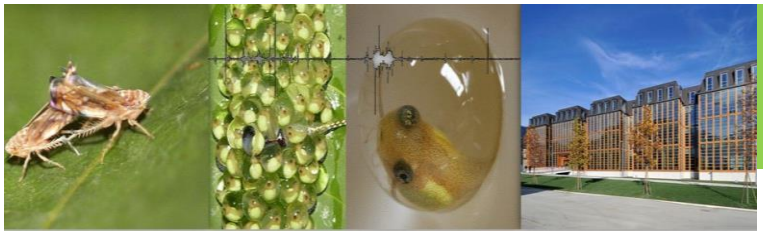

Biotremology 2016

Lecture

What's shaking? Egg vibrations as risk cues in the escape-hatching decisions of embryos

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Many animals time hatching in response to environmental cues to escape dangers or exploit opportunities. The arboreal embryos of red-eyed treefrogs hatch rapidly and prematurely to escape egg-predators and other threats, but at a cost of reduced tadpole survival. Vibrations cue hatching in snake attacks, but eggs on rainforest plants also experience benign disturbances in storms. The egg-clutch vibrations caused by both storms and snakes vary substantially, with overlapping frequency, temporal, and amplitude properties creating a discrimination challenge. To solve this, embryos use a combination of at least six different vibration properties to modulate hatching, making vibration-cued hatching a very specific response. However, the amount of information embryos gather before deciding to hatch depends on the risk, or vibration-sampling time, required; their decision is better informed when information is cheap. Our current research examines developmental changes in embryo behavior. Vibration-cued hatching does not start when embryos first develop a capacity to hatch. It begins later, with vestibular system development, suggesting that ears mediate the hatching response to predators. As embryos develop toward the stage of spontaneous hatching, the cost of induced hatching decreases, reducing selection against false alarms. Thus we expect an ontogenetic decrease in discrimination and a general increase in the hatching response. Nonetheless, some vibration properties are cheaper to assess than others, and ontogenetic changes in decision-making should be sensitive to sampling costs. Consistent with this, discrimination based on a rapidly evident property persists after that based on a property requiring more time to assess has ceased. Vibration-cued hatching offers excellent opportunities to study how animals use messy incidental cues to make high-stakes behavioral decisions, and how this changes with developmentally changing abilities and trade-offs.