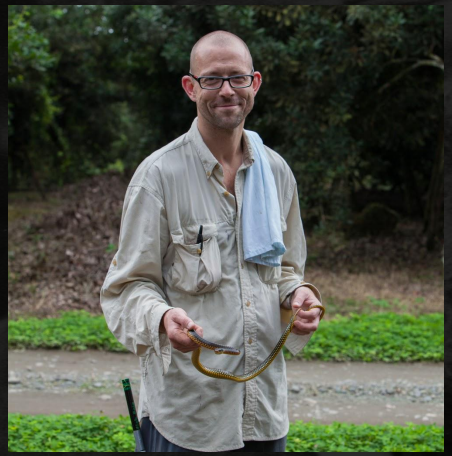
The Mathematical Laws of Morphology and Biomechanics

Tuesday 29th March 2022 noon EDT

Virtual Presentation: https://purdue.webex.com/meet/aselvite



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Non-linear relationships between form and function and the evolution of ecological diversity

Understanding how small-scale variation can give rise to macroevolutionary patterns of diversity has been a significant challenge in evolutionary biology. Natural selection operates on standing variation in populations and as such has been considered to cause only incremental changes in the functional output of biological systems. However, as selection acts on function rather than the underlying genes or anatomical structures changes in performance are required for phenotypes to evolve. Yet, many form to function relationships are non-linear and as such even small or incremental changes may give rise to major changes in the functional output of biological systems and as such allow organisms to occupy novel niches. I will illustrate these ideas with examples of the cranial system of *Podarcis* lizards and will show how modest changes in morphology may push animals across the valley of a fitness landscape to novel adaptive peaks thanks to the non-linearity of form and function due to simple scaling laws. This has allowed these animals on small island to take advantage of novel resources causing major shifts in ecology on ecological time scales.