Carolina Rezaval

University of Birmingham, UK

From Stimulus to Action: How the Brain Balances and Sex and Survival Needs

When forced to choose between fundamental needs, making the wrong decision could prove fatal. However, it is currently unclear how alternative options are evaluated and appropriate actions are prioritised. To tackle this problem, we developed an experimental system to study the neural circuit mechanisms that integrate the benefit of imminent courtship success with the risk of predation in Drosophila. By combining our novel behavioural assay with neurogenetics, connectomics and live imaging, we identified the neural circuitry that establishes behavioural priority during this 'life-death' conflict. Crucially, we found that the probability of mating success defines the decision to reproduce or flee. Our work reveals how the brain weighs up antagonistic advantages and risks, and the probability of success, at a cellular-circuit level.

Elim Hong

Sorbonne University, France

Elucidating mechanisms underlying competitive selection of neural circuits that modulate aversive behavior

The correct selection of an appropriate behavioral response to external stimuli is crucial for the survival of animals. The evolutionarily conserved habenulo-interpeduncular nucleus (Hb-IPN) pathway, which connects the limbic forebrain to the midbrain, consists of cholinergic and non-cholinergic neurons that mediate different aversive behaviors. By combining calcium imaging, electrical stimulation and pharmacological methods, we found that the synchronized activation of cholinergic neurons inhibits neurotransmission in the non-cholinergic neurons via presynaptic $GABA_B$ receptors in the axon terminals. The hardwired atypical mode of retrograde inhibition leading to the competition of distinct circuits at their terminals provides a physiological framework to explore the relationship between differences in aversive responses. Recent work on molecular mechanisms that contribute to the functional patterning of the habenular circuitry will also be presented.

Pauline FLEISCHMANN

University of Oldenburg, Germany

Neuroethology of insect magnetoreception

The earth's magnetic field, or geomagnetic field (GMF), offers different cues that can potentially be used for spatial orientation by animals. Best known examples are migratory species such as birds and sea turtles that use the inclination of the GMF to find their ways during their long-distance migrations across the globe. Migratory insects such as butterflies and moths also make use of magnetic information for their journeys. However, the GMF can also be useful for navigation over shorter distances. *Cataglyphis* desert ants rely on the GMF to align their gaze directions towards their nest entrance during initial learning walks at the beginning of their foraging lives. Recent findings revealed that the ants have a polarity-sensitive magnetic compass indicating that the underlying mechanism for magnetoreception differs from the one suggested for migratory animal species. Furthermore, when exposed to experimentally altered magnetic fields, ants show differences in the neuroplasticity induced in the mushroom bodies, centers for learning and memory, and in the central complex, the navigation center in the insect brain, when compared to ants under natural conditions. For these reasons, *Cataglyphis* desert ants are very promising experimental models to study the neuroethology of insect magnetoreception.

Adrien MEGUERDITCHIAN

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The Origin of Language: Insight from neuroethology of gestural communication in nonhuman primates

Language is an unique communicative system involving hemispheric lateralization of the brain. To discuss the question of its origins, I will highlight the works on the communicative gestures in our primate cousins and their brain correlates. Indeed, nonhuman primates communicate mostly communicate not only with a rich vocal repertoire but also with manual and body gestures. In the last 20 years, we investigated this gestural system in the baboons Papio anubis, an Old World monkey species, as well as its lateralization and cortical correlates across development, using both ethological, psychology and longitudinal noninvasive in vivo brain imaging approach (MRI). In the present talk, I will summarize our main findings showing similar key intentional, referential “domain general” properties of language as well as some similar underlying structural hemispheric specialization including Broca, the Planum Temporale and the STS. I will also present our recent MRI longitudinal work documenting their brain ontogeny from birth and how they pave the way for the further emergence of gesture lateralization across development.