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**Evolution of emergence strategies in a changing climate**

As the earth’s climates continue to change at increasing rates, the phenological targets that many organisms have for emerging (or germinating/hatching, migrating, breeding) are shifting, and it is becoming increasingly important to understand how organisms can evolve and adapt to deal with these new (and potentially less consistent) targets. How do different climatic regimes select for different emergence strategies? How does the evolutionary history of a population influence how resilient it will be to changes in phenology or climatic variability?

We constructed a general mathematical model to represent different strategies that organisms might use to decide when to emerge. We applied this model to real and simulated climatic data to study how emergence strategies would evolve under different climatic regimes. In general, temperature was a valuable cue in climates with high year-to-year variation but low day-to-day variation. Degree days was the most useful cue when the climate had even small amounts of day-to-day variation, regardless of the level of year-to-year variation. However, because fitness peaks were relatively flat in trait-space, we found that the strategy a population evolved towards was highly contingent upon the starting conditions and vagaries of random mutations. Nonetheless, populations that evolved in different climatic regimes took more or less time to evolve to new regimes. Our work provides a framework for thinking about evolution of emergence, and offers intuitions for how changes in climates may influence the organisms in different regions differently.