

The Monarch butterfly compass - from neurons to behavior

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Each fall, millions of Monarch butterflies migrate over more than 4.000 km from North America and Canada to their overwintering habitat in the mountain ranges of Central Mexico. To maintain their direction, these butterflies rely on the sun as their main orientation reference. In my group, we are interested in understanding how these fragile butterflies use the sun for orientation to maintain a directed migratory direction and how they master such a remarkable migration in spite of exhibiting a brain that is smaller than a grain of rice. We are studying the sun compass of monarch butterflies through behavioral and neuroanatomical techniques, as well as through electrophysiological approaches, such as multichannel tetrode recordings from tethered-flying butterflies. Our recent results suggest that the Monarch butterfly compass relies on multimodal information for orientation. During flight, this multimodal information is processed within an allocentric frame of reference in the brain, the ideal strategy for maintaining a migratory heading over large distances. Because of their behavioral and electrophysiological accessibility, Monarch butterflies represent the optimal model organism to study animal navigation – from the neural principles in the brain to the migratory strategies exhibited in their behavior.