JOSHUA HANOVER

Faculty Research Mentor: Dr. Catherine Lohmann
Department of Biology

Spotted Salamander, ***Ambystoma maculatum***
(Image credit: http://www.nwrc.usgs.gov/topics/sc_armi/salamanders/images/Ambystoma_maculatum_small.jpg)

The Role of Magnetite-Based Magnetoreception in the Seasonal Migratory Behavior of Spotted Salamanders *(Ambystoma maculatum)*

Some animals demonstrate homing behavior and return to familiar areas even after being transported long distances or spending extended periods of time in different areas. While this homing ability is of great interest to biologists and has been observed in a plethora of species, the mechanisms underlying this behavior are poorly understood. Spotted salamanders *(Ambystoma maculatum)*, native to the eastern region of North America, are one such example. During each reproductive season, adult salamanders emerge from underground burrows and return to their natal ponds to breed. Somehow, salamanders often enter and exit these temporary pools of water from the same direction. It is believed that individuals determine their relative location by detecting the geomagnetic field, an ability called magnetoreception, with the aid of specialized receptor cells containing a magnetic mineral called magnetite (Fe_3O_4). In order to test this hypothesis, wild salamanders were captured and marked with radio-tags as they entered or exited two breeding pools. Half of the captured individuals were then subjected to a strong magnetic pulse, while the others served as controls. A strong magnetic pulse is predicted to disrupt magnetite-based magnetoreception in spotted salamanders and hinder their ability to navigate. The offset between the entry and exit points of pulse magnetized and control salamanders was compared to determine whether navigational abilities were disrupted by the experimental treatment. We predict that pulsed salamanders will enter and exit the breeding pools at different locations, according to our hypothesis that magnetoreception via magnetite-infused receptors affects orientation ability during the breeding season. Our findings will help us understand how spotted salamanders, and possibly other migrating animals, achieve complex spatial navigation. Additionally, understanding the mechanism behind vertebrate magnetoreception could lead to the development of future navigational technology.