My First Laser

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When Theodore Maiman introduced the ruby laser on 16 May 1960, with pulses of bright, coherent red light from his laboratory at Hughes Research, I was an eleven-year-old “Sputnik” kid playing dangerously with homemade rockets and radio circuits.

Although I was too young to pay much notice then, I got hooked on lasers two years later when I read an article in Popular Science magazine titled “The Incredible Ruby Ray”. It thoroughly captivated me—I just had to make a laser for myself!

The trouble with such a venture for a thirteen-year-old boy was the required equipment; a cigarette-sized ruby crystal and a high-energy flashtube far exceeded my discretionary funds. Cash from delivering papers and mowing lawns could keep a junior scientist stocked with chemicals and radio parts, but the components for a pulsed ruby laser would require a major bequest from a rich relative. I didn’t have one.

After I had read the article in Popular Science, I started reading any article I could find on lasers and spending afternoons and weekends in the library of Philadelphia’s Franklin Institute. I needed to find someone who would lend me the required ruby crystal. By 1963 a small number of companies in the United States were making those precisely grown crystals, but the price for the required two-inch-long specimen was well over $1000. I wrote letters to every such company that I could identify, explained my plans, and inquired whether I could borrow a ruby crystal. To my delight, a research team at RCA’s engineering research facility in Camden, NJ, wrote back and invited me for a visit. I took that to mean that they wanted to check me out before offering to help.

I left the RCA laboratory with not one but two laser crystals, in addition to lots of advice on how to build my first laser. The engineers I met during my first visit to RCA stayed in touch with me during what became my four-year venture as my lasers became increasingly sophisticated (and better working) and my ability to ask better questions matured.

My third laser (shown in the photo at left), which I had dubbed “Mark 3,” was a reasonable scientific tool for 1965. Making good use of a scientific tool for discovery is an important component of a scientist’s education. While pondering what to do with my laser, another venture in letter writing served me well. I wrote to Hermann Muller, a professor emeritus at Indiana University who had won the 1946 Nobel Prize for Physiology or Medicine by showing that exposure to sufficient quantities of X-rays causes damage to biological cells and eventually leads to mutations.

Ten years later with a freshly minted PhD in physics, and ever since, I have tried to be generous with my time whenever a young student sends me an inquiry or asks me for advice or for a loan of scientific gadgetry. I remember how the RCA engineers and Professor Muller took interest in me and how they influenced my career in a positive way.


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Haunting the Inaugural USA Science and Engineering Festival

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Science buffs and fun seekers alike flocked to the Washington, DC, National Mall on October 23–24 for an extravagant exposition—the culminating event of the inaugural USA Science and Engineering Festival. The expo, hosted by Lockheed Martin, enabled thousands of citizens to experience science and engineering as pure fun, interactive “edutainment.” Hundreds of volunteer scientists, engineers, students, and others ran 1500 exciting hands-on science activities and put on seventy-five shows and performances on four stages. The festival, a result of months of planning, was a grassroots collaboration; more than 500 of the nation’s leading science organizations participated. It had strong support in Congress from both sides of the aisle, including the bipartisan Honorary Congressional Host Committee.

SPS worked closely with the American Physical Society (APS), the American Association of Physics Teachers (AAPT), and the Optical Society of America (OSA) to draw several thousand people to a Laser Haunted House at the festival, in celebration of the 50th anniversary of the demonstration of the laser.

SPS and the collaborating organizations covered the entire inside of a 10’ × 30’ tent with black fabric, creating the allure of spook and mystery to showcase the properties and pizzazz of laser light.

Staff and volunteers, including many members of SPS and Sigma Pi Sigma from the surrounding area, engaged attendees with demos including a laser fountain (highlighting total internal reflection), a homemade laser scanning system that produced 3D images of a skull, laser tattoo removal, a hologram of a pumpkin, a mini laser light show, and more.

A constant stream of visitors kept staff and volunteers on their toes, and even required crowd control when the long line became a fire hazard. The experience was inspiring and humbling. By the end, SPS had gone through well over seventy-five AAA batteries, 6 lbs. of Halloween candy, several dozens of donuts, forty volunteers and staff, and a power outage. It was exhausting but energizing at the same time.

One highlight was talking to the younger attendees on their way out of the haunted house. A girl about eight years old remarked that her favorite part was the pumpkin hologram. “I was looking and I saw a pumpkin, so I looked over to see if there was actually a pumpkin, and there was no pumpkin...I could probably trick my brother with it,” she said mischievously.

By its nature, the festival did not provide many opportunities for in-depth teaching or follow-up. Instead, the festival provided a unique opportunity for science organizations of all types to come together and host an engaging and fun celebration of science for the country. Our hope is that even though the tents and experiments have been packed away, the feelings of excitement, possibility, and wonder will linger with participants.

The science and engineering community and the many organizations that support this community find the concept of engaging the public in science and engineering more and more important. We were pleased to do our part.
The 2009 Nobel Prize in Physics for the development of CCDs and fiber-based telecommunications underscored the importance of basic research in industrial labs and the impact that research can have on society. In fact, most scientific innovation can be attributed to industry. A look at the National Science Board’s Science and Engineering Indicators: 2010 shows total investment in US R&D approached $400 billion in 2008, and more than 67% ($268 billion) came from industry. It’s not surprising that the largest segment of the workforce trained in the physical sciences is also employed in industry. At the forefront of innovation, they are the first to envision practical uses for advances in basic research. The laser is a prime example. Through their efforts, this versatile device—first regarded as little more than a scientific curiosity—has become an essential part of the world’s economy for its use in communications, medicine, and manufacturing, and an essential research tool for basic and applied science.

In this LaserFest year (celebrating 50 years since the invention of the laser), The American Institute of Physics teamed up with the Optical Society of America to hold the 2010 Industrial Physics Forum (IPF), on “Applications of Laser Technology,” from October 25-26 in Rochester, NY. IPF theme sessions took a close look at applications in biomedicine, environmental science, and metrology.

Despite the space constraints of the Rochester Convention Center, the IPF was a smashing success, with standing room only for most of the talks and often with dozens of eager conference attendees in the hallway straining to hear the speakers. With the demand exceeding the supply of seats, it was a good year to experiment with capturing the presentations on video. Members of Sigma Pi Sigma are invited to view their presentations and read the IPF blog; both can be accessed through www.aip.org/industry/ipf/.

Take a peek, and learn about such topics as quantum cascade lasers, quantum computing, probing planets with Lidar, DNA sequencing, “light” repairs to silicon chips, and more.

Planning is underway for two Industrial Physics Forums in 2011—one on superconductivity (marking its centennial anniversary) in conjunction with the 2011 American Physical Society (APS) March Meeting, and a second IPF on energy at the American Vacuum Society (AVS) Symposium and Exhibition, in October, 2011. Sigma Pi Sigma members are invited to attend either of these meetings. Details can be found on the IPF website, referenced above.