
Cognition in a miniature Brain - Performance and Mechanisms

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Résumé

Honeybees possess miniature brains but exhibit a sophisticated behavioral repertoire. Besides being useful models for the study of simple forms of associative learning (e.g. odor-sucrose and color-sucrose associations), bees have emerged as attractive organisms for the study of higher-order forms of learning, both in the visual and in the olfactory domains. In the last two decades, our work has revealed that these insects possess unsuspected cognitive capabilities, which surpass the acquisition of simple associations. Capacities such as categorization, selective attention, conceptual forms of learning, numerosity and non-linear discrimination have been documented in honey bees, thus raising the questions of the neural architectures mediating them and of the peculiarity of bees with respect to other invertebrates. Here I will discuss some of these findings and provide insights into their mechanistic bases, in an attempt to trace them down to specific circuits and neuromodulatory processes whenever this is possible. In doing this, I will highlight experimental challenges and suggest future directions for investigating the neurobiology of higher-order learning in insects, with the goal of uncovering basic neural architectures underlying cognitive processing.

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