Vision *for the* Future

University of Rochester Eye Institute

Winter 2003

Inside

Our Mission

The mission of the Eye Institute is to develop and apply advanced technologies for the preservation, enhancement and restoration of vision through a partnership of academic medicine, private industry, and the community we serve.

Currently home to the James P. Wilmot Cancer Center, the University has allocated several floors of existing space for renovation and state-of-the-art research laboratories. Plans for the Eye Institute include a "roof raising" for the addition of a new third floor and construction of patient-friendly, easy-access clinical facilities (as depicted above).

Message from the Director

We are pleased to announce that the University of Rochester Eye Institute has been awarded a $2.6 million construction grant from the National Institutes of Health (NIH) with matching funds provided by the University of Rochester Medical Center. A highly competitive process, this federal funding is an important milestone in establishing the Eye Institute as a national center of ophthalmic excellence. Along with an $11 million commitment over five years from the University and Bausch & Lomb for program development, the Eye Institute is now on an accelerated path to achieving its goal of ranking among the top 10 eye institutes in the U.S.

The NIH grant supports the renovation of 20,000 square feet of research space, enabling 10 currently funded vision research programs at the University of Rochester to consolidate and expand. The renovated space will house four programs in laboratory research, and six programs that emphasize the translation of basic optical, physical, and behavioral research into innovative clinical care. The grant also provides for core modules of research support that will be shared by all vision researchers.

As we continue to recruit world-class vision specialists and scientists, the momentum grows. We look forward to celebrating the official opening of the Eye Institute in 2004.

Steven E. Feldon, M.D., M.B.A., Director of the Eye Institute

The University of Rochester Eye Institute is most grateful to the following donors for their generous gifts and ongoing support.

We offer special thanks to Bausch & Lomb and Research to Prevent Blindness for their sustaining support.

Alcon Laboratories
Allergan Inc.
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Dr. David Bell
Dr. Luca Brigatti
Dr. Shi Hwa Chang
Mr. & Mrs. Dennis DeLeo
Mr. & Mrs. Ralph DeStephano
Dr. & Mrs. Steven Feldon
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Mrs. Ruth McCleary
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Dr. Steven Park
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Dr. Christine Platt
Ms. Elizabeth Russo
Dr. Robert Ryan
Dr. Joseph Silverberg
Dr. Gwen Sterns
Ms. Joanne Tremiti
Dr. Ralph Viola
Mr. & Mrs. Philip Wehrheim

Gifts received during the period April 2003 through September 2003.

For information on opportunities to make a gift in support of the Eye Institute, contact Larry Kelly in Medical Center Development at 585-275-0808.

Sharing the Vision

The Growth of Optics and Ophthalmology in Rochester

In the '20s, George Eastman heavily endowed Rochester's imaging and medical sciences. By 1929, the Institute of Optics was established as the first academic optical center. "Since its inception the Institute has awarded more than half of the optics degrees in the nation," said **Wayne Knox, Ph.D.**, director and professor of optics. "As we celebrate our 75th year, we are ensuring future success through expansion and alliances with key partners such as the Eye Institute."

In 1963, the Center for Visual Science was created as an interdepartmental research and teaching program. Bausch & Lomb has become a loyal corporate supporter and scientific partner. "The Center has grown into one of the most prominent visual science institutions in the world," said **David Williams, Ph.D.**, director and professor of brain and cognitive science. "The relationship with Bausch & Lomb plays an important role in our present success."

In 1978, the Division of Ophthalmology became a Department, and in 1985, thanks to a generous grant from the National Eye Institute and the support of individuals, community ophthalmologists, and resident alumni, the research wing was completed. In 1989, the residency program expanded. "It was an exciting time of growth," said **Henry Metz, M.D., M.B.A.**, first chair of the Department and a generous benefactor. "Today the Department is nationally recognized for its research capabilities and potential."

In 2001, **Steven Feldon, M.D., M.B.A.**, was appointed chair of the Department of Ophthalmology, and the Eye Institute was established. Since then, the number of clinical and research faculty has doubled.

Now, the Department has been awarded an NIH construction grant to realize its aggressive goals. Twice in its history, the Department has applied for an NIH construction grant and twice it has been awarded— a testament to our national leadership in the field.

Farewell, Dr. Metz!

It is with deepest respect and gratitude that we wish Dr. Henry Metz farewell and best wishes in his new position as Executive Director and CEO of the Smith Kettlewell Eye Research Institute in San Francisco. Dr. Metz served as professor and chair of the Department from 1971 through 1993. Although his professional interests took him into private practice in 1993, he has continued to demonstrate extraordinary dedication to medical education. It was during his tenure that the Department's first NIH construction grant was awarded, and the establishment of the basic science research program followed. His professional achievements and clinical research in the area of pediatric ophthalmology and strabismus have earned him a national reputation in his field. We thank Dr. Metz for his outstanding generosity and leadership.

Dr. Metz (left) and Dr. Feldon (right).

"Friends" of the Eye Institute

A gift from the Friends of Strong Council and capital provided by Strong Memorial Hospital have allowed us to upgrade our imaging capabilities. Now we can better meet the needs of our patients who have vision-threatening diseases utilizing real-time digital cameras in the diagnosis, treatment, and patient education process. Thank you, Friends of Strong!

Taking a look at, and learning more about. .

by Scott MacRae, M.D.

Dr. MacRae is one of the most experienced and respected refractive surgeons in the world. Having been instrumental in creating and refining the technique, he is one of a handful of physicians ushering in a new era of vision correction known as customized ablation. Dr. MacRae is currently working on numerous research initiatives, including several with the Alliance for Vision Excellence, a patient care and research collaboration between the University of Rochester and Bausch & Lomb. He is author of the first text to put forth the basic science underlying customized vision correction and its clinical potential, Customized Corneal Ablation: The Quest for Supervision.

What is customized corneal ablation?

In customized corneal ablation we use a laser to precisely tailor the cornea to compensate for very subtle optical imperfections of a person's eye.

What makes this technique so significant?

For the past 200 years, during a typical routine eye exam, doctors looked for two types of optical imperfections, known as lower order aberrations — astigmatism and defocus. Defocus takes one of two forms, nearsightedness or farsightedness. With this new technology, we can measure and correct more than 60 different aberrations of the eye. Until a few years ago, these higher order aberrations were not known to exist.

What technology was used to develop this revolutionary form of vision correction?

The entire field of customized ablation is based largely on work done by a research team directed by my colleague, vision scientist David Williams, Ph.D. Dr. Williams, who heads up the University of Rochester's Center for Visual Science, was the first to design and build a new adaptive optics-based wavefront system to allow doctors to see the inside of the human eye in extraordinary detail. Using the same adaptive optics technology that astronomers use to remove the twinkle from starlight, Dr. Williams used this system to discover dozens of previously unknown imperfections in the human eye.

Is this technique different from LASIK surgery?

LASIK stands for laser-assisted in situ keratomileusis. In the field of refractive surgery, we have been using lasers to reshape the cornea since the technology first became available in the U.S. in 1995. Customized ablation is a more advanced application of the technology using wavefront sensors to guide the laser's treatment. It has the potential to reduce the most common side effects occasionally encountered with standard laser procedures such as glare and halos around lights at night. It also offers patients a better chance of achieving 20/20 or better vision after surgery. Think of it as more customized LASIK surgery.

Does customized ablation really help people see better?

When adaptive optics is applied in astronomy it gives telescopes sharper images by correcting for interference in the atmosphere. In the same way, this technology is allowing refractive surgeons to address very subtle visual imperfections in the optics of the human eye. The result is not so much how far down the eye chart the patient can see as it is the sharpness and clarity of the image seen. Wavefront sensing and customized ablation can enhance eyesight in low-light conditions such as night driving.

How can you be sure customized ablation works?

We treated 340 eyes during FDA clinical trials of the Bausch & Lomb Zyoptix customized ablation LASIK system. More than 91 percent of patients treated achieved vision of 20/20 or better without the need for glasses or contact lenses.

2003-2004 Bausch & Lomb Visiting Professor Series

The Eye Institute hosts distinguished professionals for continuing education at the University of Rochester Medical Center. For more information on the series, contact Karen Pestlin at 585-273-3954. To learn more about earning credit at the series, call 585-275-4392.

December 13, 2003
Neuro-Ophthalmology
Mark Kupersmith, M.D.
Professor and Director
Neuro-Ophthalmology
Beth Israel Medical Center

January 17, 2004
Retina
Hilel Lewis, M.D.
Professor and Chair
Division of Ophthalmology
Director, Cole Eye Institute
Cleveland Clinic Foundation

. Customized Corneal Ablation

Ninety-seven percent of these patients said they had experienced "marked" or "extreme" improvement in their eyesight with the treatment. Forty percent of patients felt that their visual comfort while driving at night was improved over what it was while wearing glasses, which is unprecedented. This is the first time results like this have even been reported after LASIK.

How safe is LASIK?

The FDA has approved LASIK as a safe and effective procedure. When done right it is extremely safe. The likelihood of a patient losing more than a line of vision in our practice is less than one in 1,500. It is important, however, to remember that LASIK is not the right choice for everybody. Some people are not appropriate candidates, and if treated could have less than optimal results. It is important to receive a thorough pre-operative evaluation to determine if LASIK is the best option.

How do you determine who is a good candidate for refractive surgery?

In our practice we offer a 27-point evaluation process using the most advanced technology available to ensure the safest and most effective results. Every patient is tested with the Zywave wavefront sensor to look for the presence of higher order aberrations. The Orbscan Corneal Analysis System is used to completely understand the architecture of the patient's cornea. We measure every patient's pupil size three different times using three separate systems and under differing levels of light. We take two different measurements of the thickness of the cornea. All of these are crucial elements in deciding who is a safe candidate for refractive surgery. Most near and farsighted people with healthy eyes may benefit from laser eye surgery. When it's done correctly with sophisticated technology, refractive surgery is a very safe alternative to glasses and contact lenses. We conduct free informational seminars so that patients are well informed before opting for surgery.

Is customized ablation now widely available?

Not yet. With recent FDA approval of customized ablation technology, more surgeons will begin to adopt the technique. Here at the University of Rochester, we are at the epicenter of customized ablation and are one of three practices in the country to use the new Bausch and Lomb Zyoptix customized ablation system. We have been doing this for almost three years. Other refractive surgeons around the country will need to obtain and learn how to apply the technology. The research work we are doing here at the University of Rochester will be instrumental in teaching them. There are already over 100,000 patients treated worldwide with customized ablation using the wavefront technology developed and patented by the University of Rochester team. There are millions of people who will benefit from this technology in the future.

For more about the application of adaptive optics, turn to "Focus on Collaboration" on page 5 and read about customized contact lenses.

Matthew D. Gearinger, M.D.
Assistant Professor of Ophthalmology

The University of Rochester Eye Institute is pleased to announce the appointment of Matthew Gearinger, M.D., assistant professor of ophthalmology. Dr. Gearinger earned his medical degree from the University of Michigan. Following his residency at the University of Pittsburgh, he completed a pediatric ophthalmology fellowship at Duke University in 2002.

Dr. Gearinger's clinical research interests include retinopathy of prematurity, pediatric optic nerve disorders, thyroid eye disease and strabismus. Dr. Gearinger sees pediatric patients at Strong Memorial Hospital and Rochester General Hospital, where he joins Dr. Gwen Sterns' office.

In addition to his clinical responsibilities, Dr. Gearinger provides precepting and didactic teaching in pediatric ophthalmology for residents and medical students.

February 21, 2004
Genetics/Pediatric
Bronwyn Bateman, M.D.
Professor and Chair
Rocky Mountain Lions Institute
University of Colorado

March 20, 2004
Orbit/Plastics
Kimberley Cockerham, M.D.
Associate Professor and Director
Allegheny Ophthalmic & Orbital Association

April 17, 2004
Glaucoma
Paul Lee, M.D.
Professor of Ophthalmology
Duke University Eye Center

June 26, 2004
Cataract/Refractive Surgery
Sam Masket, M.D.
Advanced Vision Care
Los Angeles

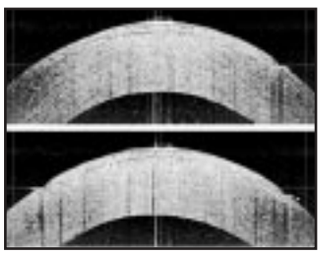
Focus on Collaboration

This column is dedicated to the collaborative endeavors of bench scientists and physicians—work aimed at swiftly bringing basic science discoveries and new technologies to improved diagnostics and treatment of eye disease.

Dr. Yoon in his lab with a patient and the dynamic wide range wavefront sensor.

Customizing Contact Lenses

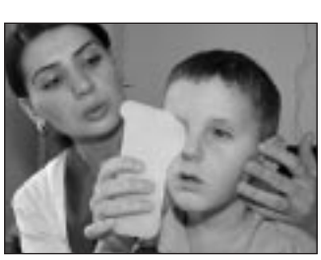
Geun-Young Yoon, Ph.D.: "Aberrations in the eye's optics degrade vision. Optical aberration is the failure to produce exact point-to-point correspondence between the object and the image on the retina. Some of the more serious aberrations are not correctable with conventional vision correction. The key to substantial improvement in vision for these individuals lies in more accurate technology for measurement and correction. Today, neither the technology for measurement nor therapeutic alternatives is adequate. Research is underway in Rochester to develop a robust wavefront sensor, with a large dynamic range, to reliably diagnose the imperfections in highly aberrated eyes, and to develop a customized contact lens that can compensate for these problems. In order to expand the wavefront sensor, a translational plate is being used to increase the spacing between wavefront sensing spots. Therapeutic intervention is being focused on the use of high-power laser ablation to customize a contact lens, eliminating the aberrations measured with the new wavefront sensor. Working with our research partner Bausch & Lomb, customized contact lenses may be just a few years away. This large, dynamic range wavefront sensor also has application in customized laser refractive surgery."



With Dr. Wang's new OCT technology, a complete, wide image can be captured of the corneal flap during LASIK procedures (as demonstrated with an animal model).

Real-Time OCT

Jianhua (Jay) Wang, M.D., Ph.D.: "Optical coherence tomography (OCT) is a technique that allows a cross-sectional visualization of the anterior portion of the eye without contacting the tissue. My Ph.D. work focused on clinical applications of OCT in understanding physiological changes that occur in different parts of the eye. The instrument used to perform these measurements was limited to a very small scanning width (2mm), resulting in the need to generate the final image from many smaller images. After I joined the Eye Institute, an advanced, custom-built OCT was developed specifically to measure in 'real-time'. This device allows us to image a full 15mm width scan at up to eight images per second, creating a video of the anterior segment of the eye. It allows dynamic changes to be recorded and other structural details to be evaluated. For instance, using this OCT, the entire corneal flap created during refractive surgery is visualized clearly. Currently, in refractive surgery and other corneal procedures, tests to measure corneal thickness involve contact with the eye and application of anesthetic drops—both could cause corneal distortion and therefore the precision is not optimal. Using this non-contact and non-invasive OCT, corneal structure changes and the efficacy of the laser used during refractive surgery will be studied. I will be working closely with Dr. Scott MacRae and Dr. Krystel Huxlin in the Department of Ophthalmology and Dr. Ian Cox of Bausch & Lomb. Together, we will investigate how we can apply this technology in improving refractive surgery procedures and outcomes. This is just one of many applications we envision for non-contact, real-time OCT."



Armine Gharakeshishyan, M.D.

Vision Exchange

We welcome **Armine Gharakeshishyan, M.D.,** who has joined the Eye Institute for six months as an Armenian EyeCare Project (AECP) fellow. Dr. Gharakeshishyan's goal is to become specialized in neuro-ophthalmology and orbital surgery so that ultimately she can return to her native country where there is a great need for specialists in this field.

Eye on the News

- **Scott MacRae, M.D.,** has been selected by eye surgeons around the world to receive one of the field's top honors, the Lans Award. It's being presented at the annual American Academy of Ophthalmology (AAO) meeting.
- **Gwen K. Sterns, M.D.,** was recognized with the AAO's Secretariat Award, and was nominated by the secretaries for Clinical Education, Ophthalmic Information, Ophthalmic Knowledge, and Quality of Care.
- **Robert C. Emerson, Ph.D.,** has retired from his position as research associate professor of ophthalmology and visual science in the Center for Visual Science. With specialist interest in the visual cortex, he is an accomplished investigator and we wish him all the best.
- **Mina Chung, M.D.,** was awarded $30,000 by the Howard Hughes Medical Institute for a pilot proposal to study diseases affecting the macula using multifocal ERG and adaptive optics imaging.
- **Ronald Plotnik, M.D.,** was the first ophthalmologist in the Rochester area to utilize an advanced technology in cataract surgery—Alcon Laboratories' AcrySof® Natural intraocular lens. It's the first foldable lens for cataract surgery that is specifically designed to filter blue light which may be a factor in the onset of age-related macular degeneration.
- **James Aquavella, M.D.,** has performed the Rochester area's first artificial corneal transplant. Called AlphCor™, this new, flexible, one-piece artificial cornea developed by Argus Biomedical is offering hope to patients who are at high risk of failure with traditional transplants and have little or no vision.

Save the date—June 4-5, 2004

The Annual Rochester Ophthalmological Society Conference will be held in conjunction with the announcement of the University of Rochester Eye Institute. The gala event will mark the dedication and opening of the clinical services expansion.

Snell Lecturer
Stephen J. Ryan, Jr., M.D., Dean and Senior Vice President, Keck School of Medicine, University of Southern California, President, Doheny Eye Institute

Bausch & Lomb Visiting Professor
Ronald E. Smith, M.D., Chair, Department of Ophthalmology, Keck School of Medicine, University of Southern California

StrongVision Faculty Practice

Comprehensive Eye Care
Shobha Boghani, M.D.
Diane Singer, M.D.

Cornea and External Disease
James Aquavella, M.D.
Steven Ching, M.D.
Ronald Plotnik, M.D.

Glaucoma
Luca Brigatti, M.D.

Neuro-Ophthalmology and Orbit
Steven Feldon, M.D., M.B.A.
Deborah Friedman, M.D.

Pediatric Ophthalmology
Matthew Gearinger, M.D.

Refractive Surgery
Scott MacRae, M.D.
Joseph Stamm, O.D.

Retina and Vitreous
Mina Chung, M.D.
David DiLoreto, M.D., Ph.D.
Donald Grover, M.D.

Research Faculty
David Calkins, Ph.D.
Krystel Huxlin, Ph.D.
William Merigan, Ph.D.
Jianhua (Jay) Wang, M.D., Ph.D.
Geun-Young Yoon, Ph.D.

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