



November 9, 2011

Species Interactions: More than the Sum of their Parts

Introduction:

Interactions between species drive evolution and underlie many aspects of our world that we take for granted. Almost all plants and animals rely on other organisms to grow and survive: from fungal associations in the roots of land plants, to nutritional microbes living in animal guts, to bacteria that can produce energy from sulfur and allow life to thrive in the deep sea. These relationships are not always amiable, and some mutualisms can shift to parasitism when conditions change. Unseen microbes affect the functioning of countless organisms—including food crops, insects, and humans—and these complex interactions can be disrupted by small changes to the climate or the environment.



How Symbiosis Created the World:

Jon Sanders is a fourth-year PhD Candidate in Organismic and Evolutionary Biology at Harvard. He studies evolution in the complex relationships between symbiotic bacteria and their host animals; coadvised by Drs. Naomi Pierce and Peter Girguis, his projects range from the gut microbes in rainforest ants to the bacteria inhabiting the gills of deep-sea snails. While most of his time these days is spent writing or analyzing data, Jon does get out occasionally to take pictures of ants in the jungle, ride his bike, and tend his flock of backyard chickens.



Most Organisms Cannot Live on Their Own:

Shelbi Russell is a second-year PhD student at Harvard University, advised by Dr. Colleen Cavanaugh. She is fascinated by symbiotic relationships between organisms, from animals to bacteria. Her research is driven by a desire to understand the diversity of these associations, how these intimate relationships evolve, and how symbiosis is maintained from generation to generation. When she is not out collecting marine bivalves from sulfidic coastal sediments or studying them in the lab, she can be found at the park with her 8-year-old Labrador, biking, scuba diving, taking pictures, or knitting.



Power Struggles and Partnerships:

Leonora Bittleston is a second-year PhD student co-advised in the Pierce and Pringle Labs in the department of Organismic and Evolutionary Biology at Harvard. She loves tiny creatures, and studies how multi-species interactions between insects, fungi, and plants affect ecological patterns and evolution. She spent last summer inspecting the contents of carnivorous plants in a Massachusetts swamp, and hopes to do comparative work in Southeast Asia. In her free time, Leonora likes to cook big dinners for friends, hike in the mountains, and draw or paint.

Join us for a tour of a species interactions laboratory following the lecture

Thank you for attending our fall lecture series! We hope to see you in the future!

<http://sitn.hms.harvard.edu>

Glossary:

Aerobic: requiring oxygen -- for instance, organisms which need oxygen to breath.

Anaerobic: requiring the absence of oxygen. Some organisms perish in the presence of oxygen.

Amensalism: a species interaction in which one party is damaged and the other unaffected; for example, when you unknowingly step on an insect.

Chemosynthetic Bacteria: bacteria that oxidize reduced chemicals for energy to live and make organic molecules from carbon dioxide.

Cheating: when one partner receives benefit but gives little or nothing in return.

Colonization: to settle in a place to live.

Commensalism: a species interaction in which one party benefits and the other is unaffected; for example, small insects which live in ant nests.

Competition: when difference species compete for the same resource; for example, weeds growing in a garden.

Division of Labor: dividing tasks among members of a group so that each member can specialize in a particular task.

Entropy: disorder in a system.

Herbivory: the eating of living plants.

Host: an animal or plant on or in which another organism lives.

Mutualism: a species interaction in which both parties benefit; for example, ants which defend a plant from herbivores in exchange for food and shelter.

Parasitism: a species interaction in which one party benefits and the other is damaged; for example, fleas on your pet dog or cat.

Partner Feedback: repeated interactions where one partner provides a benefit to another that makes it more fit, and this feeds back into a positive effect on the first partner.

Photosynthesis: a chemical reaction in which light energy is used to reduce carbon dioxide to organic carbon. See 'redox.'

Predation: one animal killing and consuming another for food.

Redox: reduction/oxidation reactions; these chemical reactions involve the transfer of electrons (energy) from one chemical to another. For example, when natural gas (methane) is burned (oxidized), electrons are transferred from the methane to oxygen, which is reduced to water.

Sanctions: punishments or resource cut-offs imposed by one partner on a cheating partner.

Symbiont: either of two organisms that live in symbiosis with one another, but here we commonly use it to refer to the species that are smaller and live on or within the other species (the host).

Symbiosis: a species interaction in which the participants live in close proximity to one another. Symbioses may be positive, negative, or neutral for the participants.

For more information:

- University of Michigan online lesson about ecological communities and species interactions: http://www.globalchange.umich.edu/globalchange1/current/lectures/ecol_com/ecol_com.html
- UC Berkeley's Evolution 101: <http://evolution.berkeley.edu/evosite/evo101/index.shtml>
- Live camera of leaf-cutting ants at University of Wisconsin: <http://currielab.wisc.edu/antcam/>
- Jon's mutualism blog essays: <http://hoursbyhours.blogspot.com/search/label/mutualism%20monday>