Making Waves With the Optics Suitcase

Stephen D. Jacobs and Leslie L. Gregg

To generate excitement about optics as a career choice, OSA's Rochester Section has developed a K-12 presentation, the Optics Suitcase. It's been on the road, engaging students and teachers alike, since 1999.

With significant financial support from Rochester Section Local members, activity grants from OSA, and the Center for Optics Manufacturing (COM) at the University of Rochester, over the past three years, the Optics Suitcase has been provided free to organizations throughout North America. It contains an array of reusable and give-away items that provide the presenter with an exciting means of introducing children to optical engineering as a career choice.

In this article, we provide a progress report on distribution and use of the suitcase, observations from the professional volunteers in the classrooms, and comments from some of the thousands of children who have been on the receiving end of the presentations.

The goal of the outreach activity is to increase the number of young people entering careers in engineering, especially optical engineering.

Our strategy is to encourage optics professionals to go into the classroom and, using the suitcase, demonstrate that engineering can be fun and exciting. We equip the presenters to explore different ways of finding color in white light using a series of activities based on give-away theme packets.

* "Take-Home Demo Excites Young People About Careers in Technology," Opt. Photon. News, July 2000, p. 16.

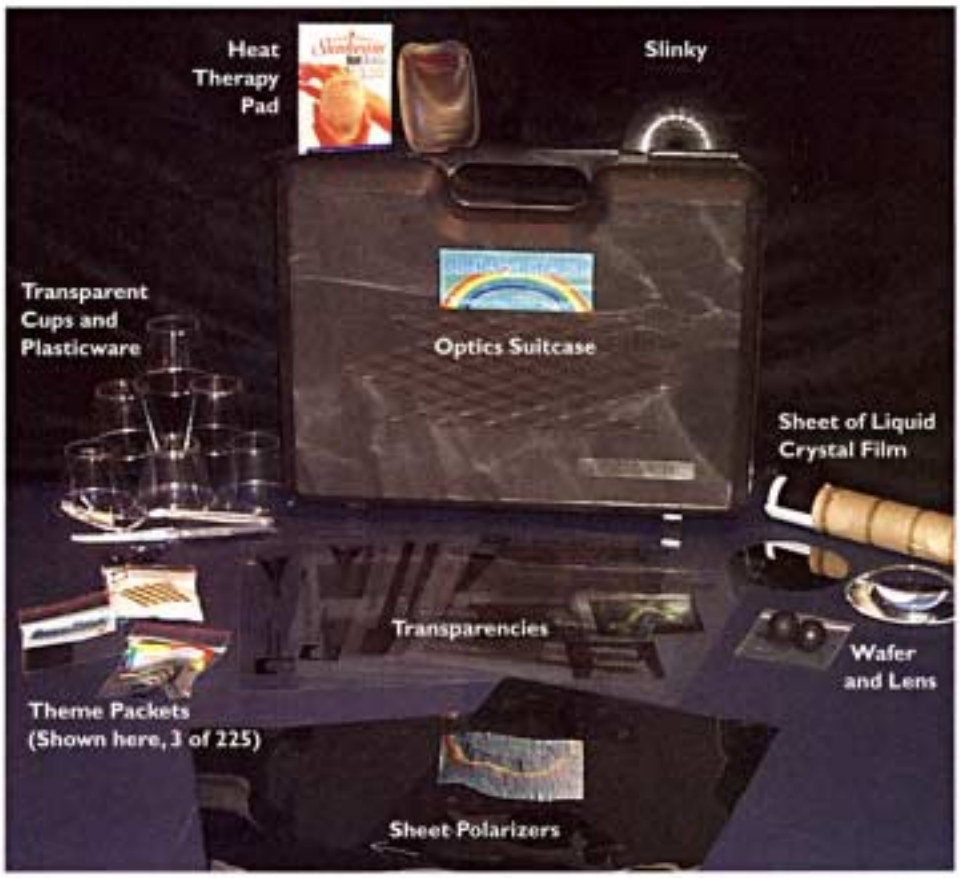

Figure 1. What's in the suitcase? Experiments to teach children about color by diffraction, color by polarization, color by selective reflection, and much more.

Geographic reach

Our early experiences were described two years ago in an OPN article.* There was some concern that, as a result of publication of the article, we would be inundated with requests for the suitcase. This did not occur. Thanks to word of mouth and presentations at educator workshops, we received an average of two requests per month. This is commensurate with our level of funding and, as of March 2002, we had manufactured and shipped 26 optics suitcases.

Recipients were evenly distributed among community colleges and universities (4), OSA local chapters (4), middle and high schools (4), companies (5), and government or not-for-profit groups (9). Before an optics suitcase is sent, we require a letter describing the activities planned from the person responsible, and a good faith commitment to provide feedback from in-school visits.

Each suitcase contains an illustrated copy of our 14-page "Educational Outreach Presentation Guide," which lists the equipment and supplies included in the suitcase (Fig. 1) and provides suggestions on how to give a ~40 min. lecture/demonstration. Reusable items include: a portable heat therapy pad and "happy /unhappy" balls (for use as attention grabbers); a silicon wafer; a lens; a slinky; two high-quality sheet polarizers; a sheet of temperature-sensitive liquid crystal film; and a set of six presentation transparencies. Give-aways include 75 copies of the periodic table of the elements (compliments of Mark Glasper and the American Ceramic Society) and 225 "theme packets"

that explore color in white light through "magic" experiments: the Rainbow Peephole (color by diffraction); Magic Stripes (color by polarization); and the Magic Patch (color by selective reflection). Seventy-five copies of each magic trick are supplied in each kit.

Replacement theme packets are supplied on request, provided we have received written feedback on the classroom presentations. The manufacture and distribution of these packets is a major effort. Fortunately, as a result of a series of outreach presentations in Kittanning, Pennsylvania, we were able to enlist the aid of Wendy Gilpin (Electro-Optics Center, Penn State University) and Roy Cigola (Progressive Workshop).

The first Optics Suitcase recipient to request refills was Celia Domser, professor and department head of the Mohawk Valley Community College Department of Engineering, Computer & Physical Sciences Department, Utica, New York. Between February and May 2001, she made seven presentations to elementary, high school, community college, and teacher groups.

Encouraging observations

Here are some comments from science and engineering professionals who have given presentations or observed them being given.

Magic tricks were demonstrated by Eastman Kodak engineer and OSA member **John Bowen** to 40 kindergarten children at Jefferson Road Elementary School, Pittsford, New York.

"I showed the spectroscope and the temperature-sensitive film. Both of these were very easy to use... and generated a lot of excitement; so much so that the teacher kept saying '...tell me when you want them to quiet down...' At the end, most of the questions were variants on, 'How did you make these?' so I think it definitely sparked their curiosity."

Engineer **Sarah Curet** from the University of Rochester Laboratory for Laser Energetics (LLE) gave a presentation to 40 children in the 4th grade at Warsaw Elementary School, Warsaw, New York. Teachers Joyce Runfola and Tina Harding wrote:

"Just wanted you to know that Sarah did a wonderful job... She was one of several presenters we've had in this year to discuss their careers in science, and she certainly gets the award for generating the most 'Cool,' 'Awesome,' and 'Wow' comments! Thanks, too, to the members of your group for putting the packets together and to the Center for providing such great hands-on projects and visuals... The kids are sure to remember the visit and the fun they had with optics."

Take-home theme packets get kids of all ages excited about careers in the sciences.

Liquid crystals respond to the warmth of a hand, magically revealing new colors.

Polariscope reveals colors in white light.

Xerox scientist **Keith Knox** used the kits with 15 eight-year-olds.

"They were fascinated with the polarizers and... how they changed as they rotated them. The stripes were beautiful with their different colors, and they loved the way the colors changed... Many of them were very inquisitive and would jump ahead of me and try out ways of combining the individual pieces on their own. By the end, I found myself letting them experiment and answering their questions as they tried to understand what they were seeing... The teachers thought the lesson was wonderful."

Wendy Gilpin from the Electro-Optics Center at Penn State sent a copy of an e-mail from teachers in Pennsylvania:

"... Larry Freeman and I [Dennis Whitson] have visited 16 schools... This is a total of about 1092 students with whom we have interacted. What seems to excite the students the most were the packets that they could manipulate themselves: Rainbow Peephole and the Magic Stripes."

John Schoen (COM) gave his first Optics Suitcase presentation to Ann Esch's fourth-grade class at Rogers Middle School, West Irondequoit, New York:

"I must admit I was nervous at the start, but the 'oohs' and 'aahs' came fast and often throughout the interaction. It was a fun and rewarding experience. Your advice to allow more interaction (not to provide the answers) was right on target. The kids had great ideas."

A note from **Jim Kirsch** of the U.S. Army Aviation and Missile Command, Redstone Arsenal, Huntsville, Alabama:

"SciQuest is the local hands-on science museum and they bring in all the sixth-grade classes every year. I was very fortunate this year to only have 30 kids with no other groups to follow so I could take more time. The polarization demo was really nice be-

cause SciQuest has an exhibit on using polarization to measure stress in bridge supports. The kids had the take-home kit but could also see a very practical application..."

Feedback from the children

We conclude this article with a selection of comments from the thank-you notes written primarily by sixth graders in Jerrilyn Boynton's "home and careers" classes at Martha Brown Middle School, Fairport, New York.

Brent: "Before you came, I had no idea what an optical physicist was, but when you left, I wanted to be one... It was neat to see all the colors that are in white light."

David: "My whole family is amazed by what you can do with the kits. I liked when you put the paper over the cups and it showed up tie-die." [He was referring to the placement of two polarizers on an overhead projector, separated by plastic cups.]

Briana: "I think you have a really cool job. I'll keep it in mind 'til I'm older."

Laura: "I never knew there were so many ways to break up light or that engineering could be so fun. It was easier to learn because we could see what you were teaching to us up close and in a way we could understand."

Acknowledgements

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Stephen D. Jacobs is a senior scientist at the Laboratory for Laser Energetics (LLE), University of Rochester, New York. He is involved in education outreach and, together with Leslie L. Gregg, created and has developed the Optics Suitcase Outreach Program. Gregg is a chemical technician at the Center for Optics Manufacturing, University of Rochester, New York. They can be reached by e-mail at lgre@LLE.rochester.edu

OPTICS SUITCASE

Given to Organizations for Career Awareness Outreach

(27 deliveries as of April 2002)

#	State/Prov	Organization	Contact
1	MA	Physics Department, Boston University	Bennett Goldberg
2	NH	Pinkerton Academy	Gale Christenson
3	DC	OSA National Headquarters	Jason Briggs
4	FL	Coastal Optical Systems, Inc.	Jay Kumler
5	NY	Oneida BOCES	Pauline Rogers
6	NY	Mohawk Valley Community College	Celia Dorman
7	NY	Boynton Middle School	Marcie Wyant
8	NY	Optimax, Inc.	James Vankouwenberg
9	NY	Fisba Optik LLC	John Nemechek
10	NY	Gates-Chili Central School District	Christine Fenton
11	NY	OSA Student Chapter, University of Rochester	Mi-Young Park
12	NY	Ceramic Assoc. of NY Alfred University	Anne Baldwin
13	PA	Electro-Optics Center Penn State Univ.	Wendy Gilpin
14	ONT	SW Ontario Local OSA Waterloo, CANADA	Donna Strickland
15	OH	American Ceramic Society	Mark Glasper
16	AL	U.S. Army Aviation & Missile Command, Redstone Arsenal	Jim Hirsch
17	IN	Crane Div., Naval Surface Warfare Center	John Smith
18	TX	Zebra Imaging	Deanna McMillen
19	NM	Ctr. High Tech. Matls., Univ. of New Mexico	Arthur Guenther
20	CO	Colorado Photonics Industry Assoc.	Brian Hooker
21	CA	Physics Department, San Diego State University	Matt Anderson
22	CA	Optical Society of Northern California	Paul Griffiths
23	CA	Coherent, Inc.	Bob Bauers
24	CA	A-MAN	Hal Walker
25	OR	OSA Columbia Local Chapter	Jeannie Williams
26	WA	SPIE	Patty Sweaney
27	WA	Mount Tahoma High School	John Currie