

The US Photonics Job Market: Recruiting for the Future

With the country's technical standing being challenged and its stable of talented professionals dwindling, programs are needed to inspire and train young people in photonics technologies.

by Brent D. Johnson

As the photonics industry begins emerging from its slumber, it directs its attention once again to the usual suspects: engineers, technicians and team leaders who have had years of experience in the field. Yet, even with the telecommunications layoffs, these professionals are increasingly difficult to come by.








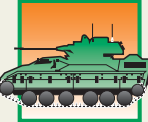
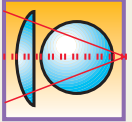
A significant number of this aging population will be retiring over the next five years. For companies that intend to build upon a continued stream of innovation, the challenge

will be in finding a new domestic supply of intellectual labor.

In fact, many in the industry have the sense that the US has reached a turning point. Throughout the last half of the 20th century, it was the dominant superpower because of its superiority in science and technology. However, as the "Sputnik" generation leaves the work force, the nation is faced with a talent shortfall that could endanger the growth and success of the economy.

The current crisis didn't happen overnight. The promise of technol-

ogy to fulfill the desires of consumers has been balanced by concerns about the environmental cost, and the nuclear culture turned away from science on the eve of its greatest triumph: the Apollo missions. After 30 years of antitechnology rhetoric, the US is paying the price for its lack of foresight. Design and manufacturing have moved to Japan and China, and the remaining US companies are propped up by an influx of H1-B workers. How can the US strengthen its place in the world technological economy?

Compensation by ...					
Primary End Product					
					
Aerospace/ Aviation	Laboratory/ University	Chemical/ Pharmaceuticals	Communications		
Median	\$85,000	\$50,000	\$79,500	\$100,000	
Average	\$84,455	\$54,682	\$78,143	\$98,267	
					
Electronics/ Semiconductors	Manufacturing Equipment	Medical/ Biotechnology	Military	Photonics	
Median	\$100,000	\$64,000	\$100,000	\$80,000	\$80,000
Average	\$120,923	\$74,675	\$133,857	\$85,200	\$86,237

Compensation by ...

Experience

	Median	Average
0-5 years	\$60,000	\$62,765
6-10 years	\$82,500	\$90,409
11-20 years	\$80,000	\$88,615
21+ years	\$90,000	\$94,973

There is an effort afoot to develop a comprehensive curriculum that will attract young people to photonics so that the next generation will be creators of technology rather than custodians of 20th-century museum pieces. A study done by the National Academies of Science and Engineering, titled "Harnessing Light, Optical Science and Engineering for the Twenty-first Century," spells out the overwhelming demand for optics and photonics technology in biomedicine, information technology, defense, manufacturing, energy and the environment.

In response, New Mexico's optical community has developed a plan that would ensure a steady source of workers in the years to come. The Alliance for Photonic Technology, which consists of Sandia National Laboratories, Los Alamos National Laboratory, the Air Force Research Laboratory at Kirtland Air Force Base, the Center for High Technology Materials at the University of New Mexico and the Center for Occupational Research and Development, worked with Albuquerque's Technical Vocational Institute (TVI) to implement a pipeline for technicians in the areas of fiber optics, lenses, lasers and silicon-based machines.

Dominique Wilson of Sandia National Laboratories, who proposed the Photonics Technical Support Initiative to the US Department of Energy that spawned the Photonics Academy program at West Mesa High School, said that Albuquerque has become a "sticky region" for photonics. Such companies as Qwest, Emcore, Wavefront and Lightpath have found the area an attractive

place to do business. However, in a recent closed-door meeting, movers and shakers from the industry have discussed the anticipated needs for trained technologists as advanced manufacturing has continued to hemorrhage from the high attrition rate at senior levels.

Based on Wilson's proposal, Sandia, the Albuquerque public schools and TVI developed the photonics program, which recruits close to 50 students into the Photonics Academy and which pipelines 15 people per year into an internship program that includes advanced manufacturing and photonics.

Wilson explained the pressing need for such programs in a school where, only six years ago, there were 800 incoming freshman and only 200 graduating seniors. The program has enrolled 46 students in an optics and photonics curriculum that extends from the high school through the PhD level for students who want to pursue training. The academy will graduate its first student two years from now.

One challenge that educators must face is finding ways to impress upon young people the full impact that photonics technology has in every aspect of their lives.

Pearl John, laser instructor at the Columbia Career Center in Missouri, said the photonics industry has difficulty attracting promising students and their parents because the technology is largely invisible to the public. Packed into neat modules and integrated circuits, photonics suffers from the "black box" effect of being hidden deep within hermetically sealed containers. Unlike the old

radio and TV sets that enticed kids like a young Richard Feynman to pull the backs off and look inside, the size and level of integration of photonic components places the technology beyond the touchy-feely experimentation that lures tinkerers into the techie fold.

To entice a new generation of photonics specialists, John and her colleagues have developed a hands-on approach to teaching the subject that is designed to stir the creative souls of youngsters. The Columbia Career Center takes part in a University of Missouri initiative called "Saturday Science," in which 100 eighth-graders are introduced to laser technology and taught how to make holograms. Many will later be enrolled in the center's three-year high school photonics program.

The photonics curriculum, designed by Don Barstow, Neal Miller, Gareth Williams and Malcolm Cornwall, is based on holography, giving students freedom to pursue holographic projects. The program also provides the experience of working with powerful lasers and professional-grade equipment.

One student, after completing the program, submitted a paper to the 2000 SPIE Conference in San Diego on tests he had performed on carabiners using strain/displacement via interferometry. Mike Walk, a rock climber who was looking for a low-cost method to predict the failure of aging climbing equipment, made double-exposure, single-beam-reflection holograms of the equipment under different loads. Other student projects have included beam path enclosures, safety devices, laser shutters for holography, and cylindrical and animated holograms.

Another benefit of the program is that students receive support and tuition if their project becomes marketable. John compares this with many colleges that take up to 90 percent of the financial rewards resulting from student work.

So far, seven program graduates are taking associate degrees at Indian Hills Community College in Ottumwa, Iowa, and two are at Vincennes University in Indiana. Two former students are studying physics and

engineering at the University of Missouri in Columbia and another is at Arizona State University in Tucson. One of the program's first students recently began work as a laser technician.

Yet, despite this record of success, John said that there is a reluctance on the part of some students to enroll in "vo-tech" schools, which are sometimes viewed as nonacademic and less rigorous than schools with more traditional liberal arts curricula.

Professors Sydney Sukuta and Kathy Werle of San Jose City College in California see this prejudice as being partly to blame for the manpower shortage in the photonics industry. They believe that many students avoid jobs as technicians because they do not think they will be treated as well as engineers. And yet, according to the professors' calculations, 70 percent of the work force can receive career preparation in a two-year program that would provide the training needed to be com-

“
There is tremendous growth potential, but one must find the ultimate employer.
”
Survey respondent

petent technicians. The program offered by San Jose's laser technology department operates with the help of the Lasers & Electro-Optics Manufacturers' Association, Spectra-Physics, Coherent and JDS Uniphase.

In fact, Sukuta and Werle say that graduates of such a program generally have more hands-on experience and income than most engineering school graduates. Senior-level photonics/laser technicians make about \$70,000 a year — more than \$100,000 with overtime. Moreover, while college students may

depend on student loans, employers in many cases pay their technicians' tuition in addition to their salaries.

The class of 2002

As newly minted high school graduates walk to the tune of *Pomp and Circumstance* this June, fewer than half will have the remotest idea of what they want to do with the rest of their lives. The most popular major upon entering a four-year institution is "undeclared." And yet, it is at this age that people make up their minds about religious beliefs and political affiliations that tend to remain steadfast and unchanged.

A small nudge in the right direction during this brief window of opportunity could have a lasting impact on the photonics industry that would provide for the future needs of the country with a ready supply of professionals. A modest commitment of resources at this crucial age could assure our continued economic development and prosperity. □