



Invertebrate Learning and Memory: Chapter 41. Olfactory and Visual Learning in Cockroaches and Crickets (Handbook of Behavioral Neuroscience)

Makoto Mizunami, Yukihiisa Matsumoto, Hidehiro Watanabe, Hiroshi Nishino

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Crickets (*Gryllus bimaculatus*) and cockroaches (*Periplaneta americana*) have emerged as pertinent models for studying the neural basis of learning and memory. This is partly because they have excellent capabilities for olfactory and visual learning and partly because their rather large brains allow detailed physiological, pharmacological, and microsurgical analyses of the underlying neural mechanisms. Studies on crickets have documented the roles of octopaminergic and dopaminergic neurons in acquisition and retrieval of memory and have also shown a serial arrangement of the NO–cGMP cascade, cyclic nucleotide-gated channel, and calcium/calmodulin system for long-term memory formation. Studies on cockroaches suggest roles of the mushroom body in olfactory learning and visual place learning. Newer techniques, such as RNA interference (for crickets and cockroaches) and transgenesis (for crickets), have been successfully applied to these insects, which should help advance the study of cellular and molecular mechanisms underlying learning and memory.

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