Title: ***Predicting organismal responses to climate change through biophysical modeling***

Abstract: A core challenge of our time is to predict how organisms will respond to global environmental change. Yet most of our current predictive tools are correlative (statistical) methods that largely overlook the mechanisms underlying organism-environment interactions and thus have a limited capacity to extrapolate responses to unprecedented environmental scenarios. An emerging area of research is committed to developing mechanistic models to capture these interactions – a multidisciplinary endeavor integrating disparate fields such as thermodynamics, physiology, and evolutionary biology. A starting point towards achieving this integration has been to develop biophysical models describing the balances of heat, water and other aspects of energy and mass exchange between organisms and their environment and translate these into metrics of physiological performance and fitness. I will show recent advances in biophysical modeling and examples ranging from simple calculations of body temperature at specific times and locations, to broad-scale patterns including species distributions across both terrestrial and aquatic realms. I will highlight that biophysical models are opening new grounds of research and have the potential to transform ecology into a predictive science.