By Todd McLeish

Low pH: what's a newt to do?

A new study of eastern red-spotted newts, by a biologist at Bennington College in Vermont, suggests that these amphibians are able to adapt to dramatically different aquatic conditions.

Elizabeth Sherman said that her research is often derived from "serendipitous walks through the forest." On a recent walk in the Green Mountains, she noticed several newts in a pond, and upon testing the water found the pH to be 4, a level acidic enough that she almost didn't believe her results. (Water is considered "neutral" at pH 7; pH 4 is 1,000 times more acidic than pH 7.) She tested several other ponds in the area, with similar results. Later, 15 miles away in the Taconic Mountains, she found newts living in pond water with a pH of 8.

"The chemical properties and buffering capabilities are very different among the Taconic and Green Mountains," Sherman said. "The Taconics are sitting over limestone that buffers the water. When I hike there, the water is very clear, but when I hike in the Greens, the water is tea-colored – an indication of the presence of big organic acids."

Sherman said that low pH (the lower the pH, the more acidic the water) drains amphibians of sodium ions, which are essential to their ability to regulate physiological processes. "If the pH is too low, they become overwhelmed and die," she said. But the Green Mountain newts have adapted to tolerate the unusual conditions.

In a study to assess the newts' pH tolerance, Sherman collected animals from ponds in the Green and Taconic Mountains and placed them in tanks of water with various pH levels. "Everybody did fine in the high-pH water, and everybody did fine in the low pH until it got below 4," Sherman said. "That's when we saw a distinction between the animals from the low-pH ponds and those from high pH-ponds. The high-pH newts from the Taconic Mountains died in the low-pH conditions after about 10 days."

Sherman also tested the newts' water preference by offering them a choice of water taken from Taconic or Green Mountain ponds. The Green Mountain newts had no clear preference, but the Taconic Mountain newts almost always selected Taconic water. In an effort to determine whether pH was the only factor in the newts' water choice, Sherman offered them high- or low-pH water from her laboratory. They all chose high-pH water.

"Here's what I think is going on," said Sherman. "The big organic acids in the low-pH Green Mountain water may be mitigating the problems that low pH typically causes for amphibians. But what's more important is that the newts, and perhaps other animals, may be adapting to conditions that have been presented to them by humans. I'm not seeing newts dropping dead from low pH. I'm not seeing differences in the numbers of newts I'm finding in various ponds. We are now studying whether the differences among the newts from high- and low-pH ponds are due to divergent evolution or phenotypic plasticity."

ELIZABETH SHERMAN

Red-spotted newts were collected by biologist Elizabeth Sherman to test their ability to adapt to varying pH levels.

Pigeons give robots a bird's-eye view

Researchers from Harvard University and the Massachusetts Institute of Technology are attaching high-speed cameras to pigeons to gain insight into how the birds navigate through dense forests and around other obstacles. They believe this information may lead to new developments in robotics and auto-pilot technologies.

"Most bird navigation studies have looked at the larger context of migration," said Harvard's Huai-Ti Lin. "We're interested in short-range path finding, how to get from point A to point B, in the context of the forest environment or obstacles in an urban environment."

Attaching a camera to the birds, and filming them from several other angles, enables the researchers to reconstruct both what the birds see and how they move. Pigeons were selected as study subjects because they are easily trained, are