

Postdoctoral position in microbial interactions between ants and social parasite beetles (Parker Lab)

Research focus

A postdoctoral position is available to study the impact of endosymbiont microbes on animal-animal symbiotic relationships in the lab of Joe Parker at the California Institute of Technology.

Work in the Parker lab is focused on social and symbiotic relationships between animals. We use a unique system to explore these phenomena: the convergent evolution of social parasitism of ant colonies by rove beetles (family Staphylinidae). Rove beetles comprise the largest metazoan family (64,000 species), and include multiple lineages that have evolved to infiltrate ant societies, employing behavioral, anatomical and chemical adaptations. The Parker lab studies these adaptations at the molecular and neurobiological levels. We are now seeking a postdoctoral researcher to probe the endosymbiotic microbiota of rove beetles and their host ants, to address how communities of microbes and multicellular organisms influence each other's evolution and function.

The successful candidate will spearhead community metabarcoding and metagenomics of ants and social parasite rove beetles to uncover microbial interactions within and between these animal species. The focal system is a model ant-beetle symbiosis that has evolved in the South Western US, in which multiple rove beetle lineages have convergently evolved to infiltrate colonies of a single ant genus. This project involves fieldwork at local sites near Caltech, as well as in Southern Arizona. To better understand how microbes influence social and symbiotic interactions between these species, experimental laboratory manipulations of beetle and ant microbiomes will be pursued, together with phenotypic analysis of behavior and chemical ecology. Inferences about how the evolution of animal interactions impacts the microbiome will be pursued by comparative studies of the microbiota of parasitic and related, free-living beetles. There is substantial opportunity to collaborate with other microbiology labs at both Caltech and the University of Southern California, as well as collaboration with theoretical biologists to develop empirically-based models of multilevel, microbe-animal networks.

The following papers illustrate the rove beetle-ant symbiosis:

Maruyama, M., and Parker, J. (2017) Deep-Time Convergence in Rove Beetle Symbionts of Army Ants. *Current Biology*, 27, 920–926 PMID: 28285995

Yamamoto, S.†, Maruyama, M. and Parker, J. (2016) Evidence for Social Parasitism of Early Insect Societies by Cretaceous Rove Beetles. *Nature Communications*, 7: 13658 PMID: 27929066

Parker, J., Eldredge, K.T., Thomas, I.M., Davis, S., Coleman, R.T. (2018) *Hox*-Logic of Preadaptations for Social Insect Symbiosis in Rove Beetles. *bioRxiv*, 198945

Candidates

Applications are encouraged from talented and motivated individuals who have a Ph.D. or are nearing completion of their Ph.D. with experience in microbial ecology, microbiome sequencing, bioinformatics and metagenomics. Interest or experience in insect biology, behavioral analysis and chemical ecology is desirable but not essential. Top candidates will have a strong track record of research productivity, excellent communication skills, enthusiasm for basic research and a collegial approach to science.

Candidates should provide a cover letter, a detailed CV, and names and contact details for three references. For more information, or to apply, please contact joep@caltech.edu

Start Date and Project Duration

The start date is flexible and depends on the candidate. Preference is for candidates who can start in Fall 2019. The position is funded for two years at least and potentially longer depending on progress.

The California Institute of Technology

Caltech is consistently ranked among the top research universities in the world and hosts a diverse and collaborative scientific community. Caltech is located in Pasadena, California, a vibrant city 10 miles northeast of downtown Los Angeles and minutes from the Parker lab's fieldwork sites in the San Gabriel mountains. More info about the Parker lab: <https://www.bbe.caltech.edu/content/joseph-parker>

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