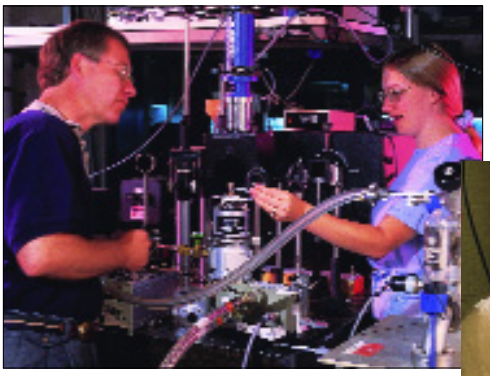
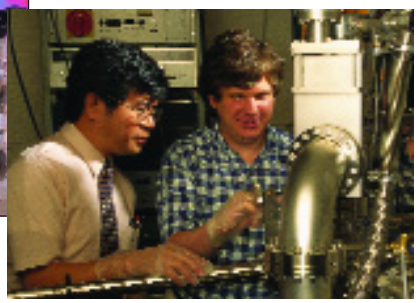


Left: Terrance Worchesky (*left*) works with a student to design electro-optic devices using photoluminescent measurements of quantum-well nanostructures.



Above: Y. J. (Ray) Chen (*left*) and his students have fabricated devices such as phased array waveguide grating routers, optical ring resonators and add-drop multiplexers/demultiplexers.

Photonics Flourishing at UMBC

The Center for Advanced Studies in Photonics Research (CASPR) at the University of Maryland, Baltimore County (UMBC), will be a year old this summer. A one-day conference there early this year gave the program a chance to highlight its partnerships with local industry and government.

CASPR was created to enhance existing photonics research programs at UMBC, officials there said. The National Aeronautics and Space Association provided $2 million in seed money for the center, which has been called upon to enhance operations at neighboring Goddard Space Flight Center. The money is helping to support eight research projects that are of interest to NASA, including the remote synchronization of distant clocks by quantum entanglement and the numerical simulation and analysis of fiber-optic compensators. The center will have three key focuses: optical-fiber communication, quantum optics and optical remote sensing.

An important function of the center will be to assist researchers and businesses interested in exploring joint commercial applications of new technology. "I feel that CASPR's duty is to keep our ear to the ground, looking for opportunities and cooperating with companies to write joint proposals, or having those companies get advice from UMBC professors," said Henry Plotkin, CASPR's associate administrator. "That is one of the driving themes."

CASPR is well placed in that it is in the Baltimore-Washington region, where more than 35 photonics-related companies have established roots since the mid-1990s, said Will Baber of the Maryland Department of Business and Economic Development. Some produce very-high-end optical switches while others work in connectors and cables, for example. Most have been hit by the telecommunications downturn. "They are retrenching in terms of their market," Baber said. "Rather than focusing just on the commercial, they're now focusing on the federal market." And being a quick drive away from Capitol Hill helps, he said.

Such relationships are critical for research institutions in this era of fiscal belt-tightening, said Phil Psilos, director of economic and technology policy studies at the National Governors Association. "Those universities that are more innovative and more on board with local economies are more insulated from major cuts," Psilos said. Freeman A. Hrabowski III, president of UMBC, echoed a related position during the January photonics event. "Even in hard times it is very important for this country to focus on our research and development efforts, because trends will change."

Optical Sensing for Homeland Security

Scientists developing optical sensing technology for homeland security need to be mindful of the effectiveness of their devices under stressful conditions, the assistant director for homeland and national security told a group gathered for a recent OSA meeting on the topic. "We are absolutely open to innovative thinking," Penrose Albright said. But "you should always be asking how the system in question will operate in the real world."

About 200 people from government, industry and universities attended the user-driven forum on "Optical Sensing for Homeland Security" in February in Washington, D.C. The meeting was designed to allow professionals in science, the military and law enforcement to share information about their needs as they work to protect the United States from terrorist attacks. "We want to make sure the systems we deploy do not put an undo burden on the general public," Albright said. "Because if they do, we'll stop using them."

The new Office of Homeland Security is working with facilities such as the Los Alamos National Laboratory to ensure those scientists also are focusing on homeland security, Albright said. The department plans to develop standards for equipment and grant programs to encourage research in technologies that could be practically applied, he said. At the meeting, representatives of the National Science Foundation, National Institutes of Health and Department of Defense discussed funding sources for scientists.

One university researcher said he felt frustrated by a lack of equipment specifications laid out by government officials during the two-day event. But Julie Bentz, acting chief of logistics for the National Guard Bureau-Homeland Security, said different devices are needed for different situations. Speed sometimes is the most important feature on a device, whereas other times it is accuracy or size, she said.

The key, said Tom Leonard of the National Guard's strategic plans and intelligence division, is technology that can "detect 100% of the bad stuff all the time."

Espionage Through Optics

From the Minox spy camera, with its high-resolution lens that captured highly detailed images, to fluorescent ink, used to hide secret messages until exposed to UV light, the International Spy Museum is full of optics technology. It opened in Washington, D.C., in July 2002, the first public museum in the United States solely dedicated to espionage. It boasts more than 600 artifacts, many of which had never before been displayed.

The museum is working to acquire other optics-related technology, said S. Eugene Poteat, a former senior officer with the Central Intelligence Agency's Scientific and Technical Directorate and a member of the museum's board of directors. Intelligence satellites with large lenses might be hung in the museum's atrium, for example. In the early days, photo satellites used film cameras rather than radioing signals down, Poteat said. The CIA in the late 1970s began using the KH-11 satellite, which digitized the process of espionage from outer space and formed a foundation for many other digital products, Poteat said.

And "there have always been spy cameras in airplanes, going back to the day airplanes were invented," he said. "There were even aerial photographs made during the Civil War… using hot air balloons." On display is a coat with a buttonhole camera; the lens is hidden behind a false button. When the user triggered the remote shutter release—connected to the lens by a thin cable from a coat pocket—the center of the false button opened briefly to take the photograph. Also on display is a "through-the-wall" camera, a Czech surveillance system used to photograph people through walls in special hotel suites throughout East Germany. The tube of the camera fit perfectly into a round camera "port" built into a hotel room wall. The film canister replaced the camera's viewfinder once the unsuspecting hotel patron was in focus, and pictures were taken with a remote trigger.

Microdot cameras could photograph documents and produce microdots less than a millimeter in diameter. A display shows how operatives used wet cellophane, silver nitrate, potassium bromide and a vodka solution to achieve their goal. "They're producing a light-sensitive film and exposing it with pretty good resolution," said Richard Linke, OSA's science advisor. "To make it on location is pretty impressive." Linke was part of a group of OSA leaders who toured the museum early this year.

The museum's Poteat was working at the CIA in the late 1950s, when German scientists, captured by Soviets at the close of World War II, were released and able to share stories about the research going on there, Poteat said. "They came back with scare stories about nuclear bombs," he said. "At that time, even in 1960, we had no spies inside the Soviet Union. So President Eisenhower asked, 'How can we confirm these stories?'" A committee was formed to study the issue, Poteat said, and it found that "the answer is optics, imagery and aerial photography. We need to photograph the entire Soviet Union. That's the only way to get reliable information… Optics is the key, and that still remains the best method."

The International Spy Museum in Washington, D.C., is full of optics technology, including the microdot camera (*left*), which was easy to hide and could produce microdots less than a millimeter in diameter. Pigeons with tiny aerial surveillance cameras (*below*) were commonly released over military sites during World War I.

The International Spy Museum is located at 800 F St., N.W., in Washington, D.C. It is open from 10 a.m. to 8 p.m. daily, except Thanksgiving, Christmas and New Year's Day.

Articles in "Scatterings" are written by Kim Douglass, assistant managing editor of *Optics & Photonics News*. Do you have a story idea? Write her at kdougl@osa.org.

DID YOU KNOW?

The Texas National Guard Civil Support Team used devices that include photo ionization detectors (PIDs) to investigate fallen debris from the Space Shuttle Columbia. The devices test for combustible and toxic gases and volatile organic compounds. This photo was taken in eastern Texas, near Nacogdoches, on February 2.