and Asia.

Pediatric ophthalmologist Graham Quinn collaborates with Scheie's Maureen Maguire to coordinate the national Vision in Preschool Children (VIP) trial. VIP will determine the most effective and efficient methods to screen preschool children for amblyopia (lazy eye), strabismus (eye misalignment), and significant refractive error. These easily treated conditions are often overlooked due to the lack of effective screening tools.

**Myopia is on the increase in children.**

**Dwight E. Stambolian, MD, PhD,  
with a study participant.**





Ronnie Suscavage can do her mending again, thanks to eye care at Scheie.

Patients come to Scheie Eye Institute from all over the world to seek the finest eye care.

## cutting-edge and compassionate patient care —that’s our end product

Testimonials abound about the quality of patient care at Scheie. Ronnie Suscavage, age 83, sought help for visual limitations caused by AMD that interfered with her everyday activities. She had been told that nothing could be done. Her condition progressed and she had trouble reading—even magnifying devices were not helpful.

Ronnie visited Scheie’s Low Vision Rehabilitation Center, where people with impaired vision come to regain their independence. The Center uses counseling and occupational

therapy training, as well as a variety of optical aids, to make the most of a patient’s remaining vision.

Janet DeBerry Steinberg, Scheie optometrist and director of the Center, examined Ronnie and prescribed special glasses to accentuate vision in areas where Ronnie’s sight was strongest. On the first day she used her glasses, Ronnie called her daughter and exclaimed, “I just threaded a needle in one try!”



Small changes, such as large numbers, improve daily living.



We educate the future leaders and physician-scientists in eye care and vision science.

## education insures progress



**Eydie G. Miller-Ellis, MD demonstrates use of an ophthalmoscope to Penn medical student, Josh Fosnot.**

Scheie doctors educate medical students, residents, and post-residency fellows for careers in teaching, vision research, and clinical practice. By the second year of medical school, Penn students have begun to study clinical ophthalmology. Many choose to specialize in ophthalmology, in part because of their experiences at Scheie. Leonard Feiner is one of them.

Feiner is among a select group of medical students who enrolled in an NIH-sponsored, eight-year MD/PhD program. After graduating, Feiner selected the Scheie ophthalmology residency, not only because of its reputation for clinical excellence, but also because the Institute supports

research conducted by residents. Feiner is investigating how retinal cells sense and respond to low levels of oxygen in diabetes. His findings might change the way doctors treat patients with diabetic retinopathy.

Scheie is also an important center for continuing medical education for ophthalmic professionals. The Institute hosts visiting professors from all over the world who share new knowledge. This nurturing of innate curiosity and promotion of collaborative research among vision scientists will lead eventually to better patient care.



**Ophthalmology resident  
Len Feiner, MD, PhD.**

## Imagination is just the beginning



**F.M. Kirby**  
*President,*  
F.M. Kirby Foundation, Inc.

The F. M. Kirby Foundation awards grants to benefit society in areas of particular interest to the Kirby family. Dr. Stuart Fine's dream to build a research center for molecular ophthalmology and his vision of developing treatments for blinding diseases, for which no therapy existed, continues to stir fervent hopes in our minds and kindles exciting expectations.

The F. M. Kirby Center for Molecular Ophthalmology now houses laboratories of molecular biologists and geneticists who are conducting research that is literally at the cutting edge. Our family is pleased to have contributed to the early development and continued growth of the F. M. Kirby Center. We are confident that the productivity of the outstanding physician-scientists there will lead to major advances that will fully validate Dr. Fine's vision of imaginative and sound treatments for heretofore untreatable conditions.

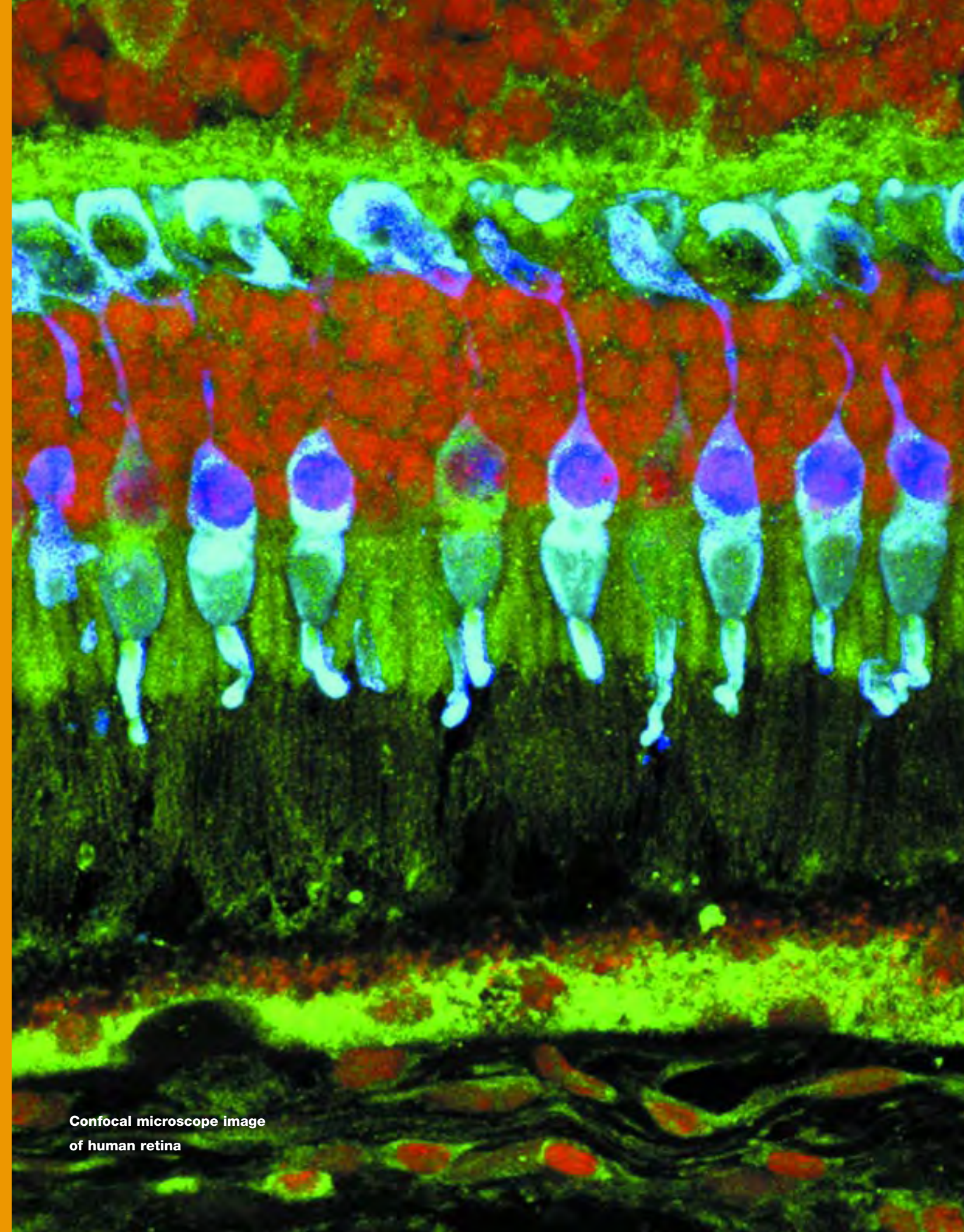
## Philanthropy makes it possible



**Stuart L. Fine, MD**  
*Director, Scheie Eye Institute*  
*Chairman, Department of*  
*Ophthalmology*  
University of Pennsylvania  
School of Medicine

Imagination has been pivotal in Penn's Department of Ophthalmology since its inception in 1874. The Scheie Eye Institute was built through the visionary efforts of one man, Dr. Harold G. Scheie. Today, the F. M. Kirby Center for Molecular Ophthalmology nurtures creative research of some of the most gifted physician-scientists in the world.

Over the years, many friends have supported our research. We are grateful to donors like Fred Kirby and the F. M. Kirby Foundation whose confidence in our physician-scientists supports their dreams to prevent and cure blinding eye diseases. This partnership of enlightened philanthropy and imaginative research brings us closer to our vision of a world without blindness.



**Confocal microscope image**  
**of human retina**