



Building the Next-Generation Optics Workforce

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The optics and photonics industries are growing faster than the overall economy, by more than 3 percent per year. There are more jobs available in the industry than there are skilled optics and photonics technicians to fill them. In the Rochester, N.Y., region, more than 100 optics technician jobs go unfilled annually because there are not enough qualified workers in the area. This, coupled with industry reports that 20 percent of experienced technicians and engineers are approaching retirement within the next 10 years, is creating even greater need for skilled optics and photonics technicians.

This shortage is not isolated to Rochester. In the past nine months, nearly 50 optics companies from around the U.S. have contacted Monroe Community College (MCC) in Rochester seeking optics technicians. And overseas, in a survey among 1700 small- and medium-size German companies, about three-quarters said the shortage of skilled workers impairs their innovation activities.

So how do we encourage the next generation to pursue optics and photonics careers? For starters, we have to provide training programs. In 1971, MCC created a two-year degree program for training technicians to work in the optics industry. Nearly 50 years later, the school's optics program is still the nation's only community college that awards associate degrees in precision optics. MCC's optics program offers opportunities to study, in depth, the four main areas of career pathways and advancement in optics: design, fabrication, assembly, and metrology. Graduates of the program produce, test, and handle optical components that are used in lasers and sophisticated photonic systems for defense, homeland security,



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aerospace, biomedical equipment, digital displays, telecom, and nanotechnology. The Optical Systems Technology program at MCC has well-equipped optical manufacturing labs where students are trained in both conventional and computer-numerical-controlled grinding and polishing.

Education, training

A successful training program must have experiential learning opportunities and industry partnerships. MCC received \$550,000 from the National Science Foundation for its Optics & Photonics Technology INnovation (OPT IN!) program to connect more high school and college students to career opportunities in these growing fields — and to produce the skilled workforce needed to keep up with industry demands. Funded over three years, OPT IN! helps provide education and training for 850 area high school and college students, increases internship opportunities, and expands outreach efforts to populations underrepresented in the optics and photonics industry, including women and minorities.

The OPT IN! program also includes the development of summer internships and 2+2 transfer opportunities between MCC and four-year institutions. Not only do students gain real-world, hands-on experience that connects to classroom learning, they also have the option to continue their education at a transfer college in pursuit of a bachelor's degree.

MCC is enhancing its existing program with new industry-based curricula and industry-standard lab equipment. It is also building collaborations that allow more high school students to earn college credits toward a degree.

Partnership with high schools and placement of optics and photonics content into secondary STEM as part of a dual-enrollment program are keys to encouraging the next generation to pursue optics and photonics. Dual-enrollment courses are taught in high schools by qualified high school teachers. Students who successfully complete dual-enrollment courses receive MCC credit and do not need to take the courses again in a college optics program.

For example, by completing Introduction to Optics as a dual-enrollment course, high school students move onto the optics career ladder and start college with advanced standing. By building secondary school partnerships, the MCC optics academic pipeline is strengthened, and the optics and photonics industries are strengthened. Five Rochester-area high schools and over 200 high school students are currently participating in the program.

Initiatives such as dual-enrollment opportunities help, of course, but for some students, a program in their junior or senior year of high school is too late. By that time, many students have chosen to pursue advanced education — and few even know that optics exists as a career path. Marketing and outreach initiatives to broaden awareness of optics and pho-

tonics can begin with preschoolers. Fun activities with hands-on optics manipulates can impress a child as young as 3 years old.

As part of OPT IN!, efforts at MCC are underway to focus on broadening regional industry and community partnerships aimed at providing experiential learning opportunities and education. The OPT IN! program strengthens local alliances with Rochester Regional Photonics Cluster Inc., AIM Photonics Inc., the Finger Lakes Regional Economic Development Council, the Rochester (N.Y.) Museum & Science Center (RMSC), New York Photonics, secondary and postsecondary educators, regional industry partners, and more.

Partnerships with science centers provide excellent avenues to cultivate general interest in optics and photonics. The RMSC engages more than 350,000 visitors annually and has a permanent exhibit — "Illumination: The World of Light and Optics" — that demonstrates the wonders of optics. Visitors experiment with lasers, lenses, and mirrors as they explore the

nature of light and optics. We need more people to walk through the RMSC and similar science center exhibits to become inspired to learn more about optics and photonics.

Workforce development

Because skilled optics and photonics technicians are so scarce, some optics companies are creating their own training programs. Optimax Systems Inc. in Ontario, N.Y., offers a three-year apprenticeship program, approved by the state of New York. It enables a budding optics technician to spend a month working in different manufacturing areas across the company and to take optical systems technology courses at MCC. And Optimax is not alone. Other optics companies, including JML Optical LLC, OptiPro Systems LLC, and SCHOTT AG, also are establishing such apprenticeship programs.

The American Precision Optics Manufacturers Association (APOMA), the working group of top U.S. optics manufacturers, is collaborating closely with its

member companies to roll out an optics apprenticeship program widely. APOMA is committed to promoting and advancing opportunities for the precision optics industry, and one of those key areas is developing a skilled optics workforce.

The Rochester region manufactures more than \$3 billion worth of optics annually, and more than 1000 optical manufacturing jobs must be filled in the next five years to sustain this local industry. The shortage of skilled optics and photonics technicians is not isolated to Rochester. It is not even isolated to the U.S. We have a worldwide shortage of optics and photonics technicians. For these industries to continue to thrive, we need to encourage and train the next generation for careers in optics and photonics.

Meet the author

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