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Modeling of Transient Nectar Flow in Hummingbird Tongues
ALEJANDRO RICO-GUEVARA, TAI-HSI FAN, MARGARET RUBEGA, University of Connecticut — We demonstrate that hummingbirds do not pick up floral nectar via capillary action. The long believed capillary rise models were mistaken and unable to predict the dynamic nectar intake process. Instead, hummingbird’s tongue acts as an elastic micropump. Nectar is drawn into the tongue grooves during elastic expansion after the grooves are squeezed flat by the beak. The new model is compared with experimental data from high-speed videos of 18 species and tens of individuals of wild hummingbirds. Self-similarity and transitions of short-to-long time behaviours have been resolved for the nectar flow driven by expansive filling. The transient dynamics is characterized by the relative contributions of negative excess pressure and the apparent area modulus of the tongue grooves.

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