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Lessons from ants on collectively developing systems

Abstract: Many successes in life are based on collaboration. Microorganisms exchange nutrients through cross-feeding, and multicellular organisms are made up of tissues with different metabolic roles and needs. Social insects take this collaboration still further, integrating their behavior and physiology to the extent that a colony can be considered a superorganism. Many ant colonies engage in social exchanges of experimentally accessible fluids that contain both exogenously sourced and endogenously produced materials in a behavior called trophallaxis. Some species engage in this behavior infrequently and only in the presence of certain cues, while others perform trophallaxis so frequently that this network of fluid exchange creates a social circulatory system that mediates a form of shared metabolism. I will describe our work on how the endogenously produced proteins transmitted in these fluids relate to colony life in the carpenter ant, how trophallaxis allows a metabolic division of labor and how the globalization of processed goods over the trophallactic network has far-reaching implications for aging, ecology, evolution and development.



Adria LeBoeuf is an Assistant Professor heading the Lab of Social Fluids at the University of Fribourg in Switzerland. Her lab studies socially transmitted materials and the fascinating consequences of their evolution, from developmental manipulation to collective behavior. She received her BA in Biology from the College of Creative Studies at University of California, Santa Barbara. After a PhD in sensory biophysics with Jim Hudspeth at Rockefeller University, Adria shifted from the nano-scale up to the evolutionary and organismal scale, when she began studying ants, socially exchanged fluids, and their evolution and transmission at University of Lausanne and later at the Weizmann Institute of Science. In 2019 she began her research group where she and her team focus on how evolution has engineered social life, in particular, through socially exchanged fluids, and how bioactive materials can be produced, transmitted and act upon others. She has been awarded grants from numerous organizations including the National Institutes of Health, Swiss National Science Foundation, Novartis Foundation and Human Frontiers Science Program.