A Jewel in the Crown II
Carlos R. Stroud, Gina A. Kern

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1. The Mission of The Institute

Carlos R. Stroud Jr.

Tradition of Service

The faculty and directors of The Institute of Optics have since its earliest days felt an obligation to serve and nurture the field of optics and its practitioners, not just at the University of Rochester, or among its own faculty, students, and alumni, but in the Rochester area, the United States, and particularly in recent years, throughout the world. This sense of obligation has led our faculty, former faculty members, and alumni to serve as president of the Optical Society of America eighteen times, as president of the Society of Photographic Instrumentation Engineers (SPIE) eight times. At present the Optics faculty serve as editors of three professional journals. The faculty have authored many of the standard textbooks in optics, including three that are currently among the most cited in all of physics. They have served on innumerable committees advising governments on topics ranging from repairing the flawed optical system of the Hubble Space Telescope, to design of counterfeit-resistant paper currency, and laser-assisted isotope separation. One even served the president as deputy in the Office of Science and Technology Policy. The Institute has reached out to the optics industry through a professional summer school for practicing engineers to return to campus and keep their skills up to date in the rapidly developing field. It also has an Industrial Associates program in which representatives from many of the leading optics companies come to campus twice a year, to meet faculty and students, to advise regarding the needs of the industry, and to learn about the latest research. The outreach has become quite international in recent decades. Steve Jacobs put together a program to distribute to schools around the world suitcases with kits for carrying out simple optics experiments (see Essay V.19). Formal cooperative agreements have been signed with more than twenty-eight schools and universities around the world to encourage exchanges of faculty, students, and research. All of this with a full-time faculty that always has been fewer than twenty.

In this essay we will see how this strong tradition of service was built into The Institute from its inception. In the first volume of this history of The Institute of
Optics, Susan Houde-Walter described the common origins of the Optical Society of America and The Institute of Optics in a series of meetings in late 1915 and early 1916, when a group of men met in Rochester to start in motion a concerted effort to raise the level of education and research in the United States to match that existing in Europe. At that time, most precision optical instruments and optical glass were manufactured by Zeiss and Schott in Jena, Germany. Here we will explore in more detail the particular meeting that started these efforts that went a long way toward determining the path of optics development for the next century and beyond.

It had started to snow in Rochester early in the fall of 1915, but on the late afternoon of November 18 the weather was clear and nine men had no problem making their way to a little reading room in the Physics Department of the University of Rochester. The minutes of the meeting and subsequent follow-up meetings were carefully recorded, and are preserved in the Archives of the University of Rochester.

In this essay we will explore three questions about this meeting:

- Why Rochester?
- Why in 1915?
- Why these nine men?

**Why Rochester?**

In a very real sense, consumer optics started in Rochester and was flourishing at the beginning of the last century. Bausch & Lomb had developed a vulcanized rubber eyeglass frame that was cheap and durable such that eyeglasses, which had previously been available primarily to the wealthy, were now affordable and practical for the masses. Twenty million pairs of glasses were shipped around the world from the Rochester factory in 1903. In 1900, Eastman Kodak introduced its Brownie camera, which brought photography from its role as a rich man’s hobby to a central place in every family vacation and birthday party. The “Kodak Moment” entered the popular vocabulary. The need for trained employees in this new industry was great. The management of these companies also appreciated the importance of research and development to develop new products, and indeed technologies, and they were willing to invest in this R&D. These companies started their own research laboratories, but felt the need for an academic center to carry out basic research and train their employees. The Genesee Valley predated Silicon Valley by more than a half century, as the hub for a new consumer technology industry.

**Why 1915?**

By 1915, there were dozens of companies in Rochester involved in the new optics industry, not only suppliers for the two big companies, but also spin-off companies
developing their own products. All of this activity needed academic support.\textsuperscript{2} There was in addition a much more urgent problem: World War I had broken out in Europe, and international shipping was being disrupted. Furthermore, the entry of the United States into the war on the side of Great Britain and France against Germany was imminent. The US optics industry was severely endangered because of its dependence on the high-quality optical instruments and optical glass that had been imported from Zeiss and Schott. The problem was exacerbated by the growing importance of optical instruments to the modern military. Machining of cannons had become so precise that they could accurately hit targets more than ten miles distant, if they could be aimed precisely. Such aiming required optical range finders, binoculars, and telescopes of similar precision. Aerial warfare had achieved a major role in the war both for reconnaissance and bombing. This required bomb sights, binoculars, and telescopes for the airplanes and for antiaircraft guns. In spite of the massive mobilization during the war, including developing the first manufacturing facility for optical quality glass at Bausch & Lomb’s factory on St. Paul Street in Rochester, it was clear that efforts would have to be continued after the war to develop the infrastructure to support an American optical industry. A part of this infrastructure was an academic institute of applied optics to carry out basic optics and train optical scientists and engineers. Perhaps not so obvious was the perceived need to found a national optical society and an optics journal to publish original research. There were two primary drivers for this effort in Rochester at the time. The first was C. E. K. Mees, the founding director of the Eastman Kodak Research Laboratories, who was convinced that to keep the very best scientists and engineers happily and productively working in his laboratory, he had to allow them to publish their work and to interact with other scientists with similar interests at scientific conferences. Another researcher working with Mees was Dr. Perley Nutting, who was recently hired from the optics group at the National Bureau of Standards in Washington, DC. While in Washington he led an earlier unsuccessful effort to found a national optical society. One might have thought that the meetings and journals of the American Physical Society (APS), founded a few years earlier, in 1899, would have served the needs of the optical industrial researchers. However, there was a movement among the leadership of the APS to focus the society and its publications on basic physics and to exclude applied physics. This sentiment was also common in university physics departments, so workers in applied optics needed another home. Both Eastman Kodak and Bausch & Lomb were willing to put resources behind the founding of an appropriate society and an academic department to serve the needs of industrial optics in the United States.

**Why These Nine Men?**

We are not left to guess at the motivations and intentions of the nine men who met in the reading room of the Physics Department of the University of Rochester on
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The afternoon of November 18, 1915. They quickly elected a secretary, who took careful and thorough minutes of the meeting. Those minutes, along with those of all other meetings of the Rochester Society for Applied Optics, later to become the Rochester Section of the Optical Society of America, are preserved in the Archives of the University of Rochester. The specifically stated goal is clear in the minutes of that first meeting: “The need for some organization to promote the advancement of the science of applied optics being apparent to workers in the field, a meeting was called to consider plans for the organization of such a society.”

While these minutes do not make the longer-term goal of establishing an academic institute to train engineers and scientists in optics, and carried out optics research, Nutting and Mees both felt that it was essential. They convinced George Eastman and Edward Bausch, on February 6, 1918, to write a joint letter to Rush Rhees, president of the University of Rochester, urging the formation of such an institute. Eastman and Bausch offered $200,000 to set up The Institute, and $20,000 each per year to sustain it. (The letter is preserved in the Archives of the University of Rochester.)

President Rhees was preoccupied with building the new River Campus for men and was not able to follow up immediately. But once construction was commenced, Rhees put the proposal to the Board of Trustees, which approved the formation of The Institute of Applied Optics in March 1929. As is described in the seventy-fifth anniversary history of The Institute, President Rhees sailed to England to recruit the first two faculty members.

The minutes list the names of the nine men whose meeting started the whole process. Let us go through the list and see who they were, their role in optics in Rochester in 1915, and what contributions they made to seeing that their early proclaimed intent was carried out.

Dr. Perley Nutting is the first name on the list. He was elected president of the local society at that first meeting and was elected the next year to be the first president of the Optical Society of America. He was born in 1873, and received a PhD in physics from Cornell University in 1903, after which he joined the newly formed Optics Section of the National Bureau of Standards in Washington. While there, he began campaigning for a national optical society. In 1910, C. E. K. Mees, the founding director of the Eastman Kodak Research Laboratories, hired Nutting to assist in the development of a practical color photographic process. While at Kodak, Nutting authored a book entitled Outlines in Applied Optics in which he argued strongly for an increased academic effort in applied optics. He was a tireless campaigner for optics and an effective first president of the national society. He did not remain in Rochester to see his dream of an academic institute realized, but was hired away by Westinghouse to form its corporate research laboratory in Pittsburgh.

The second name on the list is Dr. H. Kellner. G. A. Hermann Kellner was born July 20, 1873. He studied at the Universities of Berlin and Jena, receiving a doctorate from the latter in 1899. He came to Buffalo in 1905 to join Spencer Lens Company and later moved to Rochester to become director of the Scientific
Bureau of the Bausch & Lomb Optical Co. He was not only active in the Rochester optics scene, but was the founding editor of the *Journal of the Optical Society of America*. He served as editor from 1917 to 1919, setting a very high standard that got the journal off to a good start. He remained at Bausch & Lomb until his death in 1924.

Dr. F. E. Ross is the third name on the list. A friend of Perley Nutting in graduate school in California, Ross was offered a position as an “accountant” at Eastman Kodak in 1915 at the instigation of Nutting. He actually worked on ray tracing, and was said to be particularly adept at using logarithm tables for lens design. His main
love was astronomy and designing lenses for astronomical observations. He designed a lens with a wide field of view that was very successfully used in a number of observatories for surveys looking for the motion of nearby stars. We are indebted to him for the fine job he did as recording secretary of the local section in its formative years.

“Mr. C. H. Frederick” is the listing for Charles W. Frederick, who was the head of the lens design department at Eastman Kodak. He retired in 1936 and was replaced by Rudolf Kingslake, who served in that position for thirty-one years until his retirement.

Dr. Howard Daniel Minchin was assistant professor of physics at the University of Rochester, with a PhD in physics from the University of Michigan. He left UR in 1916 to become president of the Rochester School of Optometry.

Mr. Adolph Lomb, born in 1866, was the eldest son of Captain Henry Lomb, cofounder of Bausch & Lomb (B+L). He studied mathematics and physics for two years at the University of Rochester and then transferred to MIT, where he earned a bachelor’s degree in mechanical engineering. He followed this with advanced studies in Paris, Berlin, and Jena. In Jena he made important contacts at Carl Zeiss Works, which would later be important in developing alliances between B+L and Zeiss. By 1916, he was on the board at B+L and very active in philanthropy to support science. He served as treasurer of the local optical society and was the first treasurer of the Optical Society of America. In this role he was instrumental in helping the society survive the Great Depression, by personally donating funds to cover the budget deficits of the society’s early years. He accumulated a personal optics library that was purported to be the best collection in the country when he died. He died without a will, and his brother donated the collection to the University of Virginia at the suggestion of his good friend James C. P. Southall, professor of optometry at Columbia University, who was a graduate of Virginia.

F. B. Saegmuller was the son of George N. Saegmuller, whose optical instrument company had in 1905 joined with Bausch & Lomb to form what for a few years was called Bausch, Lomb, Saegmuller Company. Later Saegmuller helped form an alliance with Zeiss that resulted in Zeiss owning a third of the Rochester company. In 1915, the alliance was broken as a result of the war in Europe. Frank, the son, studied at the University of Virginia, then with Dr. Kellner, and later in Jena.

Wilbur B. Rayton spent his career working at Bausch & Lomb. He along with Lloyd Jones and T. R. Wilkins formed a committee that in 1926–27 planned out a curriculum for the soon to be established Institute of Optics. He was a founding member of the Optical Society of America and served as its president in 1933–34. He was an adjunct faculty member in The Institute, 1929–31.

Lloyd A. Jones, educated at the University of Nebraska, worked for several years at the Bureau of Standards before joining the Eastman Kodak research staff in 1912. He was appointed chief physicist in 1916, a position he held until he retired. He served as president of the Optical Society of America, 1930–31. In addition to serving on the planning committee for The Institute, he was an adjunct faculty member from 1929 to 1943.
More details on these fascinating and visionary men can be found in the essays by Hilda Kingslake and Susan Houde-Walter in the seventy-fifth anniversary version of *A Jewel in the Crown*. We amplify them here in order to point out that the mission of service to support the field of optics generally through education, research, and outreach was built into The Institute from the beginning, and guided its activities in 1929 just as strongly as it does now as we approach its centenary.

**Notes**


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*Figure 1.2. Liz Rogan, CEO of the Optical Society, is responsible for the oversight, strategic direction, and fiscal soundness of programs and activities of this $40 million, 150+ staff society. Photo courtesy of OSA.*
Highlight I: Map of New York Photonics

Map highlighting upstate New York’s Optics, Photonics and Imaging industries, produced annually by Rochester Regional Photonics Cluster & New York Photonics