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FOR IMMEDIATE RELEASE

Ruth Patrick's Work Opens Doors for SRNL Environmental Remediation

AIKEN, S.C. (December 10, 2013) – One of the country's leaders in providing the groundwork for modern environmental science is being remembered for her many contributions. Dr. Ruth Patrick died in September at the age of 105. Her lifetime of work helped establish new fields of research and a robust legacy of environmental stewardship. Part of this legacy began in Aiken County at the Savannah River Site. In the 1950's, Dr. Patrick was contracted by the Atomic Energy Agency to create baseline information on the water quality and wildlife at SRS prior to startup of nuclear activities.

Science Fellow Charles Turick leads a field experiment to feed bacteria in an effort to stabilize potential soil contamination.

Dr. Patrick's pioneering studies opened the door for new generations of research in environmental sciences by demonstrating that even subtle changes in the environment can have a significant impact on the ecology of an area. Her work showed that these changes may be both harmful and beneficial. "These changes can have a profound effect on an entire ecosystem," said researcher Charles Turick with the Savannah River National Laboratory (SRNL).

"The role that mankind has on the environment is now recognized as a substantial one," he added. "Dr. Patrick's work helped us understand that and that the effects are

interrelated in a chain of events. As a result, we at SRNL are involved in trying to understand how environmental distress effects the overall environment and how pollution events can be prevented or how we can restore polluted areas."

Turick is leading a research project at SRNL that will provide real-time information in an effort to monitor subsurface conditions on a regular basis. The process uses electrochemical methods to monitor microbes under the ground and transmit that information immediately, eliminating the need to pull physical samples in areas of concern. By measuring the composition of soil, water, and microbes in a particular area, researchers will not only know how to specifically address immediate cleanup needs, they will also be able to generate a database to predict areas of future concern. This research and innovative new technology can be directly traced to Dr. Patrick's work with microscopic algae called diatoms.

"Her work with diatoms was especially well targeted, because diatoms are very common in many environments," Turick said. "Monitoring them and their shifts in population could be done in practically any environment. The idea of pollution shifting populations and the dynamics of any ecosystem could be addressed anywhere. While her work focused mostly on aquatic systems, the same concepts can also be applied to soils and even aquifers. In environmental biotechnology, we look to common types of microorganisms that can be studied and then used for environmental clean-up. This approach ties into some of the basis of Dr. Patrick's work."

One of the key missions at SRNL is to develop biotechnologies to clean up contaminated environments throughout the world. "Our approach can be viewed simply as learning how microorganisms function and then putting them to work to clean up the environment. Going back to Dr. Patrick's work, while she showed that some types of organisms, including diatoms and algae, decline during pollution events, she also showed that some other species are resistant to the pollution."

Some microbes thrive on certain types of contamination. At the Savannah River Site, work with heavy metal pollution like chromium, and radionuclides like uranium are good examples of how bacteria can use contaminants to grow. Researchers then design a strategy to put the bacteria to work. In some cases, if you "feed" the bacteria, they work faster and clean up the environment sooner.

"When we began to understand how some types of soil bacteria can use some metals and radionuclides to grow, we also learned that we could fool some of those bacteria into mistaking electrodes for contaminants," Turick explained. "Now we are developing techniques that allow us to monitor the activity of bacteria that are busy cleaning up the environment. In a way this relates to another aspect of Dr. Patrick's work, that is, multidisciplinary teams. She was one of the first to recognize that scientists from different disciplines can provide their unique insights to a project to drastically increase its impact on the field."

Microbiologists, molecular biologists, engineers, geochemists, and electrochemists at SRNL are working together to increase the depth of knowledge and impact of cleanup projects. This approach is the most cost effective when it comes to developing practical applications for environmental cleanup and environmental monitoring.

Turick is joined by SRNL researchers Charlie Milliken and Hector Colon-Mercado in developing the technology for long term, in place monitoring. Also contributing to the project are researchers from Greenway Energy and Oklahoma State University. The study is funded through the Department of Energy's Laboratory Directed Research and Development program.

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