Mushroom-bodies regulate habit formation in *Drosophila*

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S28: The neurobiology of choice and decision-making.

Decisions, Decisions

CHOICE

Spontaneous choice behavior

www.breadwin.com

Drosophila at the Torque Meter

Spontaneous choice in a constant environment

How flies use re-afferent feedback to modulate this spontaneous choice behavior

Feedback Stimuli

Fly drawing courtesy of Reinhard Wolf

Associative Learning

The dichotomy of operant and classical conditioning

Composite conditioning

Classical
(fact-learning)
component

Operant
(skill-learning)
component

Dissecting Operant Learning

Nature Precedings : doi:10.1038/npre.2008.2171.1 : Posted 12 Aug 2008

PI [rel. units]

Brembs and Plendl, Curr. Biol. (2008, in press)

Multiple Memory Systems

Operant and classical components interact hierarchically

Brembs & Heisenberg (2000)

Isolating the Components

Training:
operant + classical

Test:

Classical + operant components

Operant component alone

Classical component alone

Brembs & Heisenberg (2000)

Mushroom-Bodies central

...for keeping classical memories flexible for generalization

- Mushroom-bodies mediate inhibition of operant learning
- Mushroom-bodies enable flexible generalization
- Mushroom-bodies delay acquisition of stereotyped, habitual responses

Complex, Hierarchical Interactions

between multiple memory systems instead of a simple dichotomy