

KJELDGAARD Lecture - Daniel Kronauer, PhD

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Daniel Kronauer, PhD
Laboratory of Social Evolution and Behavior
The Rockefeller University, NY

Differentiation, Communication, and Emergence in Ant Societies

Ant colonies function as higher-order complex biological systems, or “superorganisms”, in which the individual ants are analogous to cells in a body, or neurons in a brain. Ants are therefore uniquely suited to address a range of interesting and interconnected problems that cannot be studied in the same way in more conventional model systems. In this talk, I will discuss our recent and ongoing work with the clonal raider ant, a species that uniquely combines the fascinating biology of ants with experimental accessibility. In particular, we use this species to study the following main questions:

-How does behavioral and developmental plasticity arise from the interplay between molecular, environmental, and social factors? This ultimately determines the properties of the individual components, the individual ants, in an ant colony. In a multicellular organism, this would be analogous to cell-type differentiation.

-How do ants perceive and process their sophisticated pheromone language at the level of the brain? Communication between ants in a colony would be analogous to neural or endocrine signaling in a multicellular organism.

- How does communication between the differentiated units give rise to adaptive, group-level phenomena? For example, just like a brain, an ant colony has to integrate different inputs to produce a coherent and appropriate behavioral response.

By pursuing these questions, we hope to gain a better understanding of how ant colonies function at different hierarchical levels, from genes and neurons to individual ants and entire colonies.