

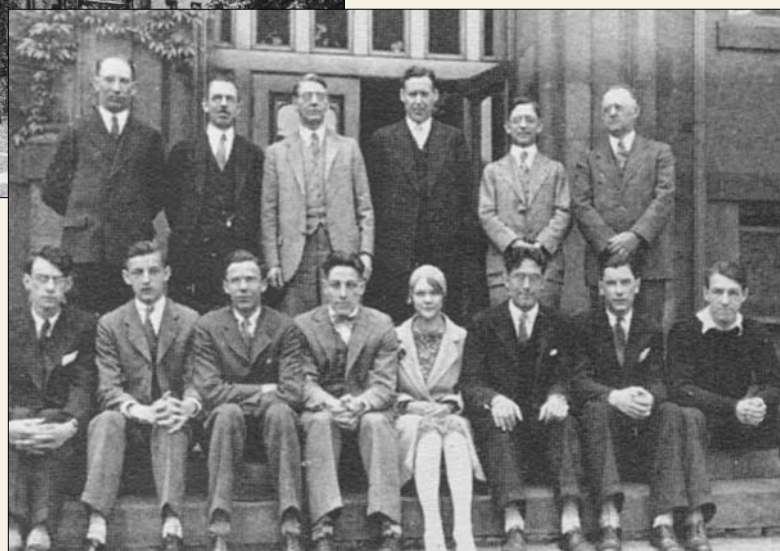
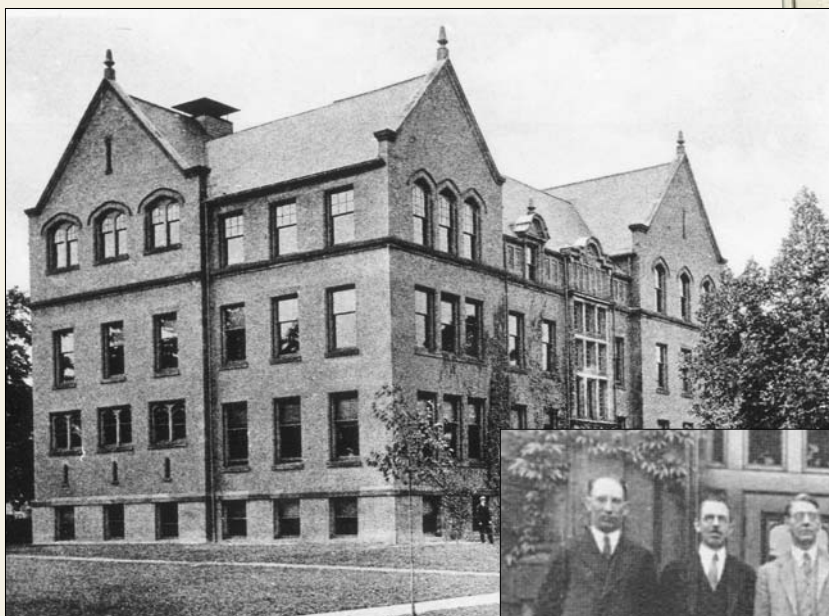
Rochester's Optics Institute Turns 75

Kim Douglass



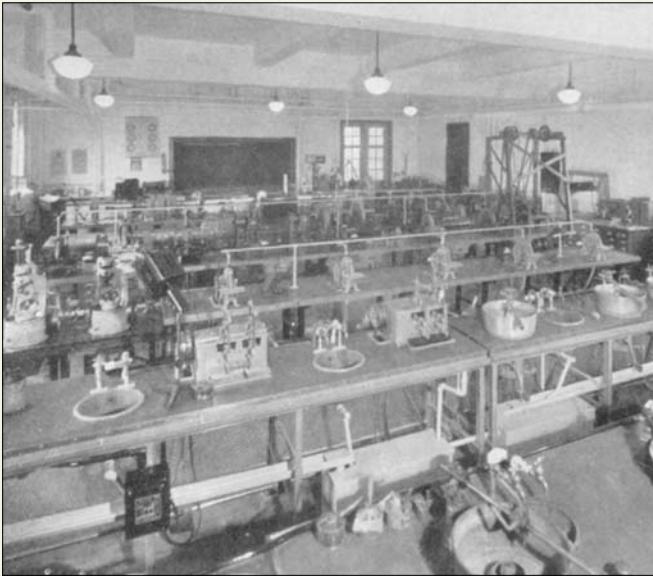
1929

(Left) The Eastman Building on the Prince Street Campus was the Institute of Optics' first home. (Below) Rochester's first optometry class.



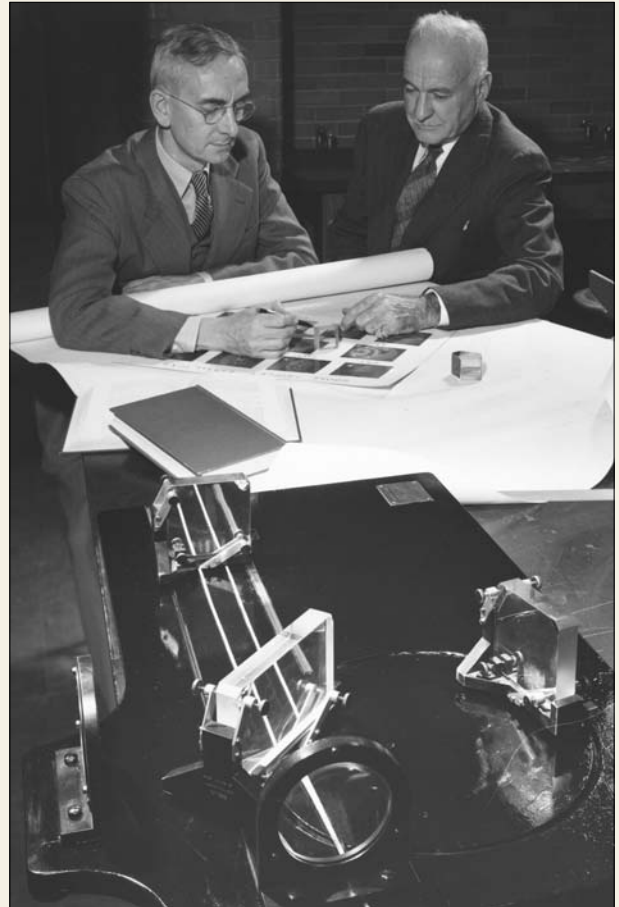
When the University of Rochester's Institute of Optics opened in 1929, the world was experiencing rapid growth in optics-related industries, from spectacles to surveying equipment, but few people outside Germany were trained in the materials and technical skills necessary to advance these fields. A group of Rochester-based entrepreneurs helped change all that by providing early funding for the school. Today, the business of optics education is growing, thanks in part to the roots planted 75 years ago in upstate New York. This year, especially, America's oldest optics institute is celebrating its rich history and promising future.

The University of Rochester Library's Department of Rare Books and Special Collections provided some photographs for this article.



1930s

The optics glass shop.



1940s

Brian O'Brien (*left*), the first permanent director of the institute, in a shot taken by famed photographer Ansel Adams. (*Below*) Institute researchers measured the properties of the ozone layer by means of ultraviolet spectrometers suspended in a gondola below high-altitude balloons.





1950s

(Left) Robert Hopkins directed the Institute of Optics from 1954 to 1965. (Above) Abbott Smith, who received his doctoral degree from the institute in 1961, takes data the hard way.

On Oct. 10, staff and alumni of the University of Rochester's Institute of Optics will gather beside the institute's Wilmot Building for a groundbreaking ceremony. Optics Institute Director Wayne Knox and others will plunge golden shovels into the ground to herald the start of a \$30 million expansion project, a 91,000-square-foot space devoted to both optics and biomedical engineering. With work planned on ultra-accurate laser vision correction, retinal disease diagnosis and the use of lasers in clinical analysis, the project in many ways reflects the range of optics in the 21st century.

But as the institute plans for its future, it is focusing as well on its past, in particular on the people and institutions which laid the foundation not only for a single educational facility, but also, in many ways, for optics in America. The Institute of Optics turns 75 this year; its founders—from such early Rochester-based optics companies as Eastman Kodak and Bausch & Lomb—had also been largely responsible for the creation, 13 years earlier, of OSA.

Many cultural, political and social events in 20th century America were

influenced by the institute. Hollywood used a sophisticated imaging system that was designed by institute scientists to film the classic movie "Oklahoma." A high-speed streak camera that recorded atomic blasts around World War II came from Rochester.

"There are few academic programs in any discipline that have played as large a role in the development of a profession as the institute has in optics," longtime faculty member Carlos Stroud wrote for a new commemorative essay book about the institute. "A very large fraction of the country's leaders in optics ... received their training [there]." The institute boasts about 2,000 living alumni; a good number of them are expected to descend on the campus this month for a celebration that will coincide with OSA's 88th annual meeting.

The beginning

The institute was created largely to fill a gap in America's scientific base. At the turn of the preceding century, Europe, and particularly Germany, boasted a strong community of optical designers and manufacturers. Several prominent American physicists published books that

addressed the need for more serious instruction in optics in the country, a concern that hit home with the onset of World War I. "A famine of superior optical instruments and optical glass immediately developed" both in England and in the United States, optics scientist Hilda Kingslake wrote for an earlier history of the institute.

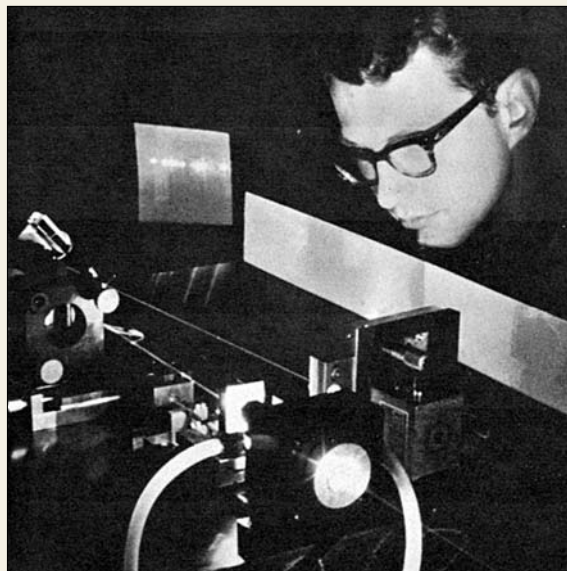
"The problem of finding personnel to cope with the often unfamiliar precision optical equipment required by the wartime government became so acute in England and France that, while the war was still in progress, a Department of Applied Optics was opened at the Imperial College of Science and Technology, a college of the University of London."

Establishing a similar program in this country was a priority for scientists and entrepreneurs such as Edward Bausch, George Eastman, Adolph Lomb and J. P. C. Southall. In part because of the plethora of optics-based companies that were springing up around Rochester, the university seemed a logical place to establish a training program. Eastman Kodak and Bausch & Lomb agreed to help the university by providing startup funds for



1960s

Barry Dame and Big Berthe. Dame received a master's degree from the institute in 1965.



1970s

Felix Schuda, who received a doctoral degree from the institute in 1974, is illuminated by light from the single-mode cw dye laser that he helped build with Michael Hercher. Hercher was a faculty member from 1965 to 1975.

operating expenses. The president of the university, Rush Rhees, traveled to England to recruit the institute's first faculty members, including Rudolf Kingslake, who together with his wife, Hilda, spent the better part of a lifetime nurturing the institute and contributing to the field of optics. Hilda Kingslake wrote 50-year histories of both the institute and OSA, arguably making her the definitive historian of optics in the United States.

Making its mark

It is difficult to document every milestone in the institute's history, although Stroud has tried through the creation of a recently published book in celebration of the 75th anniversary. In compiling the volume, Stroud—who joined the faculty in 1969—edited 400 pages of recollections, anecdotes and articles from earlier written histories. The book shows that a range of fields flourished at the institute throughout the 20th century, including lens design, lasers, photonics and quantum optics. "A Jewel in the Crown," a title which according to one of the school's former presidents is a reference to the institute's place within

the university, will be distributed to attendees of the OSA annual meeting later this month.

"A simple recitation of the chronology cannot possibly capture the character of the people who have made up the institute, nor the atmosphere and attitudes that define the environment that led to so many successes," Stroud says, which is why he drew from the written accounts of many people who touched and were touched by the institute.

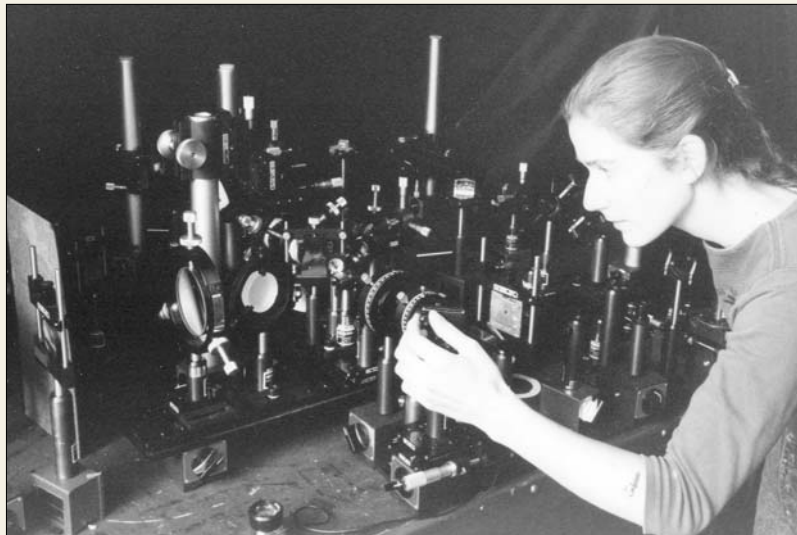
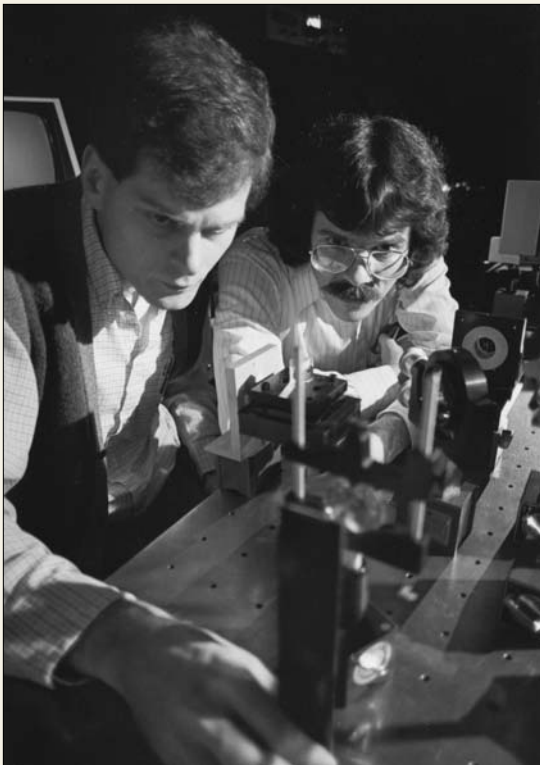
The book describes why World War II was a critical time for the institute, which at the outbreak of hostilities was barely a decade old. The war "provided the institute of optics with its first opportunity to prove its strength," Hilda Kingslake wrote. "[Institute Director Brian O'Brien] had foreseen the war and was in communication with government agencies in an effort to avoid the serious shortages that occurred during World War I of optical devices and the personnel able to cope with them ... At the height of activity, some 50 people—scientists, technicians, machinists, research students and others—were involved in the institute's program of cooperation with the government."

Two important cameras were developed at the institute during the war: a six-inch $f/1$ lens designed for aerial night work and a high-speed camera designed to make rapid sequences of pictures at speeds of up to 20 million frames per second. Special sunglasses were developed to protect soldiers from the glare of sunlight.

Rochester's metascope, with its infrared-sensitive phosphor, was at the forefront of efforts to make practical use of infrared light, Hilda Kingslake wrote.

"An infrared-sensitive phosphor is a material which stores up energy when bombarded by ultraviolet light, electrons, X-rays, alpha rays and other energizing agents. The stored energy is normally released very slowly over a long period of time. If, however, the phosphor in its excited state is subjected to illumination by infrared radiation, the energy is released much more rapidly and in the form of visible light. This phenomenon is the basis of the metascopees ..."

By the 1950s and 1960s, industry was in need of research into high-quality lenses for cameras as well as computers. One significant lens project developed at the institute was the Todd-AO cinema system. Robert Shannon wrote for the



1970s

Ian Walmsley (*left*) and Michael Raymer in the lab. Walmsley was both a student and a faculty member at the institute before moving to Oxford University in 2001. Raymer was on the faculty from 1979 to 1994.

1980s

Lenore Pugliese McMackin tweaks her experiment. McMackin received her doctoral degree in 1988.

new book of essays that researchers “devised a system which used wide film to provide sufficient image quality and illumination for the purpose. One of the key parts of the system ... was the use of a very wide-angle lens which, when used for taking the picture, would provide a very strong sense of viewer participation by providing a useful peripheral image to the audience.” The lens was used in the initial production of the movie “Oklahoma,” Shannon wrote, “but never became popular for successive productions, probably because it was a concept not well understood by directors and cameramen.”

Forging ahead

The institute has had close ties with the corporate community since its founding, and it has in many ways shaped the business of optics, in Rochester especially. Companies dealing in photographic imaging, military equipment, cinematography, remote sensing, electro-optics, lasers, digital imaging, optical storage, telecommunications and biomedical optics have been created by institute graduates, says James Zavislan, a faculty member since 2002.

An anniversary celebration planned for later this month in Rochester is being sponsored by three companies, including Bausch & Lomb and Kodak. “The companies that founded us are still here with us,” Knox said.

“The families of Bausch & Lomb founders John Jacob Bausch and Henry Lomb had a long-standing interest in the University of Rochester and expressed the hope that in the field of scientific optics, a cooperative relationship would develop,” said Bausch & Lomb Chairman and Chief Executive Officer Ronald L. Zarrella. “It seems especially fitting that on the occasion of the 75th anniversary of the Institute of Optics and Bausch & Lomb’s 150th anniversary, our two institutions are still working cooperatively to advance the science of optics.”

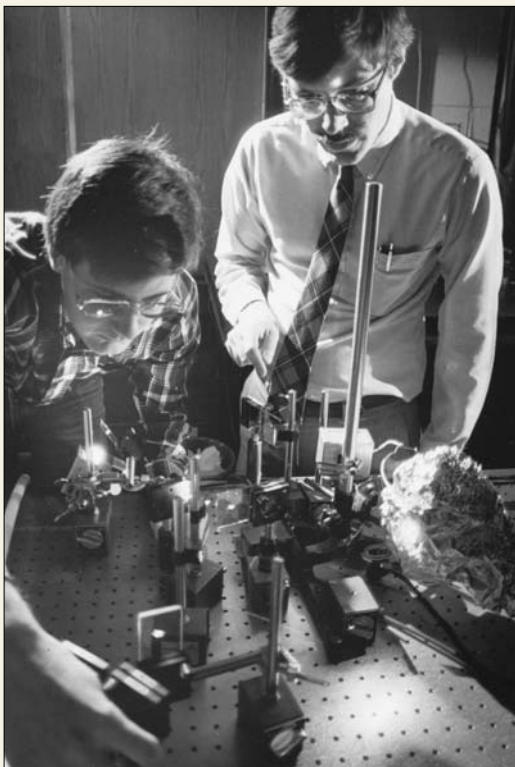
James Stoffel, director of research and development and senior vice president of Eastman Kodak, said that in many ways, his company and the optics institute have grown up together. “Of course, George Eastman was critical in the establishment of both entities,” he said. “Each is built on a solid foundation of science and innovative technology that enabled breakthroughs and other

important contributions to the imaging world.”

The third sponsor of the anniversary celebration is Optimax, and the chief executive officer, Rick Plympton, is an institute graduate. “Having a degree in optics from the institute gives you an advantage in the market because of the network or family that you become part of when you graduate,” Plympton said. “Optimax was founded on manufacturing technology for precision optics that was developed at the University of Rochester.”

Corning-Tropel Corp., a 50-year-old manufacturer of precision optical subsystems, is a product of war-time innovations at the institute. Some institute researchers had worked on image-stabilized binoculars during the war; their interest in the project continued into the early 1950s. Robert Hopkins, Jim Anderson and Jack Evans created the company to continue their research. Corning-Tropel Corp. has maintained close ties with the institute. Today, it employs 25 graduates.

The Rochester Photonics Cluster was founded in 1999 to offer networking opportunities to people working in optics



1990s

Dan Gauthier (*left*), a doctoral student, and Bob Boyd study the nonlinear optics of sodium vapor. Boyd has been on the faculty since 1977.



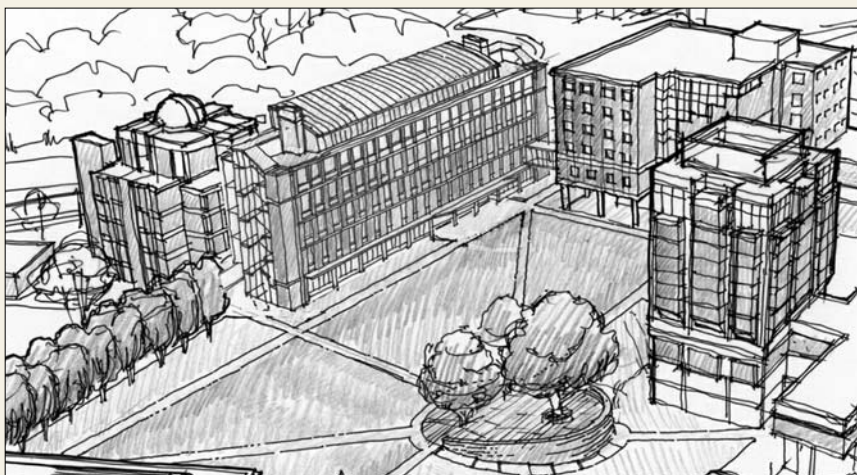
2004

The faces of today's Institute of Optics.

in business and academia. "Rochester has probably 110 to 130 companies working in optics," said the cluster's president, John Hart, making it one of—if not the—busiest regions in the country in this field. Many of the cluster's members are alumni, and the institute remains in close contact with them, in part to help place new graduates in jobs. "It's really institutionalizing those connections that happen naturally because we're neighbors," Hart said.

The institute's Industrial Associates Program is another way it maintains connections with the business community; membership in the program gives companies special access to faculty, staff and students. Twenty-two companies now participate in the program.

The completion of the optics/biomedical engineering complex will provide further opportunities, not only for cutting-edge research, but for a technology transfer program called the Center for Institute Ventures. The idea is to assist investors seeking to develop new products. The new building will nearly quadruple the size of the current institute, which operates in 25,000 square feet of space. This is particularly important given



2006 The future home of the Institute of Optics.

the growing and competitive nature of the optics education business, Knox said. Other optics programs around the nation have invested in cutting-edge facilities, and Rochester is doing the same.

This kind of competition is healthy, he says. But the future of optics also relies on the collaboration of experts across the nation and the world. "We might be competing for faculty members and students, but we're also very collaborative and

interactive," Knox says. "We coordinate programs together when we can. There's a real sense of interdependence in optics. We all need each other."

For more information about the anniversary events in Rochester and OSA's annual meeting later this month, visit <http://www.osa.org/meetings/annual/>.

Kim Douglass is assistant managing editor of *Optics & Photonics News*.