

**OR158**

*A mutualistic network of ants, aphids and gut microbes*

**Aniek Ivens, Daniel Kronauer**

Gut bacteria are increasingly recognized as crucial players in digestion and nutrient uptake in social insects. In fact, colonization of termite and ant guts by specialized intestinal bacteria may have facilitated the use of new food sources by their insect hosts. Likewise, aphid endosymbionts play important roles in amino acid synthesis from nutrient poor plant sap, thereby allowing aphids to survive on a diet of plant phloem sap only. In ant-aphid mutualisms, ants protect and groom aphids in exchange for sugar-rich honeydew excreted by the aphids. Microbes are active on both sides of this nutrient transfer: while endosymbiotic microbes in the aphids determine the biochemical composition of the honeydew, those in the ant gut facilitate nutrient uptake from the honeydew. Ant-aphid mutualisms therefore provide a unique opportunity to study the coevolutionary dynamics between microbiomes in distinct but interacting insect hosts. Here we focus on a subterranean ant-aphid-microbe interaction network found in forests in the North-Eastern United States. In this hitherto poorly characterized system, three *Lasius* ant species tend aphids inside their nests. The tended aphids belong to multiple species in the genera *Prociphilus* and *Stomaphis*. Using a combination of field sampling, DNA barcoding and next-generation microbiome sequencing, we characterized this mutualistic interaction network in terms of species interactions, host and microbiome genotypic covariance, and levels of specialization. Our findings show that the network is of moderate complexity, with varying levels of specialization between the players involved. This, in combination with the ease with which the species can be sampled in the field and kept under laboratory conditions, indicates that this is a potentially powerful new model system to study the role of microbiomes in both nutrient uptake and excretion across species boundaries.