LINCOLN LABORATORY COMMUNITY OUTREACH— Science on Saturday

Science education is vitally important, yet studies continue to show that the United States lags behind many other countries in this area. To locally encourage science education, Lincoln Laboratory has started two educational outreach activities, one of which is for volunteers to speak at schools near the Laboratory. The other is Science on Saturday.

On Saturday, 18 March 2006, the Laboratory invited students for a science lecture and demonstration, "Cryogenics and Liquid Nitrogen Demonstration," by Richard Williamson from the Electro-Optical Materials and Devices group.



Richard Williamson's presentation at Science on Saturday, given on 18 March 2006, in the Lincoln Laboratory auditorium, Lexington, Massachusetts.

Dr. Williamson demonstrated to over 150 children and their family members what can happen when substances like nitrogen, argon, water, and carbon dioxide change state from solids to liquids to gases. Much of the demonstration, which took place in the auditorium of Lincoln Laboratory, focused on fascinating events that occur when substances are cooled to the very low liquid nitrogen temperature of -320° Fahrenheit. During the demonstrations, balloons exploded and collapsed, liquid nitrogen boiled, flowers shattered, corks popped off, and steam rose. Children from the audience were provided appropriate protective equipment and took part in the demonstrations.

The enthusiastic audience kept asking for more experiments right up to the end of the hour and a half set aside for the demonstrations. Students came forward with a range of objects from pencils and paper to wristbands and fruit that they wanted to have immersed in liquid nitrogen to see what would happen.

The origins of this demonstration go back to 1981, when Lincoln Laboratory held a Family Day open house. It is always a challenge to put together demonstrations for Family Day that will be both informative and interesting enough to maintain children's attention. Much of the work in the Solid State division involves research and development on semiconductor devices. Workhorses of this effort are large stainlesssteel vacuum systems in which the devices are processed. Large pieces of stainless steel are not very photogenic, and the resulting devices are so small that it is hard to appreciate what has been accomplished. Rather than focus on the processing equipment and the devices, some staff members in the Solid State division decided to have a liquid nitrogen demonstration. The division uses a large amount of liquid nitrogen in its



Dr. Williamson asks for questions from the floor.



Young members of the audience eagerly respond.



A volunteer from the audience prepares to dip a flower in liquid nitrogen at a temperature of -320° Fahrenheit.

processing systems and for testing devices at low temperatures. The demonstration was a big hit and was repeated at successive family days.

Having seen the demonstration at Family Day, a number of Laboratory employees asked Dick Williamson to bring the demonstration to their children's schools or to Cub Scout meetings. Dick agreed, and, because of his long interest in Scouting, over the years he has given the demonstration several hundred times

to both schools and Scout groups at a long list of locations around eastern Massachusetts and southern New Hampshire. A number of schools have arranged for him to return every year. In recent years, he has given demonstration over the thirty times a year. When traveling to other cities, Dick has gone to a number of science museums and has attended liquid nitrogen (sometimes called liquid air) shows to see what others are doing. He has in-



The balloon contains carbon dioxide gas, which another participant, wearing safety equipment, is about to turn into dry ice by immersing the balloon in liquid nitrogen.

corporated many of the most fascinating experiments into his demonstrations, which provide a wonderful opportunity to entertain children while also educating them and stimulating their interest in science.

The first Science on Saturday, like Dick's other demonstrations, was an important opportunity to share with people in nearby communities a sense of what researchers do at Lincoln Laboratory.

The Laboratory's educational outreach program



will include more Science on Saturday events, as well as excursions to schools. Planned future topics include chemistry, geology, earth science, the elements, robotics, satellites, and biology.

Lincoln Laboratory employees who are interested in becoming volunteer science speakers (either for Science on Saturdays or for presentations on science at local schools) should contact Todd Rider at thor@ LL.mit.edu.