

Salk Institute Education Outreach Program

Hands-on Science Education

Elshaday Teshome

When Elshaday Teshome's father moved his family from Ethiopia to the United States in 2008, it was to assure his two sons access to a good education. Elshaday, the oldest, was passionate about science and had earned the top grade in science at his school in Ethiopia's capital. The curriculum was strictly theoretical, however, offering no hands-on laboratory experience.

“Intuition will tell
the thinking mind where
to look next.....”

- Dr. Jonas Salk



Less than a year later, while attending San Diego High School's SciTech magnet, Elshaday was offered an opportunity that surpassed anything he could have imagined: a coveted spot in the Salk Institute's High School Summer Enrichment Program. He was assigned to Dr. Jeff Long's plant biology lab, where he spent eight weeks testing the interactions of two proteins, under the supervision of a research mentor.

Elshaday plans to use his newfound skills to help his peers in science classes and hopes to enroll at UC San Diego or UC Berkeley after graduating. Ultimately, he foresees a career as a scientist, probably in cancer research. It's a goal that his internship at Salk has brought significantly closer and one in which the entire nation has a stake.

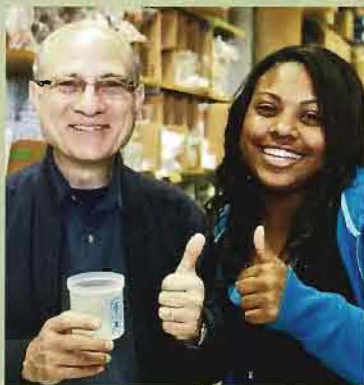
Salk Institute Educational Outreach

When Jonas Salk conceived the Salk Institute's High School Summer Enrichment Program more than 40 years ago, it was to mentor and encourage students like Elshaday. Today the High School Summer Enrichment Program is one of three signature programs of the Institute's Educational Outreach department, which is dedicated to providing San Diego County students from middle school through high school with hands-on science education. Educational Outreach also organizes Salk High School Science Day each February and operates the Salk Mobile Science Lab at middle schools and community events throughout the school year, bringing the thrill of scientific discovery to young people who otherwise would have little exposure to laboratory science.

Long before such landmark reports as *A Nation at Risk* (1983), *Science for All Americans* (1989), *Benchmarks for Science Literacy* (1993), and *Rising above the Gathering Storm* (2007) sounded the alarm about the failure of America's schools to produce enough new scientists, engineers and technology professionals in an increasingly competitive global economy, the Salk Institute was systematically reaching out to students in an effort to motivate and inspire the next generation of scientists. The results of that visionary effort can be measured in the thousands of students the programs have touched, opening their eyes, broadening their experience, promoting science literacy, and prompting some to enthusiastically pursue careers in science.

High School Science Enrichment Program

Since the High School Science Enrichment Program began over four decades ago, between 400 and 500 high school students have spent their summers in Salk labs, where they work closely on authentic research projects in laboratories with Salk scientists/mentors.



Each year, ten students out of a pool of applicants numbering close to 250 are offered this extraordinary experience after undergoing a rigorous screening and selection process that matches their interests with projects across the Salk campus. In labs ranging from plant biology to neuroscience, from cancer research and stem cells to bioinformatics, they learn how to formulate and test hypotheses, prepare experiments, and draw conclusions from those experiments. They maintain laboratory notebooks and have extensive interactions with other members of the lab staff, regularly participating in group discussions and their labs' general meetings. Weekly intern meetings often include field trips to surrounding science facilities and other enrichment activities. A program coordinator serves as a liaison between the students and the mentors, ensuring that everyone has a rich and rewarding experience.

At the end of the program, the students make formal presentations of their work to family members, teachers, mentors, and the Salk community, often before a standing-room-only audience. Students receive DVDs of their final presentations, and the videos are posted on the Salk intranet site for continued access.



High School Science Day

In 1990, 30 high school students spent a unique day at the Salk Institute, touring laboratories, meeting with senior scientists, and discovering what life as a basic researcher is like. Today the annual event, High School Science Day, hosts about 250 students each year, attracting young people from high schools throughout San Diego County who are interested in learning more about science careers. Because each participating high school determines its own attendees, up to a maximum of five per school site, High School Science Day draws at-risk students as well as high achievers and everyone in between, offering a rare opportunity to introduce a broad spectrum of young people to the challenges and rewards of scientific investigation.



During the program, Salk scientists share experiences about their lives and offer advice about launching a scientific career. The future scientists also tour several working laboratories at the Institute and get to perform some of the techniques required for actual projects in the labs, giving them a real-world taste of the latest in scientific research. Different laboratories volunteer to participate in this event each year, so even returning students and teachers are treated to something new from one year to the next. During a buffet lunch, students and their teachers take part in an informal exchange of ideas and questions with Salk researchers. The program offers students one of their first opportunities to peer into the lives of scientists and get expert guidance about a possible career.

Mobile Science Lab

An award-winning program developed in the mid-1990s by neuroscientist Ellen Potter in collaboration with Salk faculty, the San Diego County Office of Education, and local middle school teachers, the Salk Mobile Science Lab addresses the lack of funding for middle school science education in San Diego by providing an innovative experiential curriculum at no charge to schools. Offering a unique opportunity for students to learn about genetics and DNA from scientists in the Salk research community, each year it brings the excitement of hands-on scientific discovery to 18 schools from Oceanside to Imperial Beach, from the coast to Julian and beyond. The majority are underserved in some way, and nearly half are urban; approximately 70% of the students taking part are members of minority groups, and more than 55% meet the criteria for the federal free and reduced lunch program.



Since its inception, the Mobile Science Lab has served some 25,000 students, providing San Diego County schools with a compelling three-day curriculum that is aligned with the California Life Science Content Standards for the seventh grade. During the lab's visit, students not only learn about the structure and function of DNA but the techniques used for DNA fingerprinting and screening for disease. On the first day, they look at populations of fruit flies under a microscope to learn about the uses of model organisms and genetic mutations. On the second day, they learn to extract DNA from wheat germ. Finally, they use gel electrophoresis with food coloring to simulate techniques used to analyze DNA fragments. The Mobile Science Lab brings all the necessary equipment to the classroom, where 90 to 160 students work with volunteers in groups of six to eight to carry out interactive science experiments. The volunteer corps includes local researchers, which enables the middle school students to interact directly with working scientists.



“.....the greatest reward for doing is the opportunity to do more.”

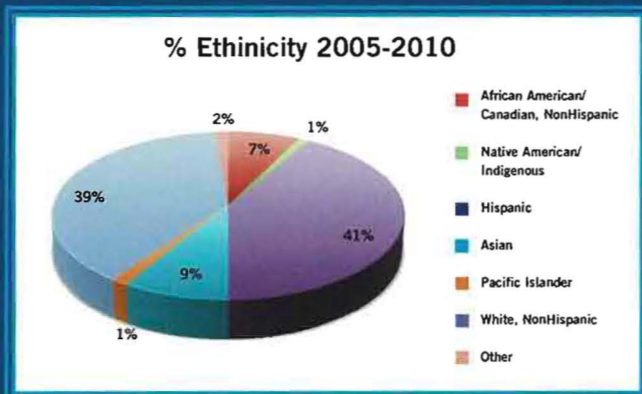
-Jonas Salk

The combination of scientist volunteers and the mobility of the program make the Salk Mobile Lab unique in Southern California; schools from outside the area regularly contact Educational Outreach staff asking the lab to visit because there is nothing comparable for their students. Because the lab is only able to serve a limited number of classes and is at capacity in terms of the number of participating schools, in 2005, Mobile Science Lab staff, in partnership with the Southern California Biotechnology Center at Miramar College, began introducing kit-based genetics curricula and teacher professional development programs to train middle and high school teachers throughout San Diego County.

In 2008, recognizing the need for an external review of all of its Educational Outreach Programs, the Institute contracted with the firm Insight Strategic Education Evaluation, to design a multiphase evaluation of the Mobile Science Lab. The first phase of the project involved interviews with all of the stakeholders, including the Salk administration, faculty, and teachers, along with in-class observations to refine the mission of Salk Mobile Science Lab. According to preliminary results, 80% of the teachers interviewed found that the Mobile Science Lab increased the amount of biotechnology taught in their classes, and that the lab contributed to students' levels of scientific literacy on multiple fronts. While the evaluation is still in its early phases, these data indicate the Mobile Science Lab is having a positive impact on the quality and quantity of science instruction in San Diego County.



Salk Mobile Lab 2005-2010
87 School Visits / multiple visits



For the past four years, the Mobile Science Lab has also been working with every seventh grader at Monroe Clark Middle School, and the first cohort to go through the program is now in the sophomore class at Hoover High School. The continuity this provides will allow the Institute to track student progress longitudinally to continue assessing the Mobile Science Lab's success at achieving its goals.

“...audacity of imagination...”

As increasingly lean school budgets continue to cut into educational programs—including science and mathematics—outreach programs like Salk's are becoming more and more critical to maintaining competitive levels of science literacy. The knowledge these programs disseminate will play out not only in individual students' academic performance and choice of careers but in their understanding of science and its central role in the physical and economic well-being of our country. The result will be better-informed, more active citizens who grasp the complexities of scientific issues and make informed decisions for their families and for society.

Salk Institute Educational Outreach Staff



Ellen Potter, Ph.D., Director, has served as a liaison between The Salk Institute scientists and San Diego County educational community since 1996. In May 2009, Ellen won a Partnership Award from the San Diego Science Alliance for recognition of her efforts to enhance K-12 science education in San Diego County. The award noted that the lab has “a positive impact in the K-12 science education community and deserves recognition.”

Dona Mapston, Educational Program Specialist, is a former nationally recognized AP biology teacher who joined the Educational Outreach department in 2005.



Thanks to the generosity of Las Patronas, the Educational Outreach department was recently able to purchase a brand-new cargo van for the Mobile Science Lab. This new van will help strengthen the program by allowing staff to bring the lab to San Diego County schools that had previously been beyond reach because of restrictions inherent in the aging van.



In addition to its school-based program, the Mobile Science Lab is an extremely popular attraction at a number of community-focused science events, including Saturday DNA Day events at the Reuben H. Fleet Science Center, which take place three times each year; the Sally Ride Science Festival; and the Annual San Diego Science Festival Expo.

Mobile Science Lab goals:

- Expand teachers' expertise, level of instruction and positively influence attitudes toward teaching biotechnology in middle school classrooms
- Increase middle school students' knowledge and understanding of the life sciences through genetics and biotechnology and its relevance to their everyday lives
- Increase students' interest in science, and in pursuing careers in STEM fields of study