APPLYING BIOTECHNOLOGY

BY BETH SEWELL

SINCE HIS ARRIVAL AT WESTERN KENTUCKY UNIVERSITY IN JANUARY 1998, DR. SHIVENDRA SAHI HAS BEGUN RESEARCH ON PROJECTS TO ELIMINATE VIRTUALLY ALL TOXINS IN SOIL AND WATER, TO ELIMINATE EXCESS PHOSPHORUS FROM SOIL, AS WELL AS TO PROTECT AND IMPROVE THE CONDITION OF MAMMOTH CAVE NATIONAL PARK. HE EVEN FINDS TIME TO TURN THE AVERAGE FRESHMAN INTO AN AWARD-WINNING BIOLOGY STUDENT.

PHOTO BY SHERYL HAGAN-BOOTH

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With his team of students and colleagues, Sahi battles man-made pollutants with the natural resources of mother nature, and of course, endless research.

"Molecular biology is only 30 years old, but it is moving so fast, everyday you find another discovery," Sahi said.

The first discovery Sahi found was a weapon to fight toxic metals in soil. Sahi went through a lengthy process of research to find a plant that would actually store or use the metal toxins. With each new day of growth, more toxic metals are removed from the soil and taken in by the plant. The plant will continuously use or store the toxins until the majority of toxic metals are removed from the soil. This will solve not only the problem of toxic soil, but it will solve the erosion problem while making the landscape more attractive, because other plants may not grow in toxic soil.

Sahi currently has a patent pending on the same general idea, but using a dead plant to get rid of water toxins. "The water toxins work the same way," Sahi said. "You just have to find the plant that won't reject the contaminants."

"Mammoth Cave National Park is the focus of my team's latest environmental research. Using the tools of molecular biology and DNA analysis, efforts are underway to identify bacteria in the cave. New theories of cave formation recognize the importance of tiny microorganisms living in the cave which produce acids as part of their normal activities. Amazingly, these tiny microorganisms may be involved in the geological processes that formed the longest cave in the world," Sahi said.

"When you don't know what kind of acid it is, we look at the bacteria," Sahi said. "To do this we extract DNA from sediment."

Each DNA extraction must be mapped and run through a database of thousands of different types of bacteria until the perfect match is found.

"We're getting a lot of exciting results," Sahi said. When the bacteria are matched, the acid can be counteracted. "It is impossible without a computer," Sahi said.

In addition to using the Internet in this project, Sahi has the collaboration of other scientists. "I like collaborating because we have things they don't and it gives us access to more resources," Sahi said. Sahi enjoys the different talents each researcher brings to a project, not only because it divides responsibility, but it speeds up the

research process as well. Rick Fowler and Chris Groves are two of the people collaborating with Sahi on the Mammoth Cave project.

Although Sahi enjoys research, his favorite part of the scientific process is writing the research proposal. "I love writing that grant proposal," Sahi said, "without it there is no project." Sahi has been successful with proposal writing, and has received funds from the United States Department of Agriculture, Environmental Protection Agency, National Institutes of Health and National Science Foundation.

One of those projects deals with excess phosphorus in soil. "Excess phosphorus is a big environmental problem," Sahi said. "When farmers use chicken litter as a nitrogen source for their crop, excess phosphorus in the soil becomes a problem." Through bioremediation and plant biotechnology, Sahi is researching a way to remove the excess phosphorus.

Although Sahi spends great amounts of time on his own research, his focus remains on teaching. "I love teaching freshman biology," Sahi said. "There is always one student who says it was my teaching that made him interested in biology and now it is his major."

Sahi teaches freshman biology, plant biotechnology and molecular biology. "Students contribute a lot to my research; they are focused, do what you tell them and, come in on time," Sahi said.

Although his favorite class to teach may be freshman biology, it is Sahi's upper level classes that draw award-winning attention.

In February, one of his students Deepti Mohamalawari, won first place from the American Society of Agronomy (Southern Branch) on her oral presentation on "Genetic Transformation of Corn and Tobacco by Agrobacterium Tumefaciens."

"It feels great," Sahi said of his student's award. "Being a teacher, it is like a prize for us."

Mohamalawari's research is based upon Sahi's thesis for his doctorate. "Vegetarians would benefit from the research," Sahi said, "because the focus of this research is to alter the genetic composition of the corn by introducing genes for essential amino acids that would increase corn's protein content and make it equivalent to a meat product."

PHOTO BY SHERYL HAGAN-BOOTH

Sahi takes pride and interest in his students' projects. "Their projects are our projects," Sahi said. Sahi takes any chance he gets to combine his projects with his class. He works closely with his students and encourages them to become active in different fields of research.

"If something is interesting, and we want to do it, we do it," Sahi said.

PHOTO BY SHERYL HAGAN-BOOTH

Sahi advises his students not to worry about job relevance in the projects they pick in college to research. "As long as you have learned how to go about the scientific process, they will teach you the rest. Save relevance for graduate school," Sahi said.

Sahi began his own education at Agra in India. He earned his master's degree at Laurentian University in Canada. Sahi did not realize his future in biotechnology until he obtained his doctorate from North Carolina State University. Sahi met and worked closely with a teacher there who got him on the track of molecular biology through research. "It was a fairly new field," Sahi said, "but interesting."

When asked what was next, Sahi said, "I have to get all this done first...then I'll do more grants."