



Education

Take-Home Demo Excites Young People About Careers In Technology

BY STEPHEN D. JACOBS

The Exploring Division of the Boy Scouts of America in Rochester, NY, conducts an annual career interest survey in area high schools. Students are presented with a list of 100 career choices and asked to rank those most interesting to them. In 1999, 1,500 of the 25,000 students who responded listed engineering, making it fourth in the ranking—behind teacher/profes-

sor (1,600 votes), doctor/surgeon (1,800 votes) and the military (1,900 votes). The previous three times the survey was conducted, engineering had ranked either second or third.

Why is it then that we hear about a drop in enrollment of engineering majors in two- and four-year college programs? Why are almost 2,000 entry-level technical jobs now going unfilled in the Rochester area alone? I don't claim to have the answer, but I have been told by some primary and secondary school educators that it is hard to keep students on the technology track because of the "difficulty of math," or the "early morning/late afternoon science lab."

The education committee of the OSA Rochester Section has developed a K-10 presentation aimed at awakening excitement about technology through light and color. Our expectation is that the momentum generated through this approach will propel more students through curriculum challenges and into careers in technology. We have taken our presentation, the "Optics Suitcase," to schools throughout the Rochester area. It works. This column invites you to pack your own career experiences into our suitcase, and take a career awareness trip to your child's school.

Using local connections

Organizing visits to schools can be a formidable task, so we identified local programs that already did so and were

seeking volunteers. Through the Rochester Area Career Education Collaborative (RACEC, a program of the Industrial Management Council and the Monroe County schools) we made presentations to 30 teachers and guidance counselors during a visit to the Center for Optics Manufacturing (COM) last summer (*OPN*, Nov. 1999, p. 6).

Taking our cue from some of the lessons learned in that forum, we contacted the Career Awareness Exploring Program (CAE) of the Boy Scouts of America in Rochester and volunteered to give presentations as part of their ongoing outreach program with Monroe County schools. So far, with help from members of OSA's Rochester Section and COM students and staff, many education outreach presentations have been conducted or scheduled (see Table 1).

The take-home demo

With a half dozen props, viewgraphs, and access to an overhead projector, our presentation takes from 30 to 60 minutes. The centerpiece is a theme packet, or take-home demo, given to each student—hence the need for a "suitcase"—at a strategic point in the presentation. We have created three theme packets at a cost of ~\$1.00 each, which explore color in white light through diffraction, transmission and reflection (see Figure 1). The packets offer speakers a way to capture the audience's attention and stimulate interaction while describing their careers. Accompanied by a one-page color flyer describing the goals of the program, the presentation encourages students to take the demos home to show parents, siblings and friends. Since I have had the pleasure of giving many of the presentations, let me describe how it went for a class of 20 sixth graders this March.

CAE-Martha Brown Middle School

I extract from the suitcase a silicon wafer—asking the students to identify it—and a silica lens. The students respond that the wafer looks like a mirror. Using a viewgraph of the periodic table of the elements (which the students had never seen before), we discuss the chemical differences between these two objects and what I do in my career: find new uses for new optical materials. I talk about where I work.



Optical Society of America
Rochester Section



Color by diffraction



Polariscope



Selective reflection

Figure 1. Three theme packets, given to students to take home, explore color in white light.

Date	Organization and site	Number of attendees
7/29/99	RACEC—"Manufacturing Matters! Worksite Visit," COM U of R, Rochester, NY	30 teachers/guidance counselors
9/30/99	OSA Annual Meeting/Educator's Day, Santa Clara, CA	15 educators
11/3/99	U of R undergraduate chapter of OSA, U of R, Rochester, NY	7 undergraduates
11/30/99	CAE—James Madison School of Excellence, Rochester, NY	50 eighth graders
1/5/00	CAE—The School Without Walls, Rochester, NY	30 tenth graders in chemistry
1/22/00	"Science Technology Hunt," <i>Science in Action Badge Workshop</i> , U of R, Rochester, NY	40 fourth/sixth grade girl scouts
1/26/00	Jefferson Road Elementary School, Pittsford, NY	40 kindergarteners
2/4/00	OSA Leadership Conference, Washington, DC	30 optics professionals
4/14/00	U of R undergraduate chapter of OSA, U of R, Rochester, NY	10 undergraduates
3/3/00	CAE—Martha Brown Middle School, Fairport, NY	40 sixth graders
3/17/00	CAE—Nathaniel Rochester Community School, Rochester, NY	22 eighth graders
3/27/00	"Technology Careers based on 2-year degrees," RACEC Training Center	9 technology teachers for sixth through tenth graders
4/13/00	Park Road Elementary School, Pittsford, NY	25 second graders
4/27/00	School #42, Charlotte, NY	21 third graders
5/31/00	CAE—Joanna Perrin Middle School, Fairport, NY	18 sixth graders

Table 1. The list of "Optics Suitcase" presentations conducted in the first 10 months of the program.

The teacher, Ms. Boynton, then distributes the first packet, the Rainbow Peephole®. This consists of a grating, an atomic force microscope picture of the phase relief (with a scale compared to a human hair), and a mini-flashlight. I show the students how to shine the mini-flashlight at each other while holding the grating up to one eye. What each sees is a pattern of eight color images surrounding the white light bulb. Between the "oohs" and "aahs," I ask "so where does the color come from?" They have no idea. We discuss the colors in light revealed by the pattern on the plastic peephole.

While Ms. Boynton hands out the second packet, "Magic Stripes," we talk about the wave nature of light. I go through numerous hand gestures to convey the idea of polarization (not too successful—three seniors in a mechanical engineering design class at the University of Rochester are working this semester on a battery-operated, wave/polarization demo for me to use in the future). The "Magic Stripes" packet contains two plastic polarizers and a plastic sheet covered with stripes of wrapping tape. I remove two large plastic polarizer sheets from my suitcase and place them before my face, oriented so I can see the students. I ask them to do the same with their two pieces. I continue to explain polarized light and transmission or extinction between polarizers. Ms. Boynton turns off the room lights, and I place the polarizer sheets on the overhead projector

in a crossed configuration, separating them by plastic cups at the corners. I throw plastic silverware between the polarizers and the room erupts with enthusiasm. This is the students' favorite demo. I won't finish this part of my story: the trick is for the students to go home and see if their parents can figure out how to "see" the stripes in the third piece of plastic.

As Ms. Boynton hands out the final packet, the "Magic Patch Trick," I take off my glasses and cover my face with a black sheet of liquid crystal "paper." As my thermal image emerges, and between the "oohs" and "aahs," I ask them "where does the color come from?" By now they might have some pretty good guesses. I try to discuss color in reflection from liquid crystals, using a viewgraph that treats the liquid crystal molecules as loose springs (reflecting red light), or tight springs (reflecting blue light). But my explanations are irrelevant. All they want to do is test each other with their patches, to see who, by virtue of an inability to color the patch, is a vampire—the living dead!

A joint effort

Much effort has been devoted to this educational outreach activity. Over 500 theme packets and one-page flyers have been distributed. With a recent Activity Grant awarded by OSA's Member & Education Services Council and additional financial support from the Rochester Section of OSA and

COM, this effort will continue. I acknowledge many individuals for their contributions: Leslie Gregg (COM) for theme packet design, manufacture, and packaging; COM graphic designer Rebecca Coppens for design and preparation of the flyers; University of Rochester undergraduates Susan Brandt, Rosa Lee,* Kerry Johnson,* Jacob Hesterman, and Caleb Farny for cutting, pasting, and bagging packets and giving demos (*); Wayne Knox (Lucent Technologies) for introducing me to the Rainbow Peephole®; Eileen Korenic (University of Wisconsin, River Falls) for coining the term "theme packet;" OSA President Erich Ippen for suggesting the term "Optics Suitcase" in his "Letter from the President" in the March 2000 issue of OPN; Theresa Macon/Courtnee Young for incorporating us into the Rochester Otetiana Council Explorer CAE program; and Kathleen Raniewicz/Eileen Hartmann for inviting us into RACEC.

For more information on this exciting program, please refer to COM's website, www.opticam.rochester.edu. Once on COM's home page, follow the link to the OSA Outreach page. Here you may download PDF or MS Power Point files of a presentation containing theme packet cost and assembly information.

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