SCHOOL OF BIOLOGICAL SCIENCES SEMINAR

Dr. Gavin Rice

Kansas State University

"Investigating the genetic origins of new body parts in Drosophila"

My lab investigates how novel (new) traits evolve, both the key steps that make the initial morphological shift and how, once established, these traits gain unique attributes. The rapidly evolving genitalia of Drosophila provide a powerful system for studying the developmental basis of morphological novelty. We investigated how the postgonal sheath of Drosophila eugracilis evolved over 150 differently sized projections. Developmental tracking of cellular morphology uncovered that these projections are unicellular. Our previous work showed that the main transcription factor for the larval trichome (unicellular hairs) genetic network, Shavenbaby, and 14 of its known downstream targets were co-opted to the D. eugracilis postgonal sheath to establish this novelty.

Although modulation of the trichome network affects the morphology of unicellular projections, it does not account for the large cellular size seen in some of the D. eugracilis projections. We find that large unicellular projections contain large nuclei, indicating that these cells have undergone localized endoreplication to give rise to polyploid trichome nuclei. These large cells also express the polyploidy-inducing gene fizzy-related during their development. The activation of the larval trichome genetic network in the phallus of Drosophila melanogaster, which naturally lacks these unicellular projections, induces only small unicellular projections. The disruption of shavenbaby in D. eugracilis reduces unicellular projection height but shows no noticeable effect on overall cellular size. This suggests that a second independent genetic network was recruited to the D. eugracilis unicellular projections to induce their large morphs. Our work shows how the co-opted traits may initially evolve as a copy of the co-opted structure and subsequently gain unique attributes through the recruitment of additional genetic networks.

Additionally, we are working on other recently evolved novelties that seem to move between nearby tissues, how the female genitalia evolve, and establishing transgenic tools in species of Drosophila that currently lack them. We hope to use the plethora of novelties that we have identified to understand how often the same genetic networks or cellular mechanisms are co-opted to make similar traits, or if there are many ways to evolve similar structures.

Hosted by
Kristi Montooth

Thursday, October 22nd, 2026 at 3:30 p.m.
Hamilton Hall 112
Zoom Link: https://unl.zoom.us/j/94081044933
Password: sbsseminar

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