“Modulation of social networks and individual behavioural trajectories in ants”

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In this talk, I will first discuss mechanisms regulating division of labor. By using an automated tracking system, we followed >500 individuals over >100 days and constructed networks of physical contacts to provide a continuous measure of worker social maturity. These analyses revealed that most workers occupied one of two steady states, namely a low-maturity nurse state and a high-maturity forager state, with the remaining workers rapidly transitioning between these states. There was considerable variation in the age at transition, and, surprisingly, the transition probability was age independent. This suggests that the transition is largely stochastic rather than a hard-wired age-dependent physiological change. Despite the variation in timing, the transition dynamics were highly stereotyped. Transitioning workers moved from the nurse to the forager state according to an S-shaped trajectory, and only began foraging after completing the transition. Stochastic switching, which occurs in many other biological systems, may provide ant colonies with robustness to extrinsic perturbations by allowing the colony to decouple its division of labor from its demography. In the second part of the talk, I will show that ants can alter their social networks in the presence of pathogens. By using a combination of automated tracking, controlled pathogen exposure, transmission quantification, and temporally explicit simulations we found that pathogen exposure induced behavioral changes in both exposed ants and their nestmates, which helped contain the disease by reinforcing key transmission-inhibitory properties of the colony’s contact network. This suggests that social network plasticity in response to pathogens is an effective strategy for mitigating the effects of disease in social groups.