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Graduate student Brett Aiello, right, and Assistant Professor Michael Butcher are pictured with one of the turtles that are part of their research in a biology lab in Ward Beecher Hall.

Research contributes to evolutionary understanding

Biological sciences graduate student Brett Aiello has been studying the movements and muscle actions of turtles for nearly a year and is already coming to discoveries he did not expect to find.

“These guys are a *lot* faster than their reputation gives them credit for,” Aiello said about the four South Carolina native turtles he’s using for his master’s thesis research.

Aiello, of Poland, Ohio, is working with Michael Butcher, assistant professor of Biological Sciences, in a lab in Ward Beecher Hall on research that investigates the muscle contraction activity of the turtles.

Butcher and Aiello are using the data to evaluate how the limb muscles affect bone strain and movement, an area that is not well understood, by combining several technologies that have not been attempted all at once in the past. The research makes a significant contribution to understanding the evolution of bone loading from animals of a sprawling position, like turtles, to those in upright stance, said Butcher. It could also ultimately lead biomedical engineers to design new materials for prosthetics or develop other bone repair and reinforcement materials.

“This could help us determine just how much bone strain is based on the counteractive forces that occur as the turtles walk and how much strain is influenced by muscle contractions,” said Butcher.

The team plans to publish an article detailing the research in the *Journal of Experimental Biology*.

To carry out their studies, Aiello first trains the turtles to walk on a small treadmill. “I put a mirror in front of the treadmill,” he said. “They see another turtle and keep moving toward it.”

After a month of training, the team then attaches a small gauge with three electrical sensors to the turtle’s femur. The gauge measures the strain on the bone, sending signals through wires to an amplifier and then to a

computer during the

test trials. They also place special crystals into a major hind limb muscle. These measure the relative length of the muscle at the time of peak bone strain. Two additional electrodes measure the amount of muscle electrical activity with contractions.

Once the gauges are in place, the turtles are tested on the treadmill. One experiment requires 50 walking steps, and an adequate data set requires at least four consistent experiments with four turtles—a process that takes several months.

This is the first time Aiello has worked with live turtles. Having earned his bachelor’s degree in zoology from Miami University of Ohio, he has worked with birds in the past but sees a big difference in training turtles.

“Turtles have more personality than birds,” he said. “It’s rare you get to work hands-on with any live animals, though, so I’ve been grateful for the opportunity here.”

The turtles—affectionately named Big Momma, Slider, Little Girl and Thaddeus—complete the reptile quartet for the research. Aiello spends a great deal of time maintaining a home for them that mimics their natural habitat, with a sizeable tank and powered sun lamps. He’s also careful that the turtles aren’t exposed to many hands for their safety.

“We have a responsibility for the welfare, health and general happiness of these animals,” said Butcher. “And we take that very seriously.”



Graduate student Brett Aiello monitors a turtle on a treadmill.