Reaching Out to Teach

BY TRICIA BRICK

On the path to science

The termite wranglers were at the ready. They had listened to a lecture on the scientific method and had learned a little about the genetics of behavior and how pheromones work. They'd each joined a team with a molecular technician and a principal investigator for their experiments. Today, they were more than high school girls participating in a lab activity at BU's Metcalf Science Center; they were scientists.

Now it was time to talk to the termites. The girls had watched these little insects as they'd marched in a tidy line following the path drawn by one blue ballpoint. But when the termites were placed on pieces of paper with other kinds of lines, they scattered, refusing to stay on the trail. Why?

The girls formulated hypotheses: Termites might follow straight lines but not curves, or maybe termites just like the color blue. With the help of a team of CAS graduate students, the girls tested their hypotheses through experimentation—by drawing a straight line and a curved line on a piece of paper to test if the termites might be choosing the direct route, for example, or by drawing lines with different pens to see whether the colors or styles of ink affected the insects' paths. Over a series of experiments, the investigators came to a conclusion: it's these Bic pens the termites prefer.

Biology grad student Timery DeBoer (GRS'10) and her colleagues explained the science behind the insects' behavior: termites produce a particular trail-following pheromone that conveys information to other termites, signaling that they are on a path to food or back to the nest. Certain Bic ballpoint pens contain a chemical that mimics this pheromone, so termites will follow a line drawn on a piece of paper with one of these pens.

The termite scientists were participants in CAS's Summer Pathways program for girls from inner-city Boston public schools who are interested in the sciences. For a week they lived in student housing, ate at the dining hall, and participated in a range of activities that included building circuits in a BU engineering lab, taking trips to Merck & Co.'s pharmaceuticals research labs and the Museum of Science, and visiting various University labs and other facilities for introductions to neuroscience, computer science, photonics, and related disciplines.

Summer Pathways operates as part of Arts & Sciences' LERNet center, created in 1998, which serves as a headquarters for education outreach in the STEM (science, technology, engineering, and mathematics) subjects, and today is home to more than a dozen programs. "A young woman who is interested in science will tell you she wants to be a doctor, because that's the only option she knows about," says LERNet Director Cynthia Brossman. "When she meets students who are engineers, ecologists, public health specialists, chemists, and astronomers, her whole worldview is changed." Brossman estimates that thirty thousand students have participated in Boston University STEM programs in the 16 years she's been working in outreach here, from single-day Mathematics Field Days, Engineering Days, and Department of Energy Science

Middle school girls participate in after-school science clubs run by GRS students.

Bowls to the six-week Program in Mathematics for Young Scientists, or PROMYS, which brings top high school mathematics students from around the country to BU for a summer immersion experience. LERNet programs exist for educators as well: for example, the Science Immersion Institute leads K–8 teachers in two-week summer workshops on topics like geometric optics and "green energy"; the PROMYS for Teachers offers summer and academic-year professional development for mathematics educators.

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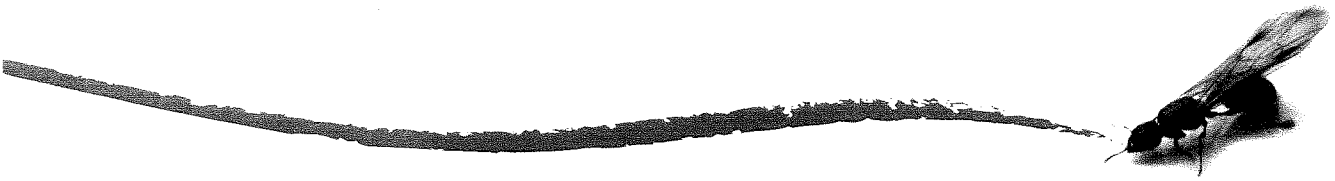

Left: Boston-area students examine samples in a neuroscience lab at CAS.

Below: From left, students Judith Terranova, from Boston Arts Academy, and Salma Goumih, from Quincy High School, are fascinated by a live specimen at a Summer Pathways program.

"We're building a bridge between the University and the community," says Brossman, who received the 2007 Maria Mitchell Women in Science Award for her work with LERNet. "If somebody wants to put on an event, I can give pointers about how to plan the event and direct them to certain resources. I can also help to foster collaboration among other people who might be interested. We're able to serve as a centralized resource, and that works very synergistically."

Graduate Students (BIO BUGS) events—a second lab focuses on comparative anatomy, complete with a lesson in dissection—have brought hundreds of middle and high school students to campus for hands-on learning and an introduction to the University's scientific community. "Our goal is to bring them onto campus," DeBoer says, "and have them interact with students, let them use the tools that their schools don't have. Boston University has so much equipment and other cool things that schools can't afford."

>> "We are Boston University. Our identity and our destiny

That synergy can come from bringing together an outreach idea with an interested elementary school principal. It also helps to create a network of people interested in outreach within Arts & Sciences, which can lead to cross-pollination of resources and inspirations. For example, the termite activity DeBoer led at Summer Pathways last year is one of two labs she developed through LERNet with her colleague Eric Crandall (GRS'08). The daylong Biology Inquiry and Outreach with Boston University

That's not to say, of course, that technology is the only asset Arts & Sciences has to offer. Through LERNet's many programs, the College and Graduate School are also sharing with Boston classrooms their most valuable resource: their people.

The Boston University Fellows (BUF) program places STEM graduate students directly in inner-city public school classrooms, where over the course of a yearlong fellowship they share teaching responsibilities, assist in lesson planning, develop labs and other activities, and in general bring their expertise and experience as

Left and above: High schoolers from Codman Academy and Charlestown High School examine dissected specimens in a BIO BUGS comparative anatomy lab led by Timery DeBoer (GRS'10) and other grad students.

working scientists to Boston kids. "The central focus of this program is to support graduate students and make them better PhDs, better teachers, better industrial scientists, better politicians, whatever they decide to do," says Physics Chair Bennett Goldberg, who is former director of LERNet and principal investigator for the National Science Foundation Graduate Teaching Fellows in K–12 Education (GK–12) grant that funds the BUF program. "But for the kids, the grad students are unbelievable role models in the sciences."

concepts." The two worked together to adapt the Boston Public Schools' science curriculum, creating lesson plans and assignments to make the concepts accessible to the students.

Graduate students who've participated in the BUF program say that they often have to put their research aside for a year in order to make time for the demands of their work in the classroom. But they emphasize that the value of the program goes beyond the intensive training they receive in teaching and communication

are intimately interwoven into the fabric of the city..." —BRUCE SCHULMAN

As a fellow last year, biology student Angela Seliga (GRS'09) spent two days a week working with Brighton High School teacher Jeanine Constantine in her special-needs classroom. In addition to assisting with teaching classes in biology and chemistry, Seliga worked with Constantine to create lesson plans to help her students prepare for required statewide science exams. "She's been teaching special education for twenty years, so she knows how to break down complex ideas into simple ones, but she didn't have a science background," Seliga says. "I had the experience with the complex science skills. "I feel I've been very fortunate in my life to have very strong, positive women role models, and Cynthia Brossman and Jeanine Constantine are two of the newest," says Seliga, who has also worked with the Summer Pathways program. "My accomplishments are not anything I did alone; somebody realized I had an interest and aspiration and offered me opportunities. And those opportunities only happen if people take the time to reach out."