

JOINT IB DEPT. - MILLER INSTITUTE LECTURE

*commemorating the 60th anniversary of the establishment of the
Adolph C. and Mary Sprague Miller Institute for Basic Research in Science*

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"Organismal and evolutionary responses of insects to variable and changing climates"

**Thursday, September 3
12:30 p.m.
2040 VLSB**

Insects and other terrestrial organisms experience variation in temperature, radiation and other environmental factors at a variety of spatial and temporal scales. I will describe two case studies with insects that consider variation across two temporal scales—diurnal fluctuations in temperature, and decadal changes in recent climate—and their consequences for performance, fitness, selection and evolution. First, experimental studies with *Manduca* (hornworm) larvae show that diurnal temperature fluctuations alter rates of growth, development and survival, due both to the non-linear effects of temperature on performance (thermal performance curves) and to the time-dependent effects of stress and physiological acclimation. We develop a simple model that extends thermal performance curves to incorporate time-dependent effects of heat stress, and predicts growth rates in fluctuating environments. Second, we use historical data, recent experiments, and modeling to evaluate potential evolutionary responses of *Colias* butterflies to recent climate changes. Our empirical studies detect evolutionary shifts in phenotypic traits for some life stages but not others. Our models for the fitness and evolutionary effects of climate on *Colias* adults suggest that weather variability among years causes fluctuations in the fitness landscapes for key thermoregulatory traits, strongly limiting evolutionary responses to overall climate warming.