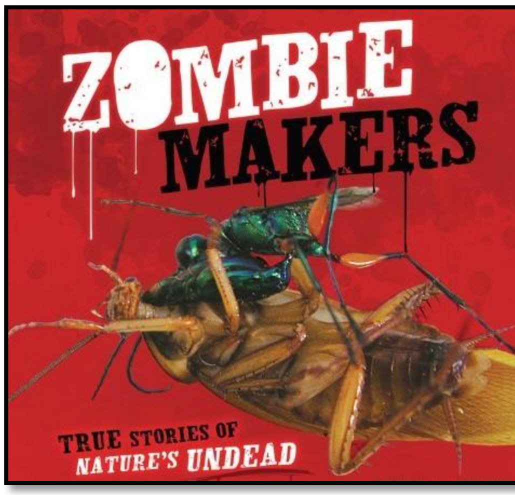
In Prof. Frederic Libersat lab

Opening positions for highly motivated MSc or PhD students interested in the field of Neuro-parasitology: Mechanisms of host behavior, chemical manipulation by a parasitoid wasp.



Objective 1 Venom and cerebral protein expression analysis: proteomics analysis. First, to identify the venom components and which peptides/proteins venom components are good candidates in the behavioral manipulation. Second, to identify proteomics changes in the cerebral ganglia which are involved in the behavioral manipulation.

Objective 2 The role of the head ganglia in the long lasting lethargic state: Employing the high temporal resolution of extra-cellular multi-neuron recordings, we will identify the microcircuits in the cockroach's brain that are involved in providing descending control over thoracic locomotor circuits.

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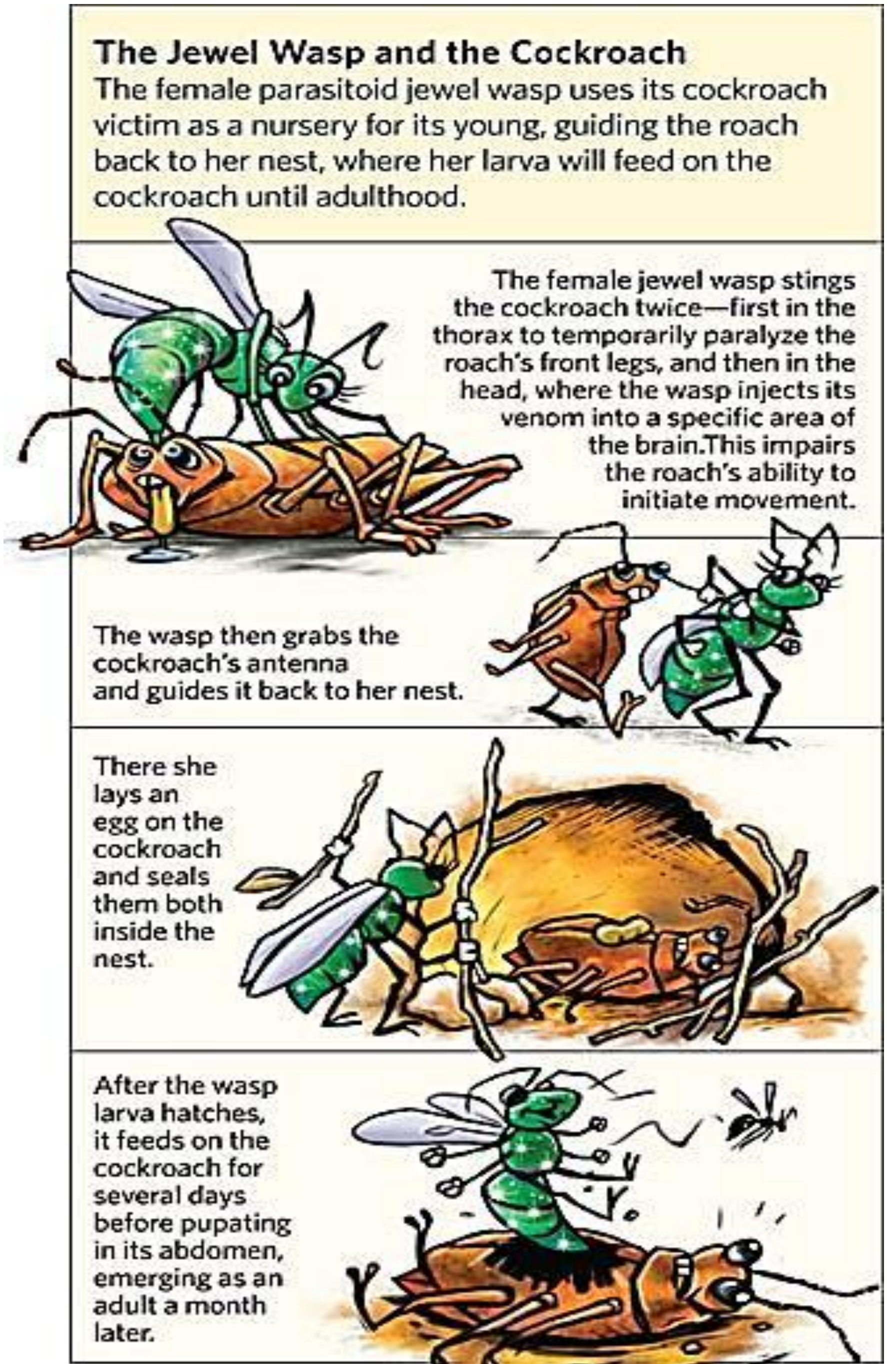

SCOTT YOUTSEY/MIRACLE STUDIOS

Scientific Abstract of Research topic in Libersat's Laboratory

Neuro-parasitology is an emerging branch of science that deals with parasites that can control the nervous system of the host. The parasitoid wasp Ampulex compressa delivers a sting precisely into the cerebral ganglia of its host, the American cockroach. This sting does not paralyze the cockroach but rather reduces its ability to spontaneously generate movements. So far, our investigation of this unique behavioral manipulation revealed a possible neuronal substrate involved in the regulation of spontaneity in insects. In the present proposal, our goal is to identify the molecular and cellular mechanisms underlying this venom-induced manipulation. Our working hypothesis is that venom contains several components that contribute, in a sequence, to the induction of lethargic sleep like state in the cockroach. First, we hypothesize that the venom components interact with neurons and circuity via changes in proteins expression. Hence, we will further identify such components and their targets. Second, we hypothesize that wasp induces analgesia in the host to allow, for instance, host feeding. Thereafter, we hypothesize that the venom induced lethargic state in cockroaches might represent an extreme version of the quiescent/sleep state and both states might be controlled by the head ganglia. Our 1st objective, using proteomics analysis, is to identify the venom components and proteins expression changes in the cerebral ganglia that are promising candidates in the behavioral manipulation. Our 2nd objective is to identify, using electrophysiology, the microcircuits in the cockroach's head ganglia involved in providing descending control over thoracic locomotory circuits and affected by the wasp venom. Our 3rd objective is to unravel the cockroach noxious pathway and explore its gating by the wasp venom on the opioid system in the lethargic state. Our 4th objective is to explore whether the long lasting lethargic state is associated with changes in synaptic connectivity in the cerebral ganglia as it occurs during sleep-like state in insects.

Although many fascinating examples of behavioral hosts' manipulation have been reported, one of the most explored and best understood examples is probably the wasp cockroach model -system. Hence while understanding of the neural mechanisms of parasitic manipulation is still lacking, our system provides an excellent model in neuroparasitology for some major advances now and in the close future.