Vision Future

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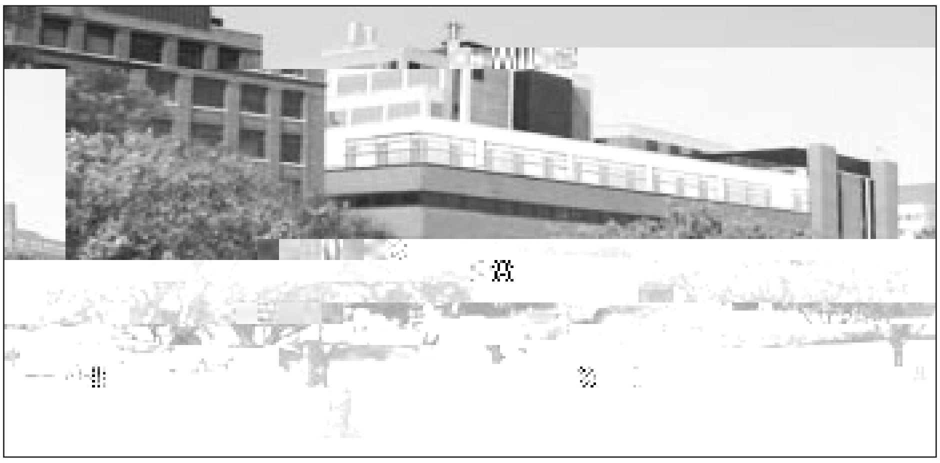

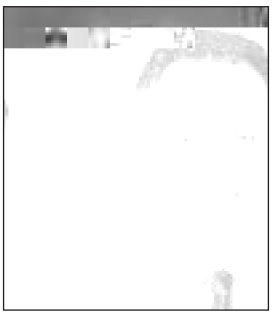

We are pleased to announce that the University of Rochester Eye Institute has been awarded a $ million construction grant from the National Institutes of Health (NIH) with matching funds provided by the University of Rochester Medical Center. A highly competitive process, this federal funding is an important milestone in establishing the Eye Institute as a national center of ophthalmic excellence. Along with an $ 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 eye institutes in the U.S.

The NIH grant supports the renovation of square feet of research space, enabling 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 .

In the [illegible]s, George Eastman heavily endowed Rochester's imaging and medical sciences. By [illegible], 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 [illegible], [illegible].D., director and professor of optics. "As we celebrate our [illegible]th year, we are ensuring future success through expansion and alliances with key partners such as the Eye Institute."

In [illegible], 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 [illegible], [illegible].D., director and professor of brain and cognitive science. "The relationship with Bausch & Lomb plays an important role in our present success."

In [illegible], the Division of Ophthalmology became a Department, and in [illegible], 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 [illegible]

[illegible] .D.

[illegible]?

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.

[illegible]?

For the past 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 different aberrations of the eye. Until a few years ago, these higher order aberrations were not known to exist.

[illegible]?

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.

I[illegible] LA IK [illegible]?

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 . 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 or better vision after surgery. Think of it as more customized LASIK surgery.

D[illegible]?

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.

H[illegible]?

We treated eyes during FDA clinical trials of the Bausch & Lomb Zyoptix

[illegible]

[illegible]

[illegible]

[illegible] .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."

[illegible] OCT

[illegible], M.D., [illegible] .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."

[illegible]

We welcome **[illegible], 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.

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- **S [illegible] M [illegible] R [illegible], 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 present-

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