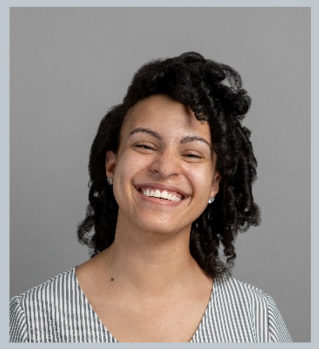
PaleoPerformance: Connections between Paleobiology and Bioinspired Robots



Aja Carter
Carnegie Mellon University

Friday, April 12th, 2024
11:00 AM
Maeder Hall Room 102
Princeton Robotics Special Seminar

Biological inspiration has provided key design subsets of robotics, where there has been an explosion of interest in quadrupedal and bipedal humanoid robots. However, the diversity of available biological designs is constrained by many facets, including geologic and evolutionary history. Throughout Earth's history, there have been abiotic extinctions unrelated to task-based deficits, such as the asteroid event that led to the extinction of non-avian dinosaurs. Moreover, within the paleobiological community, early burst models of evolution suggest that some groups of animals explore more regions of their design space early in their evolutionary history. The challenge of applying these deep-time observations to bio-inspired robotics is that the fossilization process prohibits direct observation of extinct taxa. In this talk, I will introduce and relate paleobiological tenets and their evolutionary significance to bio-inspired robot design. I will then discuss my current work in defossilization techniques, a process that allows paleobiologists to evaluate extinct taxa's performance similarly to living taxa, opening up the biological design space. I will conclude by discussing the future directions of my work, including spined quadrupedal robots.

Aja Carter is a paleobiologist who received her Ph.D. in 2020 from the Earth and Environmental Sciences department at the University of Pennsylvania. Her thesis work focused on the evolution of the spinal column and how the earliest vertebrates transitioned away from the water to land. During that time, she also authored papers on 3D printing technologies to probe the fossil record experimentally. Following her thesis, she was a Vice Provost Postdoctoral Fellow at the University of Pennsylvania, working in the General Robotics Automation Sensing and Perception (GRASP) Lab, with the KodLab Group, advised by Daniel Koditschek. Currently, she is a postdoctoral researcher at Carnegie Mellon University, advised by Aaron Johnson in the Robomechanics lab. Her work is now focused on using the fossil record to inform design of bioinspired spinal columns for quadrupedal robots, as well as understanding the spinal column's role in dynamic gaits within extinct taxa to better understand whole body mobility, and in turn changes in terrestrial ecosystems through deep time.

PRINCETON
Mechanical & Aerospace Engineering