

# *Louis J. Fox* CENTER FOR Vision Restoration

of UPMC and the University of Pittsburgh

January 2015

[www.foxcenter.pitt.edu](http://www.foxcenter.pitt.edu)

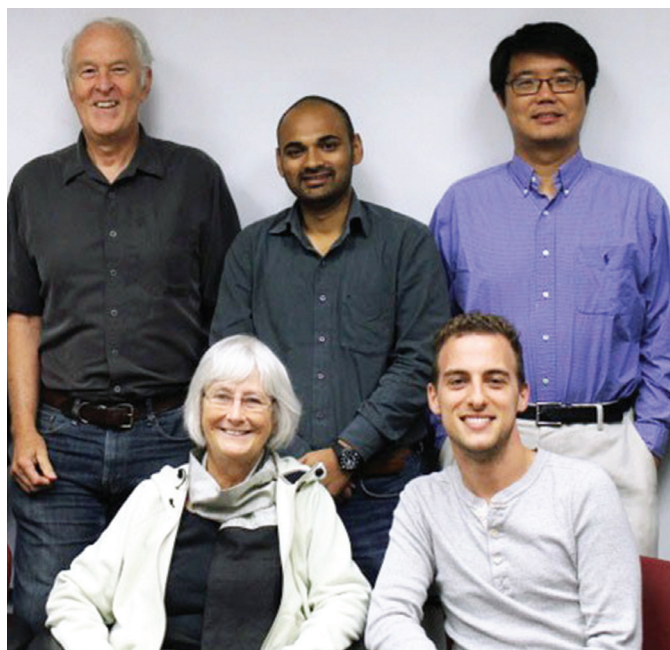
## Exciting Development to Reverse Corneal Blindness

By Jim Funderburgh, PhD

Corneal scarring affects millions of individuals around the world. The most common treatment for this blinding condition is a corneal transplantation. For more than a century, corneal transplants have been used to repair damaged and diseased corneas. Eye banks in the United States provide donor corneas to meet national demand, with over 48,000 corneal transplants performed in 2013. When a donor cornea is available, surgery is necessary to remove the damaged cornea and replace it with a healthy one. The patient who receives a cornea transplant then faces post-surgical follow-up care, a regimen of life-long medications, and a chance of rejection. Even with these complications, corneal grafting is the most widely carried out and most successful of organs transplants. World-wide, the situation is not so simple. As many as six to eight million individuals endure corneal blindness with little hope of obtaining a transplant.

**The unique partnership involving the Fox Center, UPMC Eye Center, and the McGowan Institute has the ability to make a critical impact on patients by providing premium care and hope for restored sight.**

At the University of Pittsburgh's Louis J. Fox Center for Vision Restoration, scientists have been working for over 10 years to find a treatment for corneal scarring, which is simpler and cheaper than corneal transplantation. As a Professor of Ophthalmology at the University of Pittsburgh and the Associate Director of the Louis J. Fox Center for Vision Restoration, I am leading a research group to pursue the




Four of the corneal scarring study authors: (back row) James Funderburgh, PhD; Sayan Basu, MD; Jian Wu, Otero Fellow; (front row) Martha Funderburgh; Andrew Hertsensberg.

idea that stem cell-therapy may be able to reverse corneal blindness without the need for surgery. As part of this research, my associates and I have isolated stem cells from human corneas and shown that they can produce transparent tissue in the lab.

Two years ago, a donation from the Western Pennsylvania Medical Eye Bank Foundation was used by the Fox Center to support a collaborative research project between University of Pittsburgh and the LV Prasad Eye Institute in Hyderabad, India. This study was designed to bring laboratory research on corneal stem cells to a point where the cells could be used for therapy. The funding brought Dr. Sayan Basu, a corneal surgeon to the Fox Center laboratories to learn how to prepare corneal stem cells. Working with a team of Pittsburgh scientists, Dr. Basu was able to show that the

stem cells could reverse corneal scarring in an animal model. The procedure that these researchers developed was very simple and could readily be adaptable to human use on an outpatient basis. Dr. Basu also found that the stem cells could be obtained from small tissue samples taken from a patient's eye. Such a procedure will allow an individual to be treated with their own stem cells. The results of this exciting research were published in December in the prestigious journal Science Translational Medicine with Dr. Basu and Pittsburgh graduate student Andrew Hertsenberg as co-first authors.

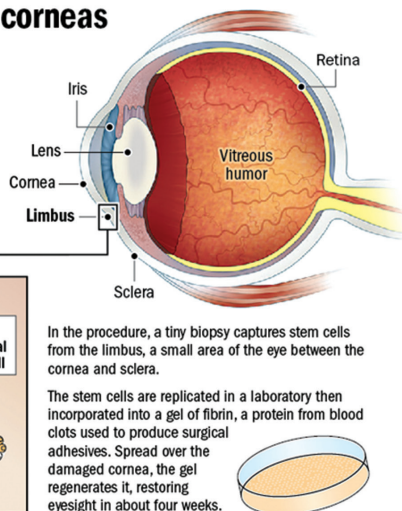
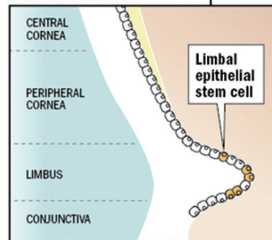
Since his return to India, Dr. Basu has received approval to conduct the pilot study through India's Institutional Review Board and he is performing stem-cell transplantation procedures on individuals with corneal blindness at the L V Prasad Eye Institute. In the United States, translating the stem-cell procedure to human treatment faces some obstacles. It must be proven successful in human clinical trials, receive U.S. Food and Drug Administration approval, and be cost effective. We are hopeful that success of the clinical trials in India will pave the way soon for corneal stem cell therapy in the United States. 

*The team behind the study includes co-lead author Andrew J. Hertsenberg, B.S., Martha L. Funderburgh, M.S.P.H., Michael K. Burrow, B.S., Mary M. Mann, M.S., Yiqin Du, M.D., Ph.D., Kira L. Lathrop, M.A.M.S., and Fatima N. Syed-Picard, Ph.D., all of Pitt; and Sheila M. Adams, Ph.D., and David E. Birk, Ph.D., both of the University of South Florida.*

## Clearing damaged corneas with stem cells

The University of Pittsburgh School of Medicine successfully has healed damaged corneas and restored vision in mice with their own stem cells. The procedure is being tested on humans in Hyderabad, India.

### LIMBUS AREA DETAIL



Source: Science Translational Medicine, [stembook.org](http://stembook.org)

Post-Gazette

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## The Miracle of Vision Restoration

By J.C. Noreika, MD, MBA



Dr. J. C. Noreika

Surveys worldwide reveal that, if forced to choose, most human beings prefer death to blindness. This is not surprising given the importance of vision in terms of survival, function, and enjoyment of life.

I am an ophthalmologist. I finished my training at the Pittsburgh Eye and Ear Hospital in 1980 and have enjoyed a gratifying career. Modern medicine's

advances are impressive. Every ophthalmologist attends to patients who are losing or have lost their sight. Although specialists might offer little relief, patients can now learn that hope in the restoration of their vision is not misplaced. Dedicated researchers have made this their life's calling.

I am not one of those researchers. Mine is a community-based practice, the front-lines of vision care. For the past three years, I have attended the Vision Restoration Symposium sponsored by The Louis J. Fox Center for Vision Restoration and produced by the UPMC Eye Center and the McGowan Institute for Regenerative Medicine. I share new information with my patients and offer the knowledge that gifted people are working to reverse the tragedy of blindness. It helps.



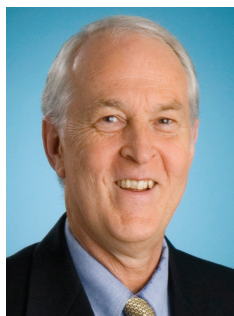
Dr. Joel Schuman

Dr. Joel Schuman, who heads the Department of Ophthalmology at UPMC and is the Director of the Louis J. Fox Center, extended an invitation to spend a day in the laboratories. He has assembled an impressive contingent of international talent. More importantly, he has instilled a single vision in this diverse group: blindness, from whatever cause, must yield to the regeneration of vision.

Advances in the restoration of corneal clarity emanate from the laboratory of Dr. James Funderburgh, the Associate

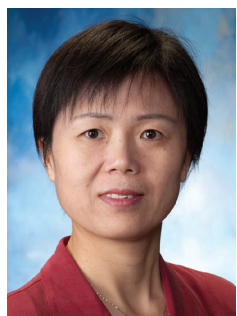
**“...Witnessing advances over the last three years, I hope that, like the contributions of Pittsburgh’s Jonas Salk and Thomas Starzl, we will witness a new miracle: the banishment of the hopelessness of vision loss.”**

**— Dr. J. C. Noreika**



**Dr. James Funderburgh**

Director of the Fox Center. Studying the role of stem cells and biosynthetic materials, corneal restoration after injury, infection, degeneration and scarring is moving inexorably from the lab bench to my exam room. Dr. Yigin Du, a product of Beijing University’s academia, is applying her ground-breaking efforts with stem cells and their ability to transform damaged tissue to the fight against the second leading cause of blindness worldwide, glaucoma. Working with these remarkable cells, she hopes to rejuvenate the eye’s fluid filtering mechanism thus lowering the eye’s internal pressure thereby preserving the health of the optic nerve.



**Dr. Yigin Du**

Dr. Schuman is an internationally respected specialist in the field of glaucoma. He co-invented the revolutionary ocular coherence tomography (OCT) technology. Now, he and fellow researcher, Dr. Michelle Sandrian are pushing the limits of OCT by combining it with other modalities to unlock the secrets of this incurable condition. Down the hall, Dr. Igor Nasonkin is developing models whereby specific



**Dr. Michelle Sandrian**



**Dr. Igor Nasonkin**


stem cells can be used to repair or replace damaged retina cells, an idea inconceivable a half generation ago.

I met the young, highly intelligent team of Dr. Mike Steketee at the McGowan Center for Regenerative Medicine. Having worked with pioneers of optic nerve regeneration, Dr. Steketee uses nanotechnology aimed at the mitochondria of living cells to learn how these tiny energy factories can be manipulated to treat disease and degeneration. The stuff of life, the extracellular matrix, is one of his key interests.



**Dr. Michael Steketee**

The overarching goal of these investigators is to one day successfully perform a whole eye transplant to restore sight.

Impossible? Until I became familiar with the daily miracles being performed at UPMC, I would have agreed. But, witnessing advances over the last three years, I hope that, like the contributions of Pittsburgh’s Jonas Salk and Thomas Starzl, we will witness a new miracle, the banishment of the hopelessness of vision loss. 

## **Make Double the Difference!**

**University of Pittsburgh Medical Center is matching dollar-for-dollar every gift to the Eye & Ear Foundation that is made to support the Louis J. Fox Center for Vision Restoration.**

**Visit [eyeandear.org](http://eyeandear.org) to make your gift online, or mail the attached envelope.**



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# Providing Hope: The Charles and Louella Snyder Retinal Regeneration Laboratory

By Zack Butovich

Macular degeneration (MD) is a relatively common disease that affects the eye's retina – a thin, light-sensitive layer of tissue that lines the back of the eye and is responsible for interpreting light and images from the front of the eye. Within the retina, light is converted into an electrical impulse and sent through the optic nerve to be processed by the brain's visual cortex. But when a retina is affected by MD, parts of its light-sensitive tissue die, deteriorate, or degenerate. Sometimes the process is quick, and sometimes it is very slow, but either way can result in complete blindness. Currently, most treatments are, at best, a stalling mechanism, as there is no cure for MD.

But at the Louis J. Fox Center for Vision Restoration, researchers are working hard to piece together a complex puzzle that may resolve the lasting issues that plague sufferers of MD and other similar degenerative diseases, such as retinitis pigmentosa, or diabetic retinopathy. The Fox Center is specifically designed to address the issue of how to restore sight to those who have lost it, by bringing a dynamic set of researchers from various disciplines together to focus on one specific ophthalmic problem.




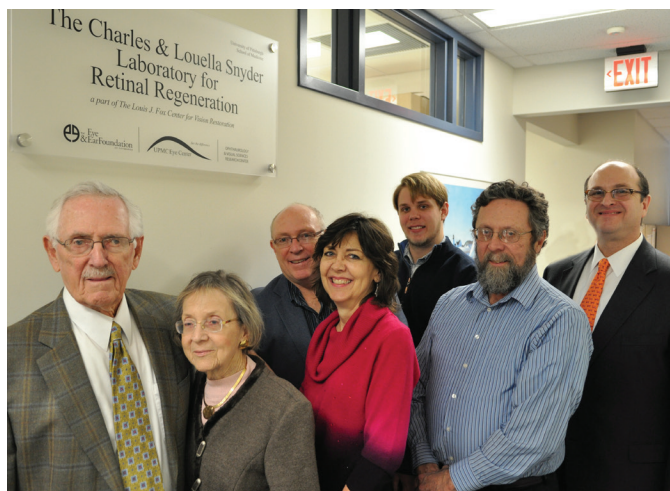
**Dr. Igor Nasonkin and  
Dr. E. Ronald Salvitti**

Dr. Nasonkin's primary research goal is in the development of artificial retinal progenitors (the type of cell that processes signals from the retina to the brain), and utilizing them to restart communication between the brain and retina, thereby healing damaged pathways and restoring vision.

Dr. Igor Nasonkin, the E. Ronald Salvitti MD Chair for Ophthalmology Research, for example, leads the Charles and Louella Snyder Retinal Regeneration Laboratory at the University of Pittsburgh Department of Ophthalmology, and is determined to find a way to revive damaged retina tissue using stem cell therapies and genomic treatments.

**At the Louis J. Fox Center for Vision Restoration, researchers are working hard to piece together a complex puzzle that may resolve the lasting issues that plague sufferers of macular degeneration and other similar degenerative diseases.**

This technology and research involves the collaboration of a number of different sciences including genomics, epigenetics, developmental biology, stem cell biology, tissue engineering, and regenerative ophthalmology – creating a cross-disciplinary environment the Fox Center was specifically designed to foster. Basing its model off of the highly successful McGowan Center for Regenerative Medicine – one of the most prominent centers for regenerative medicine in the country – the Fox Center is unique in applying its mission specifically to vision restoration. 



**The Snyder family at the new Charles and Louella Snyder Laboratory for Retinal Regeneration: Charles and Louella Snyder with children Sally, Dennis, and Richard Snyder, grandson Cameron, and Dr. Joel S. Schuman, Distinguished Professor & Chairman of Ophthalmology, University of Pittsburgh.**



Louis J. Fox

## Support the FCVR, Double the Impact!

The University of Pittsburgh Medical Center is matching dollar-for-dollar every gift to the Eye & Ear Foundation that is made to support the Louis J. Fox Center for Vision Restoration.

All donations to the Eye & Ear Foundation to support the Fox Center will provide critical funding to advance the research and clinical programs within the Department of Ophthalmology.

Visit [eyeandear.org](http://eyeandear.org) to make your gift online, or mail the attached envelope.

For more information on our research, please contact:  
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## About the Louis J. Fox Center

Established in 2008, the **Louis J. Fox Center for Vision Restoration** supports research within the **Department of Ophthalmology and the McGowan Institute at the University of Pittsburgh**, internationally recognized for its innovative research and clinical translation of regenerative medicine-based therapies. Through the philanthropy of Mr. Louis J. Fox, the Fox Center is the first national, comprehensive, multi-disciplinary research and clinical program dedicated to ocular regenerative medicine.

**Against the backdrop of the impressive research environment provided by the University of Pittsburgh and the University of Pittsburgh Medical Center, the Louis J. Fox Center for Vision Restoration has the capability of making a critical impact on research and patient care practices, improving the lives of people throughout the nation and around the world.**

Led by Dr. Joel S. Schuman, Director of Louis J. Fox Center and Chairman of the Department of Ophthalmology, a multidisciplinary team is in place, collaborating and advancing the field. The main focus of this collaboration is the discovery and development of new cures for blindness and loss of vision through basic and clinical research, especially for those with problems such as retinal vein occlusion, macular degeneration, glaucoma and other maladies affecting the cornea, retina and optic nerve.

**The Eye & Ear Foundation of Pittsburgh** is a 501 (c)(3) support organization for the Department of Ophthalmology and the Louis J. Fox Center for Vision Restoration, as well as the Department of Otolaryngology at the University of Pittsburgh. All donations to the Eye & Ear Foundation of Pittsburgh to support the Louis J. Fox Center for Vision Restoration will provide critical funding to advance the research and clinical programs within the Department of Ophthalmology.





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Ms. Bernita Buncher hosted an Eye & Ear Foundation fundraiser, *The Art of Vision*, to support a special type of postdoctoral fellowship position that exists only at the University of Pittsburgh — an OTERO Fellow. OTERO stands for Ocular Tissue Engineering and Regenerative Ophthalmology, and represents an effort to create a postdoc position that would operate within the Louis J. Fox Center for Vision Restoration, a collaborative program of the Department of Ophthalmology and the McGowan



Lawton Snyder, Dr. Joel S. Schuman,  
and Bernita Buncher.

Institute for Regenerative Medicine at the University of Pittsburgh, combining the renowned expertise of all three world-class institutions into a highly innovative and cross-disciplinary research scientist.

This *Art of Vision* event showcased ophthalmic images of our research scientists, inspiring supporters to recognize the aesthetic beauty of science behind the work.

**Images from the Art of Vision Event can be found on our website at [eyeandear.org](http://eyeandear.org) and are available in print form for a donation of \$1,000 or more towards our OTERO Fellowship program.**

By the end of the year, we aim to achieve full funding for an OTERO position for one year. We hope you can be a part of that campaign. 