ECR Spotlight

ECR Spotlight – Jarrod Petersen

ECR Spotlight is a series of interviews with early-career authors from a selection of papers published in Journal of Experimental Biology and aims to promote not only the diversity of early-career researchers (ECRs) working in experimental biology but also the huge variety of animals and physiological systems that are essential for the ‘comparative’ approach. Jarrod Petersen is an author on ‘Effects of ingesting large prey on the kinematics of rectilinear locomotion in Boa constrictor’, published in JEB. Jarrod is a PhD candidate in the lab of Dr Thomas Roberts at Brown University, USA, investigating the ways in which anatomy and muscle physiology allow non-model systems to preform bizarre behaviors, such as large prey ingestion in snakes.

How did you become interested in biology?
I have always been fascinated by how things work and an anatomy class early on in my education helped me integrate this interest with biology. Learning about the beauty and complexity of the interconnected systems of the body over the years has inspired much of my research and career interests. Subsequent study of the comparative anatomy and physiology of animals exposed me to the diversity of their spectacular behaviors, such as the movement of snakes. I often find myself captivated by and driven to investigate how these behaviors that ‘don’t seem possible’ are achieved, much like we did in our recent study in JEB.

Describe your scientific journey and your current research focus
I entered the field of biomechanics through a collaboration with my anatomy professor at Westfield State University where we described and experimentally tested the ‘walking rays’ of the striped searobin, Prionotus evolans. After obtaining my bachelor’s degree in biology, I joined a PhD program in Dr Thomas Roberts’ lab at Brown University where I focused my studies on muscle and movement, and have helped team-teach medical anatomy for several years. I began my research career by studying how muscle functions with the connective tissues that surround it. Then, I developed a series of projects that examine the function of a unique muscle in a non-model system, snakes, during the bizarre behavior of rectilinear locomotion following large prey ingestion. I will be defending my dissertation in the coming weeks and look forward to pursuing anatomy education and muscle mechanics of non-model systems in my future career.

How would you explain the main findings of your paper to a member of the public?
Many snakes, including boa constrictors, can eat prey that exceeds the size of their own heads. Once the difficult task of ingesting large prey is complete, the prey bolus remains inside the snake and distends the body wall and the tissues that line it. Snakes are vulnerable after feeding and need to move to cover to avoid predation; one of their primary modes of locomotion is rectilinear crawling, a straight-line motion that is actuated by several muscles lining the distended body wall. The idea that these muscles can function after they may be elongated extensively in the body wall of fed snakes conflicts with the well-known trade-off in skeletal muscle where muscle force declines as length increases. While some field observations suggest that fed snakes can perform rectilinear crawling, this had not been tested empirically and any potential changes in kinematics were unknown. Our study fed boa constrictors large prey and measured the kinematics of their movement and found that they were not greatly different when compared with those measured before feeding. These results are surprising; rectilinear locomotion appears to be resilient to the demands placed on the snake by a large prey bolus, despite several muscular actuators that are likely elongated along the body wall. Based on the kinematics, we speculated that the muscles lining the body wall rotate and shorten less during rectilinear locomotion in fed snakes, which may reduce the lengthening experienced by these muscles. This study provides evidence suggesting that rectilinear locomotion is resilient to the demands imposed by large prey ingestion and opens up questions surrounding the muscle mechanics and ultrastructure of relevant muscles.

What is the hardest challenge you have faced in the course of your research and how did you overcome it?
I found it difficult to feel comfortable when experiments don’t go according to the plan and when the results of an experiment are confusing and unexpected. Throughout the course of my

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dissertation, I have come to realize that this ‘unknown’ is possibly the most exciting place to be as a scientist. While some experiments are destined to fail, they always teach you something that is useful for moving forward. Acknowledging the idea that confusion is a common result when asking questions that nobody knows the answer to helped my outlook and my work immensely.

What is your favourite animal, and why?
I love snakes because, despite their seemingly unusual body plan, they are capable of astonishing feats and occupy an incredibly diverse array of habitats ranging from marine to arboreal. Behaviors from sidewinding locomotion to large prey ingestion captivate observers of all ages and backgrounds because they are so foreign to what we know and might expect.

What’s next for you?
I am currently and eagerly applying to positions that will allow me to further my interests in muscle physiology and anatomy education.

Reference