75. Looking to 2029

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Here in Rochester, as we celebrate our seventy-fifth anniversary, we are looking back over a distinguished past, as well as forward to an exciting future leading to our one hundredth anniversary in 2029. The Institute of Optics was born in a very turbulent time in September 1929. In October 1929, the stock market Dow Index dropped by a factor of two, and then began a long decline. Throughout the Depression that followed, the newly formed Institute of Optics was busy gearing up and produced its first Ph.D. student in 1939. Figure 1 shows the Dow Index during these years.

In what ways does the stock market affect an academic institution in general, and in what ways should it specifically impact an optics department? A private academic institution such as the University of Rochester relies on its endowment for part of its income. This is a very

![Figure 1. Top is the Dow Jones Index from 1921 to 1940, bottom is the NASDAQ Telecom Index from 1998 to 2003. There are strong similarities in peak-to-valley ratio as well as duration of the peak.](image-url)
direct tie to the market. Other factors such as corporate revenues are important. In good times of large corporate profits, it is much easier to get corporate donations and contributions to the University and the department. In addition, our industrial associates program revenues follow these general economic trends. In any case, there is a striking similarity between the market conditions in 1929 during our founding, and the market conditions in 2000. During this time, many entrepreneurs were looking into a “new world” in which it was very easy to obtain venture capital funding. It was also easy to hire people by luring them away from relatively secure jobs at large corporations and very secure jobs in tenured positions at universities into startup companies with very uncertain futures. Many university departments were dealt a severe blow by faculty egress. At The Institute of Optics, several faculty members left around the year 2000 to start and manage companies, Director Dennis Hall had been promoted to associate provost for research at Vanderbilt University, and Professor Ian Walmsley left for Oxford University. During this period, my Advanced Photonics Research Department at Bell Labs in Holmdel was undergoing very much the same process, with many scientists leaving to go to start-up companies. Shortly after I was appointed director of the Institute in April 2001, we hired several new faculty members to regain our required faculty strength. We have recently hired Assistant Professor Chunlei Guo, Professor James Fienup, Associate Professor James Zavislan, and Assistant Professor Miguel Alonso. Also, Professor Susan Houde-Walter has returned from her two-year leave of absence as president of LaserMax. We anticipate more faculty hiring in the future.

Since the founding of the Institute seventy-five years ago, the field of optics has changed considerably, yet the Institute has changed along with the field. Although optics is a relatively specialized field, there is a wide range of activity in the field, ranging from lens and optical system design to quantum optics and semiconductor optoelectronics, ultrafast and adaptive optics, telecommunications and biomedical optics, physical and geometrical optics, theoretical and experimental optics, high intensity optics, imaging and optical fabrication/testing, and nano-optics. The Institute is unique in that it covers much of the field of optics, while maintaining significant depth in these areas. It is a Big Tent of Optics, a very dynamic and active place, very much in tune with the optics industry through several channels such as industrial associates meetings, seminars, corporate visits, corporate sponsored research, etc. It is also a free-wheeling academic department where faculty are free to pursue, and well-supported in building, whatever research program they wish. It is a collegial and supportive department in which junior faculty are hired into tenure-track positions with appropriate conditions and every expectation that they will achieve tenure. It is a department in which graduate students are admitted in the expectation that they will finish their degrees with a high success rate. We expect that they will look back at their time as a student as a happy but challenging and rewarding time, yet one that is perhaps a bit scary at times, too. When Tiger Woods recently played the Eighty-fifth PGA championship in Rochester, he commented that the course at Oak Hill was “the toughest and fairest course I have ever played.” I would certainly like to think that our students would say the same about our optics program well past the year 2029.

As we celebrate our seventy-fifth anniversary, we are in the midst of a very exciting expansion of our facilities that will have a significant and lasting impact on our department well into the future. The Institute of Optics spent most of its first fifty years housed in a single floor of Bausch & Lomb Hall and moved into the current Wilmot Building in 1975. After twenty-five years in the Wilmot Building (fig. 2a), the department had outgrown its space. As I write this, we are starting construction on the Optics-BME building project that will expand the available optics research and teaching facilities as well as provide a home
for our biomedical engineering department. This project came about as a result of several factors. Our biomedical engineering program became an official department in the year 2000 (note the coincidence in fig. 1, that BME was also founded during a market peak). They had landed a Whitaker Foundation faculty development grant as well as a three million dollar Whitaker challenge to assist in the building of a new BME building. The original plan was to put the new BME building next to the Wilmot Building. When I arrived, a number of discussions with the chair of BME, Rick Waugh, and BME faculty members made it clear that there were many new opportunities in the field of biomedical optics, an area in which we already had significant optics faculty interest and strength, as well as significant BME faculty interest. So, we began investigating the possibility of building a combined Optics-BME complex as our expansion. This project is scheduled for completion in June 2006.

This building will provide optics with expanded state-of-the-art research space as well as expanded lecture halls and greatly improved meeting spaces. Figure 2b shows a draft plan of this project as of this writing.

The expansion of optics space (Wilmot currently offers us only 25,000 square feet) will allow us to significantly increase our research output, modernize and expand our teaching laboratories, create new centers, expand our lecture halls, and create new environments for our undergraduate and graduate students to hang out, study, and meet with teaching assistants. In addition, the new space will allow us to increase the size of our faculty over time, allowing us to expand into new areas of optics as they evolve. And, there is a national need to increase emphasis on K-12 education. The new building will allow us to host groups of students for visits with lectures, demonstrations and perhaps even some hands-on experiments with optics.

We are also expanding and enhancing our industrial associates group to include more companies. Currently, we have twenty-two companies signed up, with as many as twenty-five more pending. The economic climate at the time of this writing is pretty tough, and many companies find that funding for these kinds of academic programs is the first to disappear when times get tough. But, The Institute of Optics has always had strong connections to the optics industry, and it makes it very unique in the University setting. The Institute of Optics has been responsible for producing people who have founded quite a large number of
Moving forward, we find ourselves in a University of Rochester that is significantly changed as a result of greatly increased intellectual property revenues. Recently, the University has catapulted into the top ten list of universities for IP revenues, with $40 million in revenue in 2002. This has caught the attention of many here, and the timing is right to launch a new entrepreneurship initiative here in the Institute. We hired Associate Professor James Zavislan for many reasons—one of them is his interest in optics entrepreneurship. We are working to create a much smoother channel for carrying out the normally difficult transitioning part of research once the early concepts have been shown. (Jim writes more about that in essay 73). I think that, over time, our Institute ventures program could have considerable impact on the economic development climate in Rochester.

The optics education environment has changed markedly since the founding of the Institute in 1929. Figure 3 shows the number of institutions that offer optics degrees. The data from this is contained in a 2001 OE Reports survey.

As can be seen from this figure, after the founding of The Institute of Optics, the next addition was the University of Arizona in the early 1960s. After that, there was a rapid rise in the 1980s. We can only presume that the number of optics degree-granting institutions will continue to rise through the year 2029. In the face of this increasing competition, The Institute of Optics needs to continue to maintain the great traditions and standards of optics that we have developed, yet at the same time continue to expand and add new elements. We have recently added several new graduate courses such as nano-optics and biomedical optics, as well as new undergraduate courses in computing for optics and optics in the information age. We continue to develop and implement new courses in the optics curriculum.

In her distinguished last writing of the history of The Institute of Optics on the occasion of our fiftieth anniversary, Hilda Kingslake didn’t mention about our seventy-fifth
anniversary; rather she made the comment, “ahoy and onward to our 100th Anniversary.”
So, as I write this, I have my hands full with planning our seventy-fifth anniversary events for October 2004. I’m not spending too much time planning for the details of the hundredth anniversary in 2029, but I would like to think that we are laying the groundwork well in advance. The Institute of Optics was born in a turbulent time and lived and prospered through many more exciting and turbulent times, and I am sure we will have a lot of interesting things to write in 2029.

Figure 3. Number of institutions in the United States offering optics degrees of any kind.