Increasing Diversity in Environmental Science and Engineering: The ORD Research Apprenticeship Program for High School Students

A cooperative training program between the U.S. Environmental Protection Agency's (EPA) Office of Research and Development and Shaw University

EPA Science Forum 2004

Healthy Communities and Ecosystems

Kelly W. Leovic, ORD/RTP/NERL

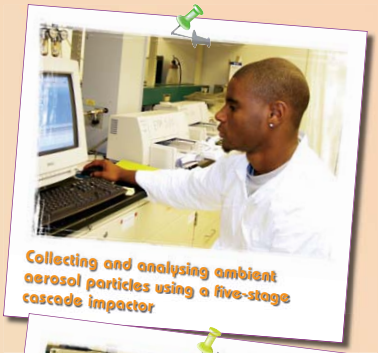
What is the Research Apprenticeship Program (RAP) for High School Students?

The RAP began in 1990 as a collaborative effort between EPA's Office of Research and Development in Research Triangle Park, NC and Shaw University in Raleigh, NC. The program addresses the under-representation of minorities in environmental sciences and engineering.

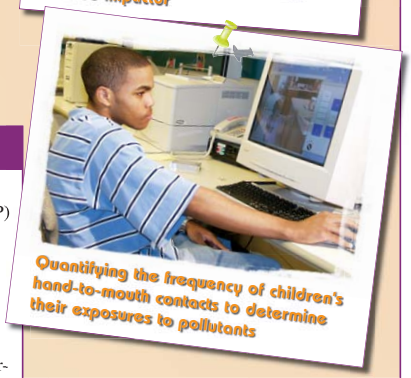
The RAP encourages participating high school students to pursue advanced degrees in environmental science and engineering by:

- enriching the scientific and mathematic concepts that students study in the classroom
- providing the opportunity to interact with scientists
- developing effective scientific research and technical skills
- enhancing students' motivation, self-confidence, and desire to achieve

Evaluating technical information on safe buildings and building decontamination



Collecting and analysing ambient aerosol particles using a five-stage cascade impactor



Quantifying the frequency of children's hand-to-mouth contacts to determine their exposures to pollutants

Evaluating the effects of pollutants on the developing nervous system

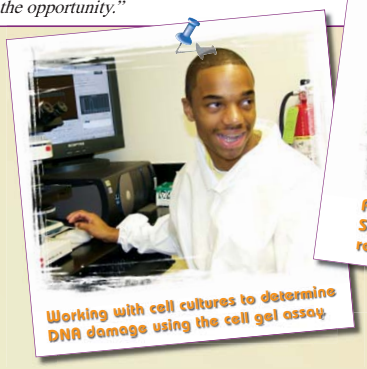
Program Successes

The success of the EPA/Shaw University Research Apprenticeship Program (RAP) is well demonstrated:

- seventy-four high school students have participated in the program
- nine participants have been accepted into the prestigious NC School of Science and Mathematics
- at least four students have co-authored peer-reviewed journal articles based on research conducted while working at the EPA
- many students have been hired by EPA in subsequent summers during college
- the overall high school grade point average of participants is 3.57 on a 4.0 scale
- one hundred percent of those who completed the program entered college—90% majored in either science, math, or engineering with the support of over half a million dollars in scholarships and grants
- a program graduate currently enrolled in medical school was selected as a 2004 Research Scholar with the Howard Hughes Medical Institute at the National Institutes of Health

EPA scientists who have mentored students in the RAP have been very satisfied. One mentor noted that *"... is an outstanding student and excellent scientist-to-be. He is a good worker, learns quickly, is careful and attentive, and was very productive while he was in my lab. He was well prepared for his work in a lab, has excellent interpersonal skills, and he interacted in a great way with all my staff and colleagues. He was helpful and accommodating....I would very much be interested in having him be a summer employee next year in my lab. Thanks for the opportunity."*

Determining protein concentration and isolating protein in tissue samples to investigate the carcinogenic nature of disinfectant by-products from drinking water



Working with cell cultures to determine DNA damage using the cell gel assay

Analyzing data from the Brewer Spectrophotometer site in RTP to record UV-B

Funding Sources

The RAP is supported through funding from EPA's Office of Research and Development in Research Triangle Park, NC. Contributing organizations include:

- National Exposure Research Laboratory
- National Health and Environmental Effects Research Laboratory
- National Risk Management Research Laboratory Air Pollution Prevention and Control Division
- National Center for Environmental Assessment

The ORD Center for Environmental Education wants to share information about this successful program with other parts of EPA and the public to encourage its replication in other locations!

How Does the Research Apprenticeship Program Develop the Students?

The 4-year program has two sessions: the academic year and the summer program. During the academic year, students attend classes, workshops, and monthly interactive presentations by EPA scientists three Saturdays each month at Shaw University.

During the summer, 9th, 10th, and 11th-grade students attend 6 weeks of classes, workshops, and field trips coordinated by Shaw University. The high school seniors apprentice under EPA mentors at EPA research facilities during the summer. This intensive experience immerses students in scientific research and culminates in a research forum during which students present their work to an audience that includes the mentors, other students in the program, students' parents, and EPA scientists.

Students in the Program must demonstrate superior ability in math and science, live in Wake County, and be in grades 9 through 12. Students must maintain high academic performance in high school and strict attendance standards to remain in the program.

Currently, only ten rising 9th graders are accepted into the RAP annually.

How do ORD-RTP scientists participate in the Research Apprenticeship Program?

The success of this program comes from the ORD scientists and engineers who volunteer their time and talents to help train these ambitious students.

MENTORING STUDENTS — Each summer, eight to ten seniors come to EPA to serve as interns with EPA mentors. Students work on "hands-on" projects, typically in the laboratory or on a computer, that can be completed during six weeks.

GIVING SCIENTIFIC PRESENTATIONS — Hands-on scientific presentations are given by EPA scientists and engineers on Saturday mornings during the academic year.

REVIEWING STUDENT APPLICATIONS — Student applications for rising 9th graders are reviewed each April in a half-day review session with representatives from EPA, academia, and the private sector.