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“Defining the neuronal circuitry of fear”

Abstract:

Classical fear conditioning is one of the most powerful models for studying the neuronal substrates of associative learning and for investigating how plasticity in defined neuronal circuits causes behavioral changes. In animals and humans, the amygdala is a key brain structure within a larger neuronal network mediating the acquisition, expression and extinction of fear memories. In my talk, I will review emerging concepts in the organization and function of the neuronal circuitry of fear learning and extinction. In particular, I will summarize recent progress in understanding how switches in the activity of distinct types of amygdala neurons mediate rapid changes in fear behavior and anxiety. I will show that functionally, anatomically and genetically defined types of amygdala neurons are precisely connected within the local circuitry and within larger-scale neuronal networks and that they contribute to specific aspects of fear learning and extinction. Finally, I will discuss how inhibitory circuits contribute to the acquisition and expression of fear and extinction memories by multiple mechanisms and at multiple levels. The talk aims at illustrating how the convergence of molecular, electrophysiological and optical approaches has enriched our understanding of the neuronal basis of fear conditioning and of learning and memory in general.