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Regional

Jennings studies environmental pollutants

David Jennings, an assistant professor of biology at Southern Illinois University Edwardsville, studies frogs. While this fact may make him appear as your typical field biologist, he is much more than that. He studies frogs and other animals in order to understand what we humans are doing to the environment.

Born in Raleigh, N.C., he obtained his bachelor's degree in biology from Kansas State University, his master's also in biology from Rutgers University and his doctorate in biology from the University of Colorado. For Jennings, the frog is the ideal subject for studying the environment. Because frogs experience both the land and the aquatic environments, they are very sensitive to environmental changes.

"Their skin is also permeable, so anything in the environment can get through into their bodies," said Jennings. Even temperature may determine the sex of some of these animals. "There are certain enzymes that are involved in converting a male into a female or vice versa.

"Frogs are really interesting because most of them spend half of their lives in water, then they metamorphose from a tadpole into an adult frog that lives on land, and in the process they go through a lot of physiological and anatomical changes," Jennings added. "The frog I have studied is actually a tropical frog. They do not have a tadpole. They lay their eggs on land and they develop directly into adults, so no tadpole, no swimming. They have four legs right away." Unlike most frogs in North America, he explained that frogs in Central America do not have tadpoles.

One area Jennings has been studying is the ability of organisms to respond to

changes to environmental conditions. "I think that one of the things evolutionary biologists have become very interested in is something called evolvability," he said. "And that is how quickly you can respond to certain environmental changes or how flexible your development is, for example."

When it comes to changes that are due to evolution, biologists look at not only changes in the external features of organisms, but also in their physiology and behavior.

"We all use DNA as our information source," he said. "Bacteria, plants, they all use DNA as their information. Among vertebrates the basic genetics are also very similar. We share 99 plus percent of our genetics with mice, but we do not look like them." Although we are genetically so similar, anatomically and physiologically we are not.

"The main thing that people seem to be thinking is that it is not about what genes you have, it is about how you use them, regulate them, when you turn them on or off, how long they are active, how fast they work when they are active," Jennings explained. "It is like having a hammer. You can do a lot of things with a hammer. It is one tool, but the way in which you use it then determines what you actually end up with. Those genes in development work in kind of the same way."

At that is why he chose frogs to study these evolutionary phenomena. "The thing that interests me the most about frogs is their hormones. Thyroid hormone in frogs is the same as thyroid hormone in humans," he said. "So if I can understand how it works, how you turn it on, how you regulate its action, then that is pretty much applicable to any animal that uses thyroid hormone and chances are that we are going to turn on the same gene."

Aldemaro Romero College Talk

Although we have all heard about genetic engineering – and the controversies surrounding it – there is also talk about hormonal engineering. "In fact, there are kinds of conditions that are treated, like short stature,

Jennings said. "If people have a deficit in growth hormone, you can actually get human growth injections to help an individual who is growing slowly to grow faster."

The effects of artificial hormones on humans are also of concern since they are also used in many other applications, such as their extensive use by the poultry industry. "I think that (concern) is certainly true with some of the things like steroids, hormones, thyroid, testosterone and estrogens," he said. "They cross through your cells really easily."

"There are also a number of hormonal-based pesticides that are actually designed to mess up the hormones of the insects," explained Jennings. "Unfortunately hormones in insects and vertebrates are not really that different, so when you introduce hormones into the environment, they can potentially get into and affect wildlife, so that might be one of the reasons for frogs declining. It is that pesticides in the water might be doing that, and might also be affecting human reproduction."

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.



Photo by Randi Papke

Dr. Jennings while carrying out his fieldwork on frogs