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## Regional

# Theodorakis studies effects of toxic chemicals

For decades we have been hearing about the effects of toxic chemicals on the environment and on biological organisms – including humans. Yet, even with all of the environmental regulations that have been put into place over the past 50 years, it is still not always clear whether these effects are still getting worse. While we don't have rivers catching fire or eagles going extinct anymore, the negative effect of chemicals have, according to some scientists, become more pronounced.

"It seems like people don't learn the lessons from the past, so we are doing things all over again that might cause problems in the future," said Chris Theodorakis, an associate professor in the department of biological sciences at Southern Illinois University Edwardsville. Theodorakis obtained his bachelor's degree in ecology and evolution from the University of Illinois, his master's in zoology from Ohio State University and his doctorate in life sciences from the University of Tennessee. Experts on the effect of chemicals on the environment – like Theodorakis – are called ecotoxicologists. Among the newer threats to the environment that he cites is nanotechnology, the manipulation of matter at the molecular scale.

"There are many types of particles, such as ultra-fine powders, which are among the things that I study that can be used for polishing agents or abrasion resistant clothing, and that are starting to be produced at huge rates but nobody knows the effects they may have on the environment," Theodorakis said. Another huge problem that he points to is the mass production and disposal of electronic devices, especially in countries without strict environmental regulations.

"There are a lot of issues, such as globalization of pollution and the transport of pollutants from one country to another, either by humans or by the environment," Theodorakis said. "There are problems with heavy metals showing up in the Rocky Mountains National Park that are thought to come through the atmosphere by winds from China, where they don't have strict environmental controls like



Dr. Chris Theodorakis in his lab.

SIUE Photo by Ana Roa

we have." There are tens of thousands of known chemicals and many, according to Theodorakis, have not been tested for toxicity, so we don't really know how serious the problem is.

"In some cases we can predict it," he said. In some cases we could have predicted it but we didn't, like when PCB's (polychlorinated biphenyls) were banned because of their usefulness as fireproofing electrical insulators and electric transformers."

One of the big topics of ecotoxicology now is the indirect effect of chemicals. For example, when chemicals are used to kill excess algae in lakes, they end up killing the fish as well because those chemicals end up in fish that consume the organisms absorbing those chemicals. This unintended consequence is what ecologists call the interruption of the food chain, that when you affect part of it you end up affecting almost everything else.

"In the 70s and the 80s when a lot of

the rivers, especially those in the eastern United States, were heavily polluted they didn't have any fish, so there was no danger to the human population because there were no fish to catch," Theodorakis explained.

"But as the rivers became cleaned, the fish started coming back and started accumulating the chemicals. Some of these chemicals can be concentrated many thousands of times in the fish compared to the water."

## Aldemaro Romero College Talk

Ecotoxicologists like Theodorakis are sort of "doctors" of the environment. "We can predict, suggest ways of preventative health like a doctor does and diagnose the cause of a disease or impact in the environment, similar to what a doctor does," he said. "In fact, some of the techniques from medicine have been adopted in ecotoxicology to figure out whether or not pollution seems to be having effects."

In addition to nanoparticles, Theodorakis said that he believes that there are other new chemicals that can end up creating serious problems. Examples include the brominated and perfluorinated chemicals used for waterproofing products.

"One of the emerging concerns is how all these chemicals will interact with other ecological issues such as climate change," Theodorakis said. "When you have multiple problems in the environment, people are not only impacted by one problem, such as climate change, habitat destruction, chemicals or invasive species. The combined effect is greater than any one alone can produce."

Because of all of these issues, Theodorakis said that he sees a lot of potential for jobs for environmental scientists today and in the future. "Having a degree in something environmental definitely helps you get a job. Graduates can work for governmental agencies and private industry. Companies like Monsanto, Dow Chemical, and Procter & Gamble hire toxicologists. Private consulting firms also hire many in order to help clean up environmental messes or figure out problems." The environment, it seems, is today in need of more "doctors" than ever.

*Aldemaro Romero is the Dean of the College of Arts and Sciences at Southern Illinois University Edwardsville. His show, "Segue," can be heard every Sunday morning at 9 a.m. on WSIE, 88.7 FM. He can be reached at [College\\_Arts\\_Sciences@siue.edu](mailto:College_Arts_Sciences@siue.edu).*