

Nutritional Decision-Making in Ants



Preferred Majors: biology/animal behavior (with at least a small math background)
or engineering (if interested in control systems/biomimicry)

Topics: collective behavior, nutrient regulation, distributed problem solving, control systems

Desired Academic Year: freshman - junior, but seniors considered

Location/Campus: ISTB1, Room 303, Tempe Campus

Hours Per Week: 7 – 15 (possibly more later)

Project Description:

Organisms of all shapes and sizes are inherently good at solving complicated (math) problems. If an animal eats, it has to solve the problem of *what* to eat and *how much* to eat—a trickier problem than one would expect. We constantly perform a balancing act: eat too much sugar, for example, and you'll end up with a host of dietary problems. Too little and you won't have enough energy. But once we start adding multiple nutrients to the mix—e.g. carbohydrates and protein—the situation becomes a juggling routine. However, almost all organisms seem to solve this system of equations effortlessly: even humans do, when given enough options!

But now imagine that you and your friends are trying to throw a healthy potluck, a feast with two constraints. Each person can only bring one ingredient and no one is allowed to discuss what they are bringing beforehand. How do you ensure everyone doesn't just bring empty hamburger buns and no one brings the patties? This is the scenario that ants are faced with every day: research has shown that ant colonies regulate their nutrition at the *colony* level. See, the nutritional demands of the colony differ from the individual foragers actually collecting the food: ant larvae, for example, require much more protein than adult ants, yet adults are the only individuals leave the nest. Additionally, because ant colonies are often very large—hundreds of thousands of workers—the foragers do not have direct knowledge of the food collected by their fellows. But somehow the colony manages to “meal plan” in a way to keep everyone happy.

How do they do it? This is the main research avenue that I, and any accepted applicant, will be pursuing. Using local ant species and tropical colonies I have collected from Panama, we will be testing what colonies eat, which ants collect the food, how they regulate intake, and what their strategies are. Unsolved research questions related to this topic abound. The applicant's role as a researcher would be to create artificial diets and feed/maintain the ant colonies, as well as collecting data. Dependability, consistency, and attention to detail are required. (A familiarity with mathematics is also ideal.) The student will be invited to lab meetings to discuss stimulating new research and should ultimately have ample opportunity to formulate his/her own project.

Application Instructions and Contact Information:

Send an email to Andrew Burchill at andrew.burchill@asu.edu with

- 1) why you are interested in *this* project
- 2) a very brief summary of your research experience
- 3) what are your career goals
- 4) any questions you may have
- 5) your CV attached