

Friday, May 5th, 2023, 12 PM – 1 PM
Klug Seminar Room, Boelter Hall Penthouse



**Robust running in birds and bots:
Integration of mechanics and control
for robustly stable and agile bipedal
locomotion**

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ABSTRACT: Birds are diverse and agile vertebrates best known for their agility in flight, yet ground birds have a long evolutionary legacy as agile terrestrial bipeds. In the Neuromechanics lab, we use ground birds as animal models to study the integration of mechanics and sensorimotor control for bipedal locomotion. We collaborate with engineers to enable integrative approaches to understanding animal locomotion, and to apply insights from animal locomotion to biologically inspired robots. Legged locomotion involves abrupt transitions in load between the swing and stance phases and requires precise control of leg-substrate interactions to provide body weight support, maintain stability and avoid injury in varied terrain. In this seminar I will highlight findings from experimental biomechanics that reveal how bipedal animals make effective use of compliance, damping, joint mechanical coupling and postural stability mechanisms to achieve robustly stable and agile performance. I will also discuss how our experimental findings from ground birds have been tested in BirdBot as a physical model of avian bipedal locomotion. Birdbot achieves robust and remarkably efficient bipedal gait using a simple feedforward actuation at the hip and intrinsic mechanical control of distal joints through a multi-articular spring network with load-sensitive clutch mechanism in the foot.

BIO: Dr. Monica Daley is a Professor of Ecology and Evolutionary Biology at UCI, where she directs the Neuromechanics lab and the Center for Integrative Movement Sciences. Dr. Daley earned her Ph.D. from Harvard University in Organismic and Evolutionary Biology, investigating muscle-tendon dynamics and biomechanics of bipedal locomotion. Her PhD research was supported by a Predoctoral Fellowship from the Howard Hughes Medical Institute and supervised by Andrew Biewener. After her PhD, Dr. Daley trained in neuromechanics as an NSF Postdoctoral Fellow with Dan Ferris at the University of Michigan. Daley was faculty in the Structure and Motion Lab at the Royal Veterinary College (RVC) from 2008-2019 and joined the UCI Department of Ecology and Evolutionary Biology in Summer 2019.