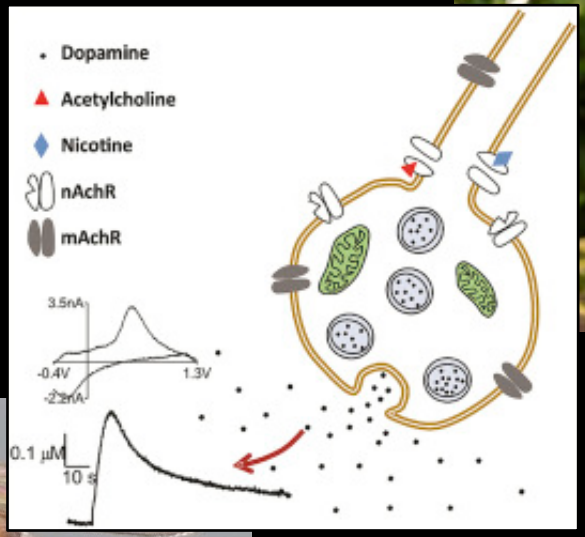
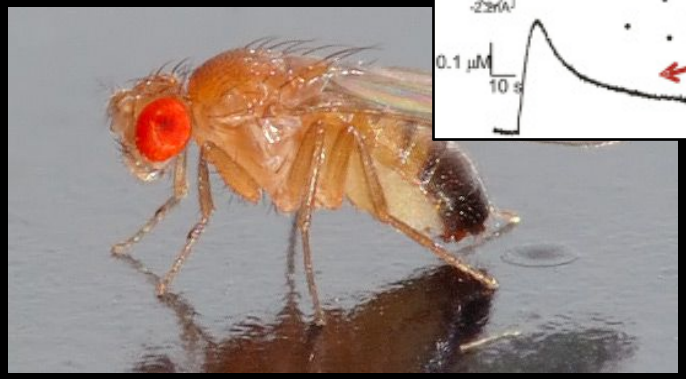
biology Seminar Friday 4:10 B19 –

"***A Drosophila model for developmental nicotine exposure"*** -
Dr. Norma Velazquez-Ulloa - Lewis and Clark College

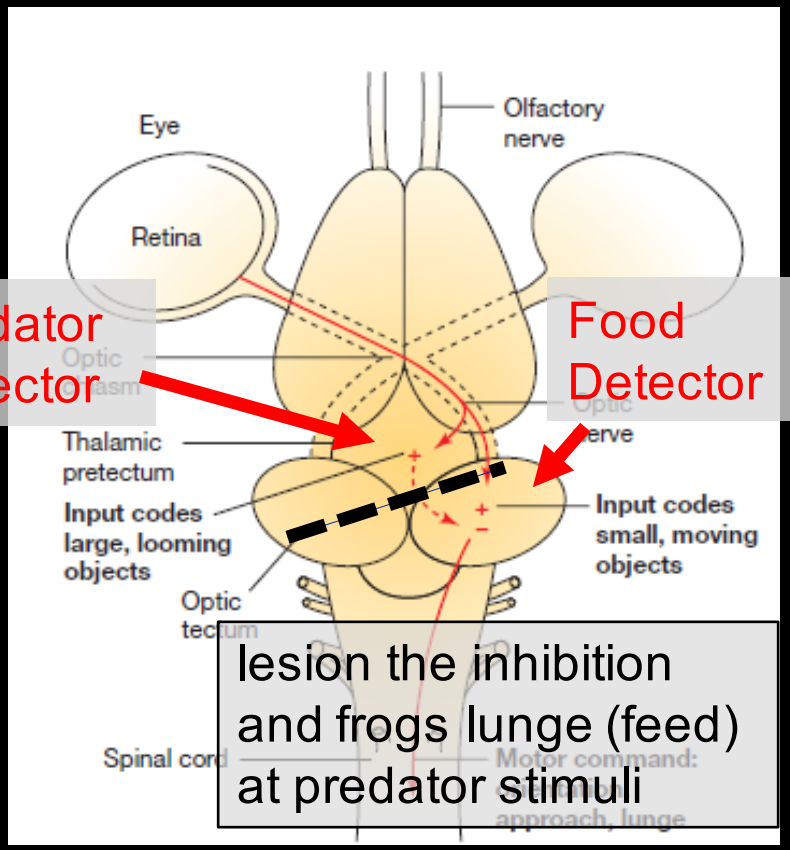




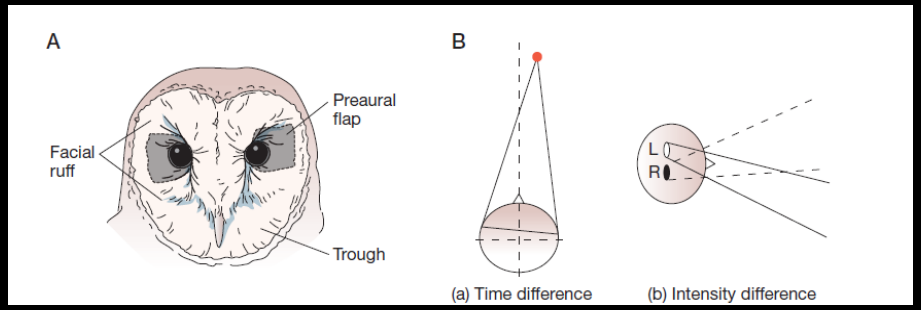
PROCEEDINGS OF THE IRE November

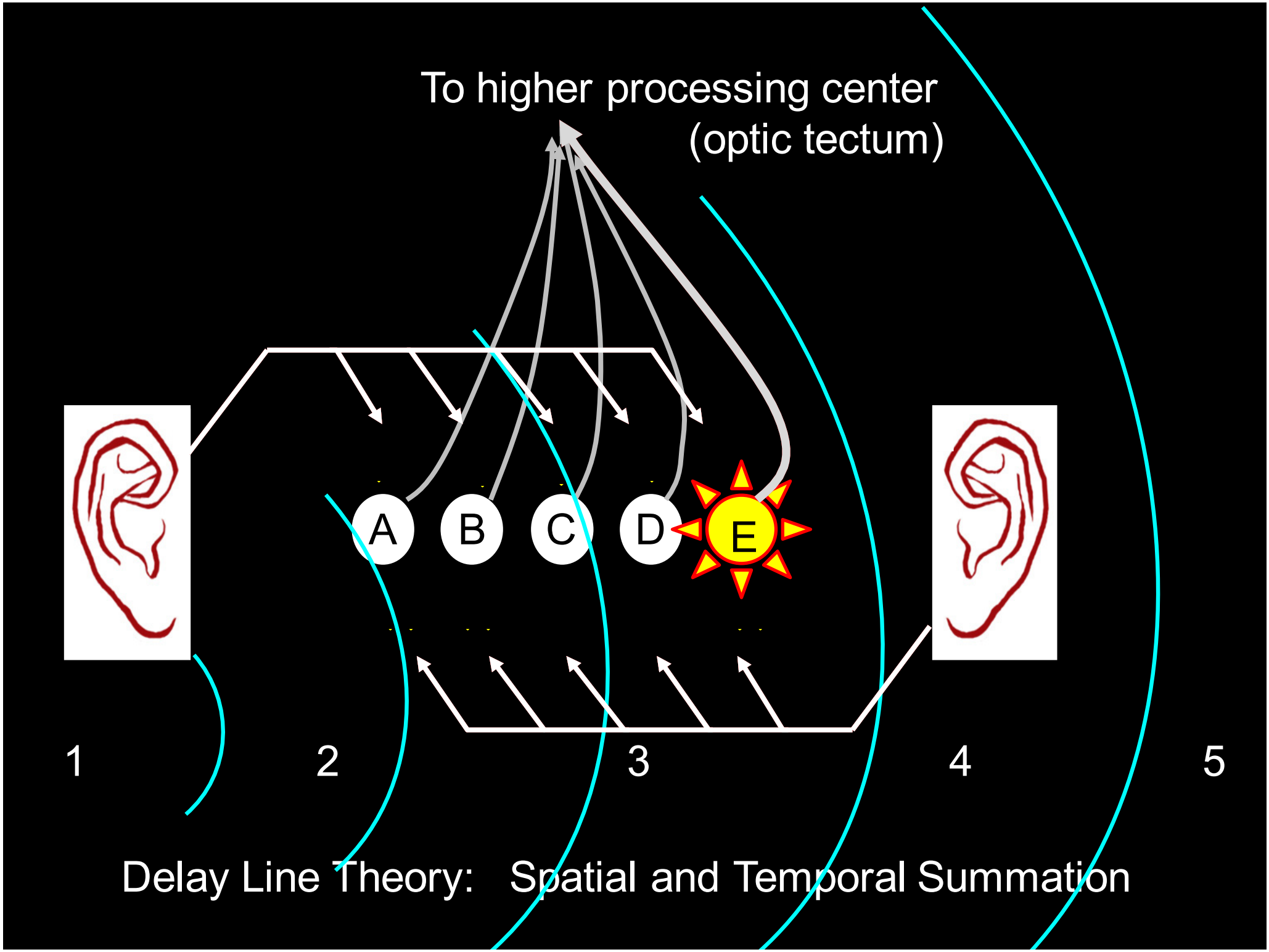
What the Frog's Eye Tells the Frog's Brain*

J. Y. LETTVIN†, H. R. MATURANA‡, W. S. McCULLOCH‖, SENIOR MEMBER, IRE, AND W. H. PITTS‖



"feature detectors" to process stimuli


A
Facial ruff
Preaural flap
Trough
B
L
R
(a) Time difference
(b) Intensity difference

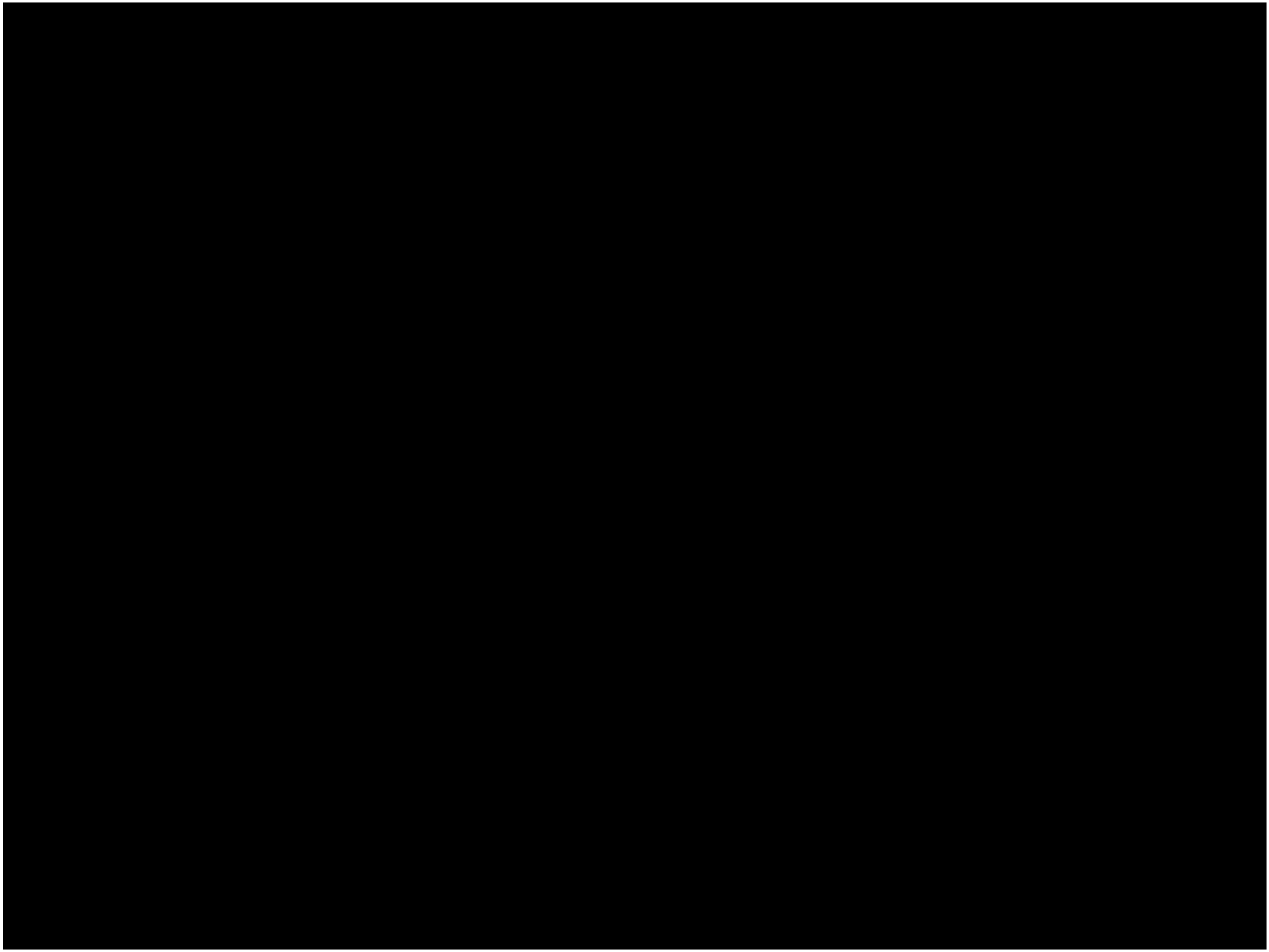


Delay Line Theory: Spatial and Temporal Summation

Marginal Value Theorem

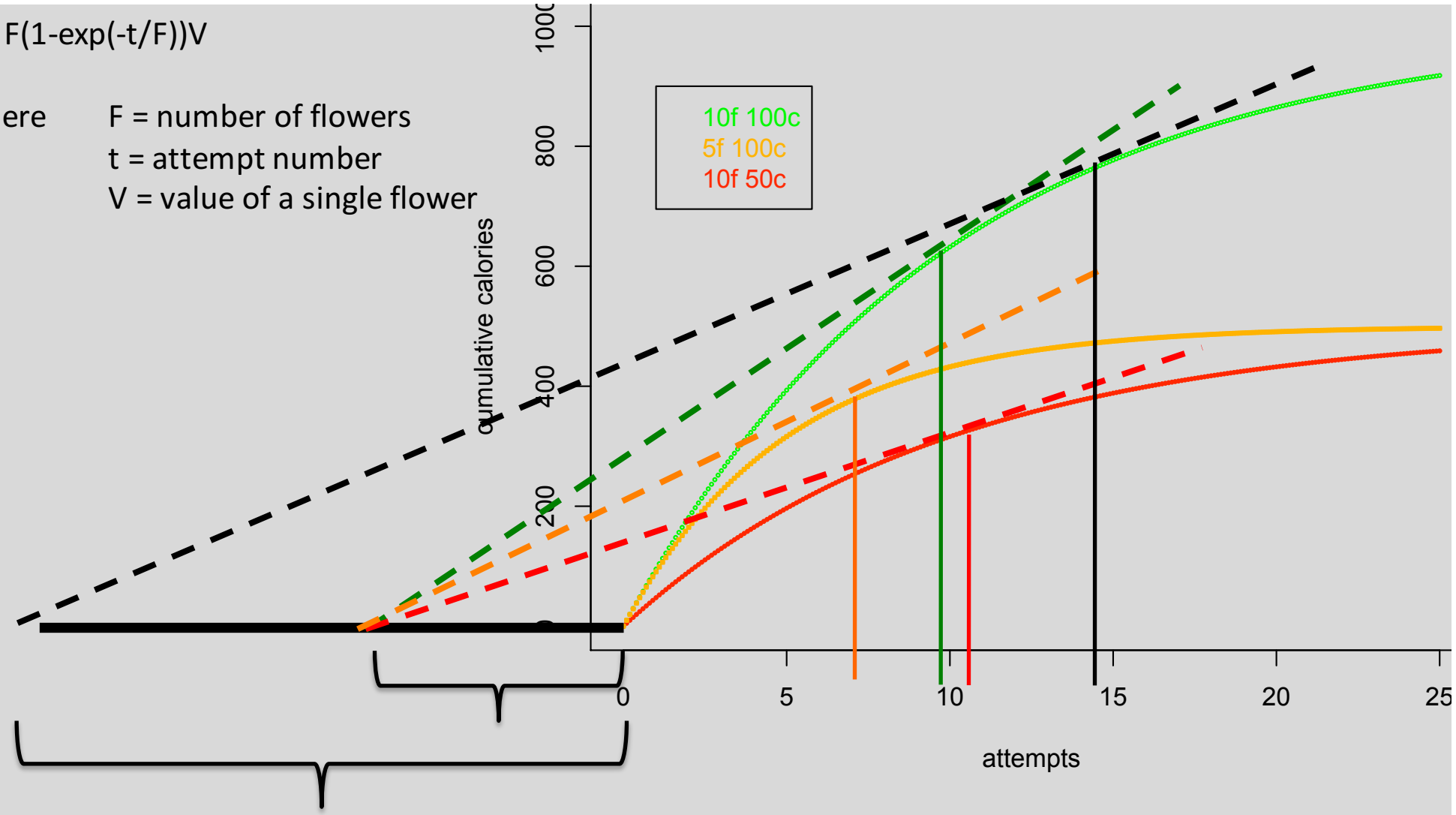
- Each patch contains about 12 flowers.
- All flowers are full of nectar at the start of a game. Feeding empties a flower.
- As you search in a patch you may encounter empty flowers which you already visited, because searching is random.
- Searching within a patch, and travel between patches, costs only time, not energy.
- Seaching a full flower costs the same as an empty flower.
- Travel time is proportional to distance between patches.
- You have 120 "activity" seconds -- time only counts down each time the mouse is clicked.

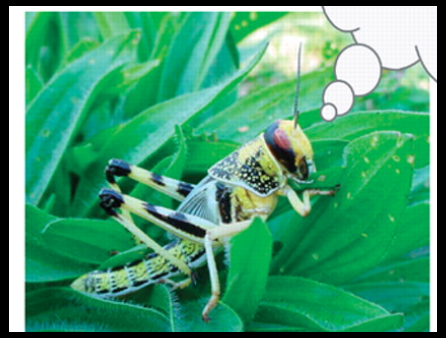
http://bio150.chass.utoronto.ca/foraging/intro.html
http://bio150.chass.utoronto.ca/foraging/index.html



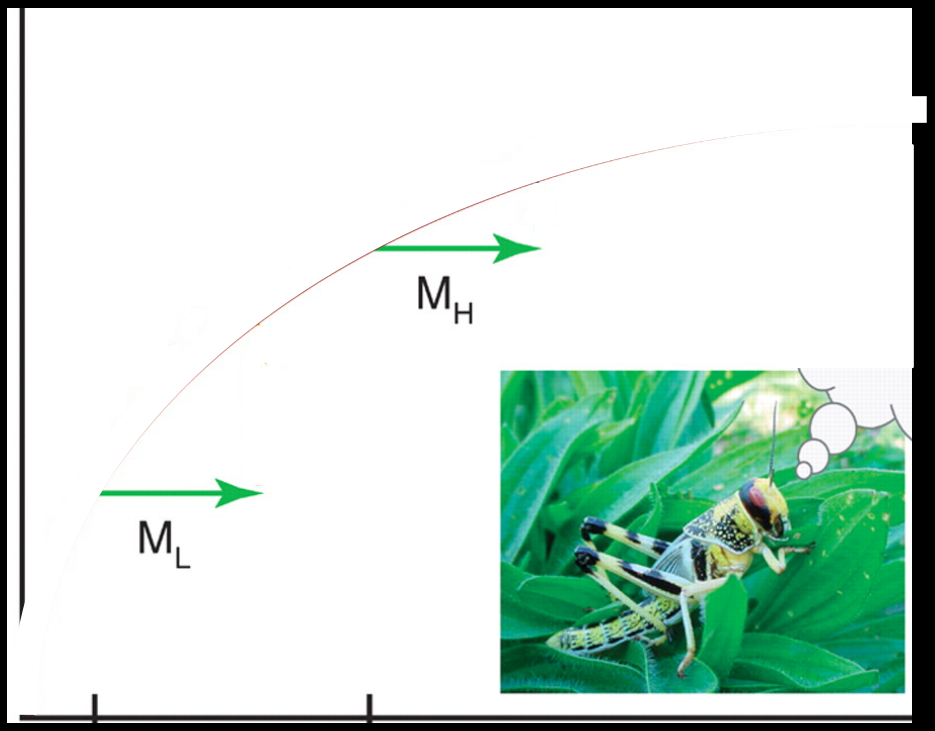
$$Y = F(1-\exp(-t/F))V$$

Where F = number of flowers
t = attempt number
V = value of a single flower

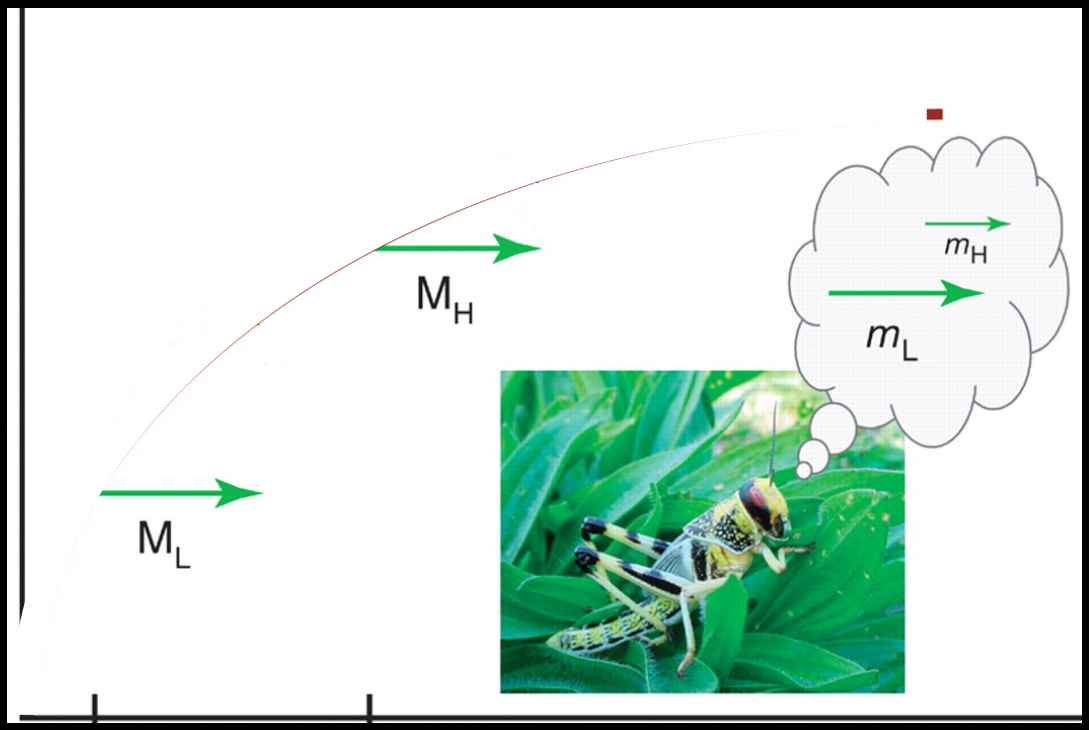




Most OFT models assume animals have “perfect information” (i.e. behave rationally)

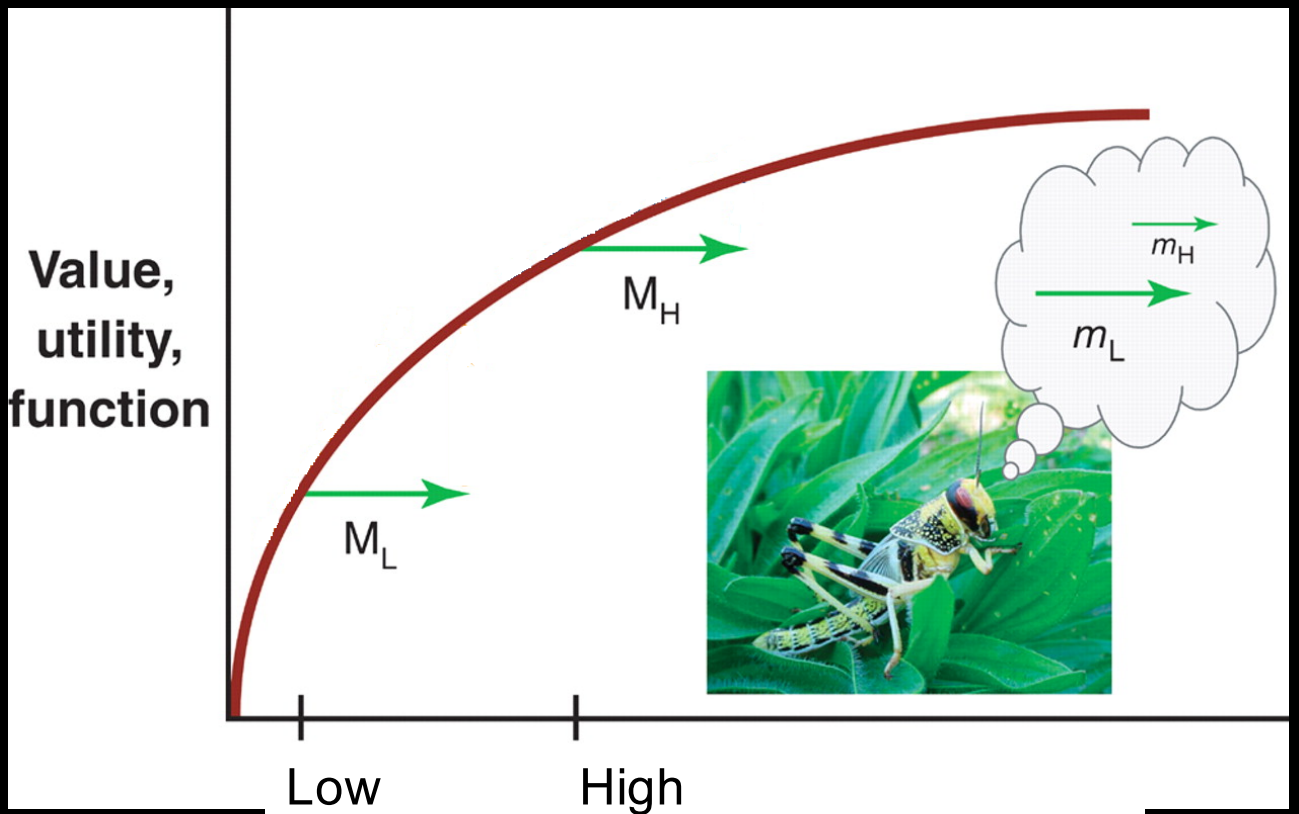


Most OFT models assume animals have “perfect information” (i.e. behave rationally)
food should be selected based on nutritional value



Most OFT models assume animals have “perfect information” (i.e. behave rationally)
food should be selected based on nutritional value
but animals don’t always behave that way :

2 items of equal quality can differ in perceived values



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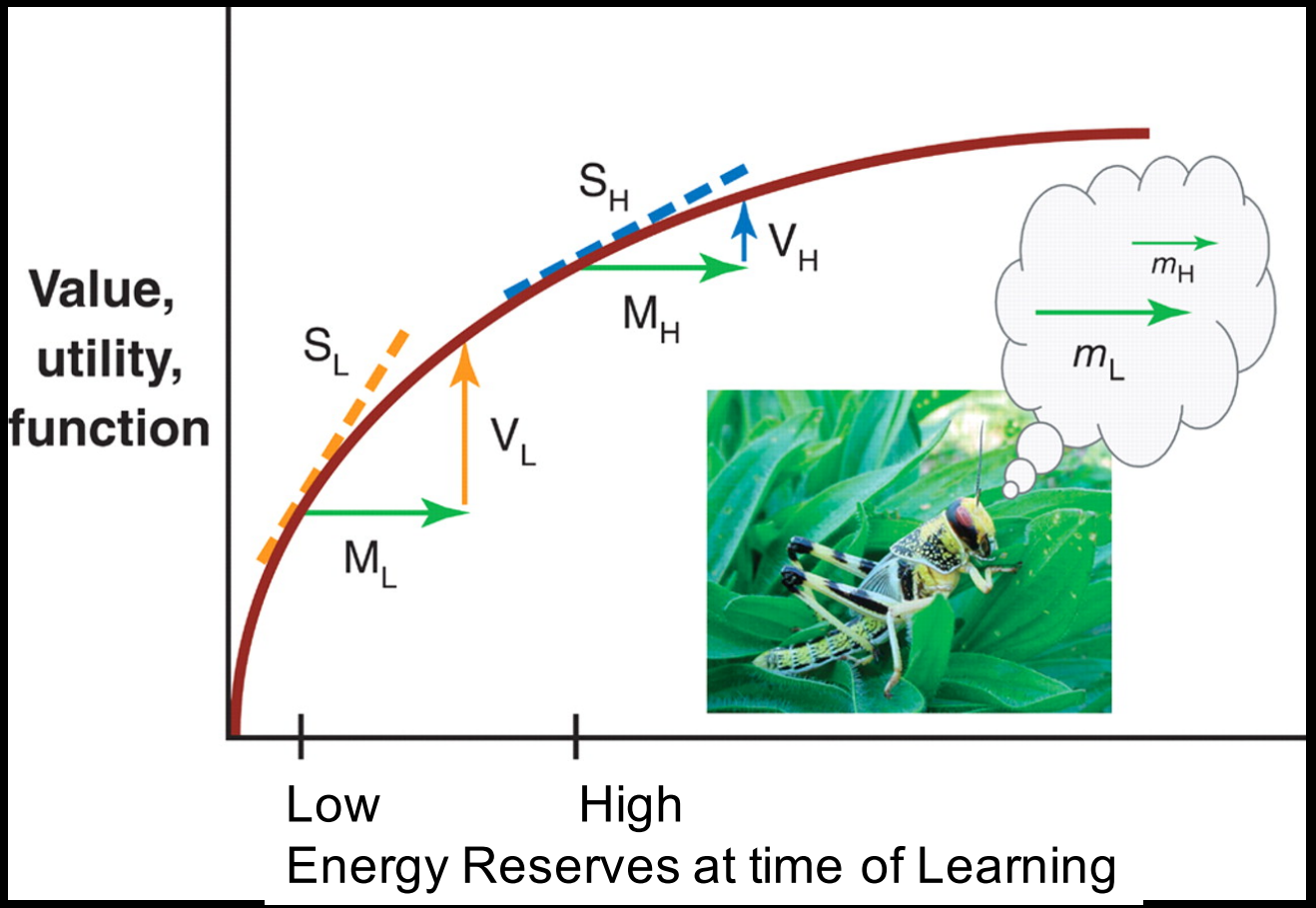

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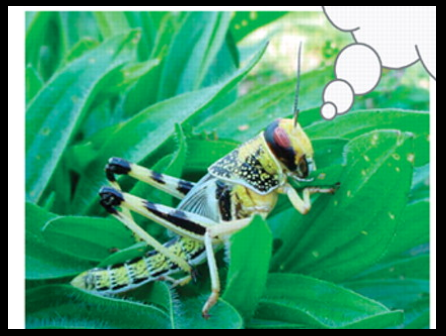
- Manipulated nutritional state (Low and High) at the time of learning (3 day training)
- Associate lemon grass w one state and peppermint odor with the other for food item of the same nutritional value (balance)
- Manipulated nutritional state (Low and High) and test for food preference.



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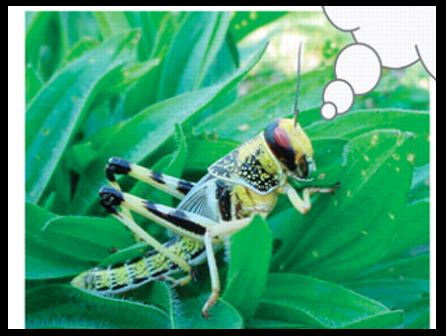

4 Possible Predictions

Magnitude Priority: choices depend on the intrinsic value.
(no preference)

Value Priority: choices are controlled by past gains,
(prefer that associated with Low state)

State Priority: options are valued by association with desired state.
(prefer that associated with High state)

State-Option Association: options valued according to matching state
(prefer that associated with current state during test)

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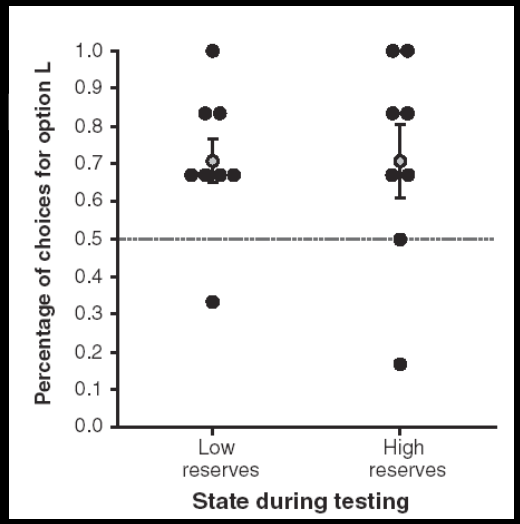

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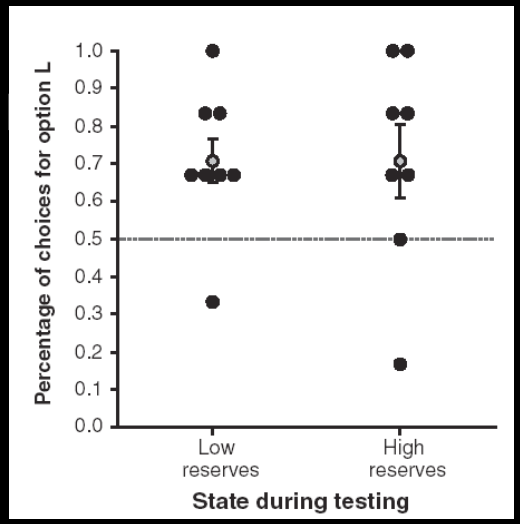

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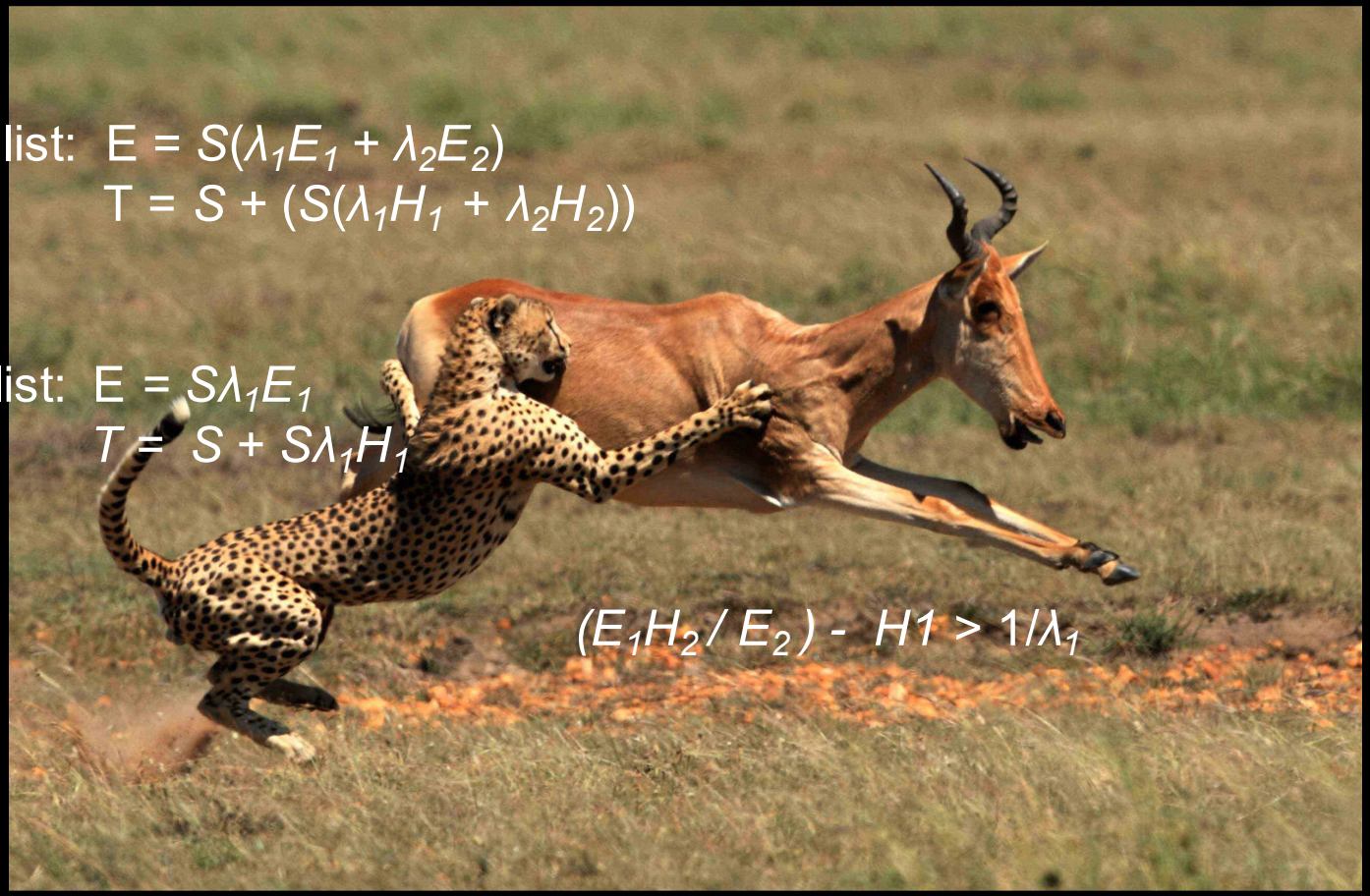
Locust prefers food associated with low energy reserves regardless of its current energy state.

For generalist: $E = S(\lambda_1 E_1 + \lambda_2 E_2)$

$T = S + (S(\lambda_1 H_1 + \lambda_2 H_2))$

For specialist: $E = S\lambda_1 E_1$

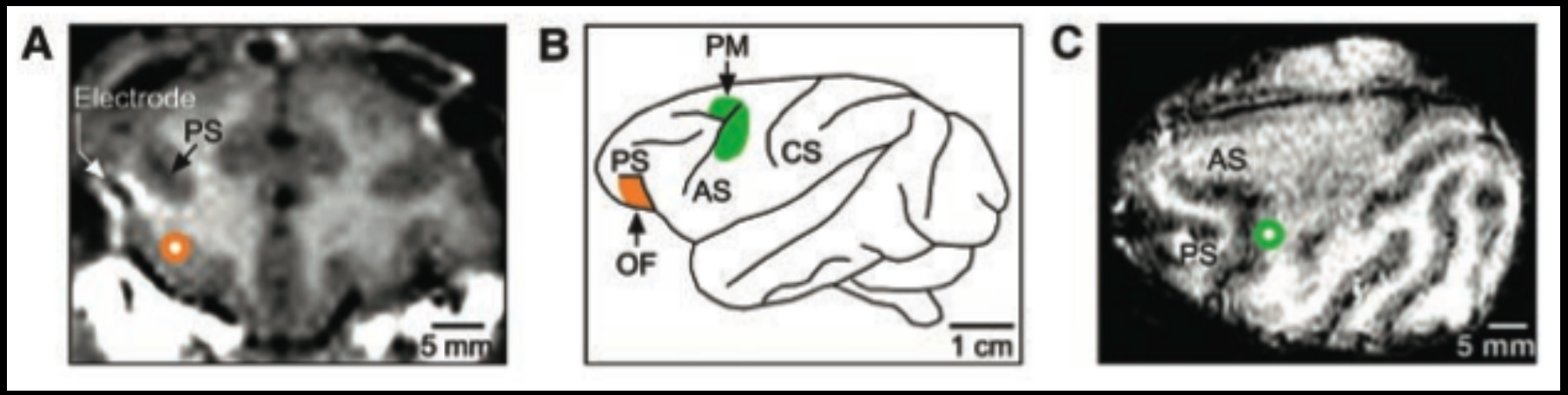
$T = S + S\lambda_1 H_1$



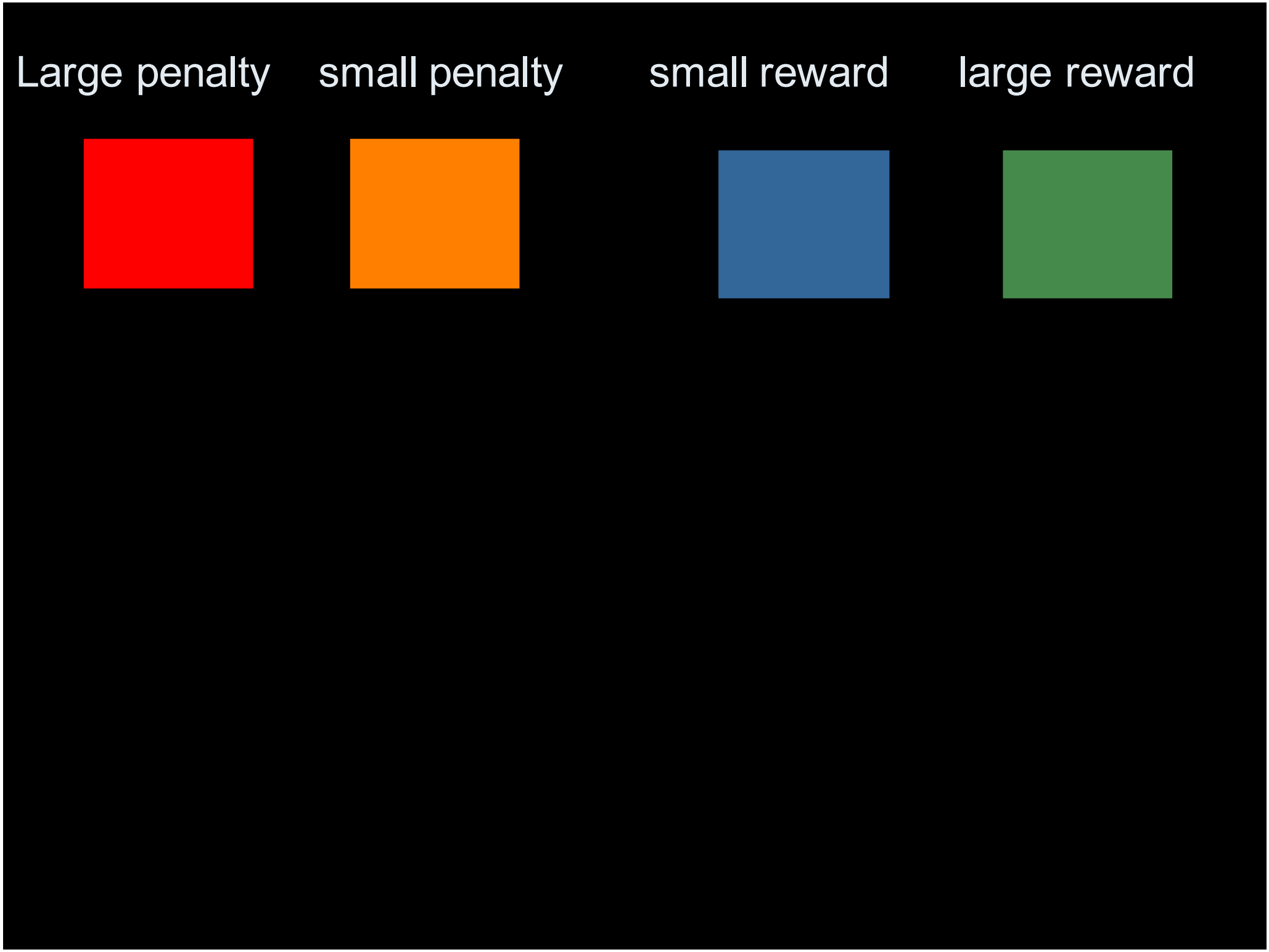
Animals may specialize in ways that don't fit simple models.

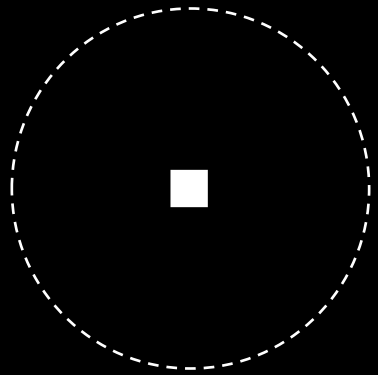
- Redesign model,
- Repeat Experiments
- Analyze New Results
- Learn More About Animal Behavior.

Reward Value and Motivation

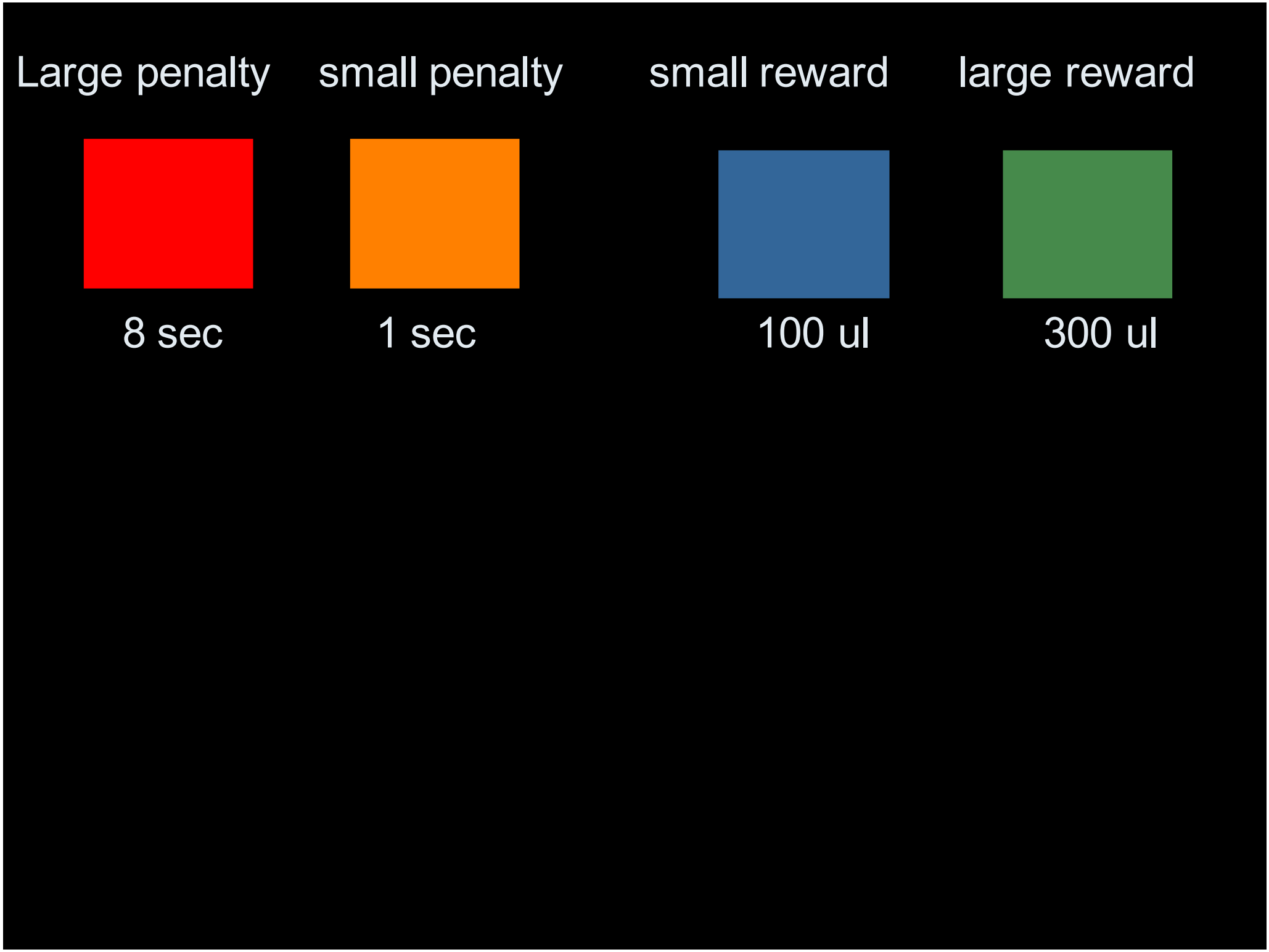


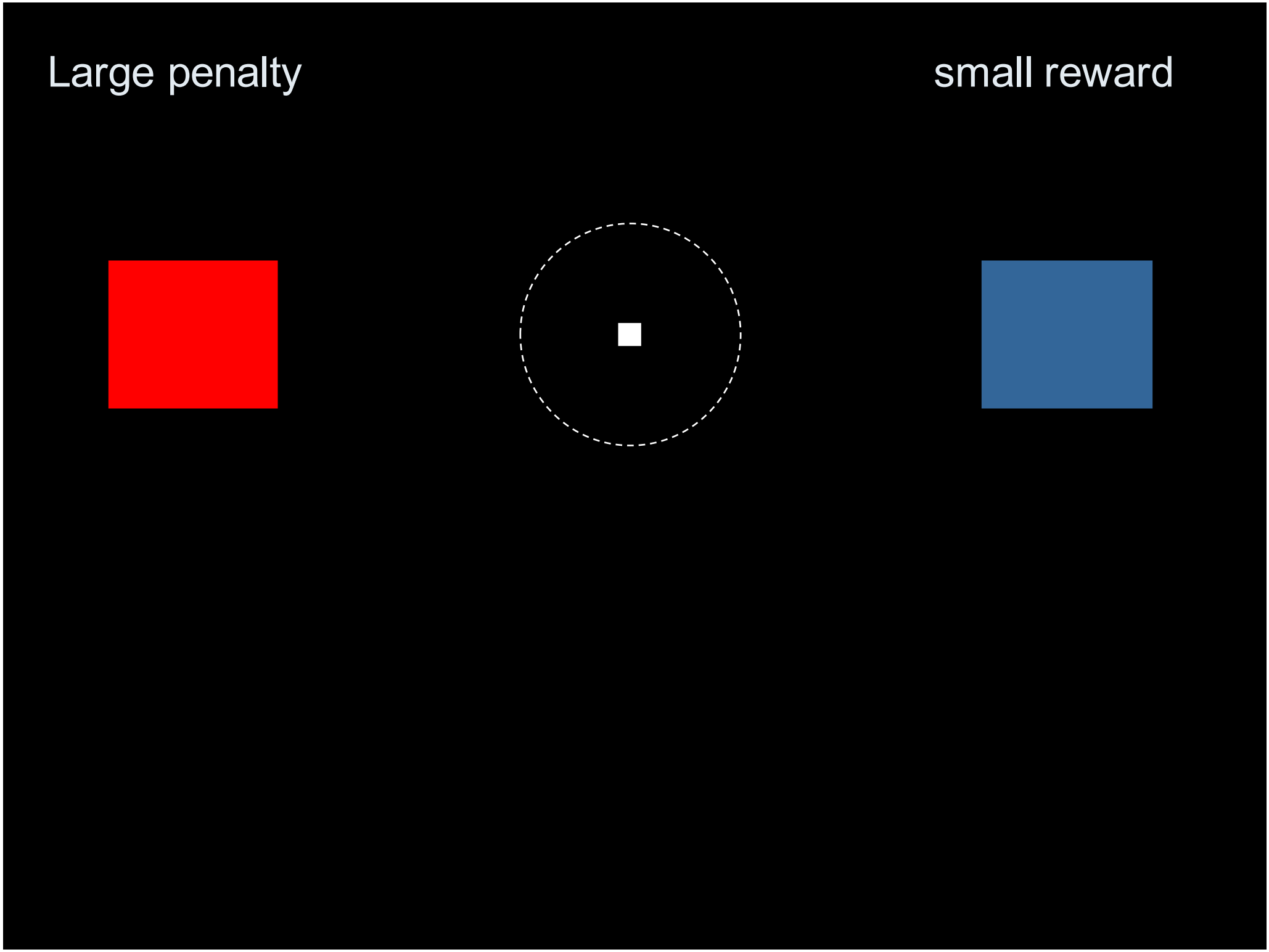
Roesch, et al 2004 Science 304:307.


Large penalty
small penalty
small reward
large reward



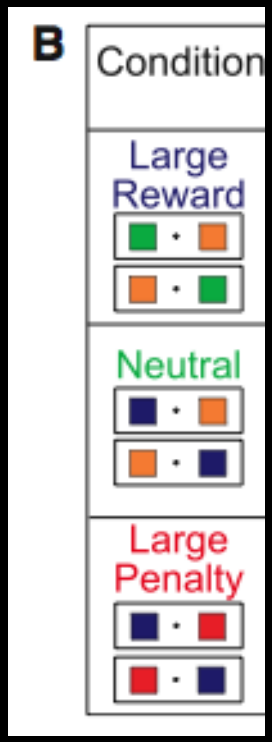

Small penalty
large reward

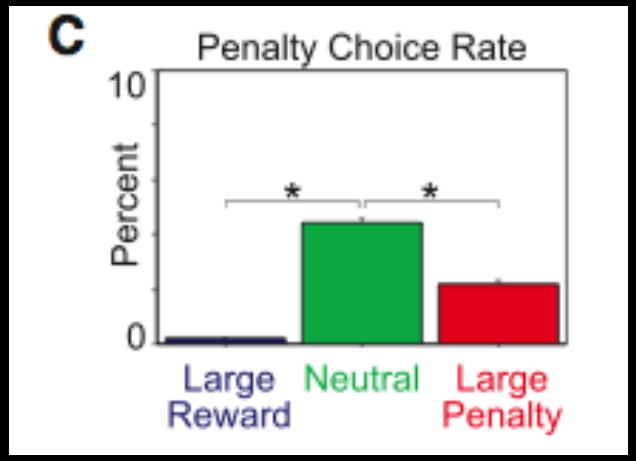

Large penalty
small penalty
small reward
large reward
8 sec
1 sec
100 ul
300 ul

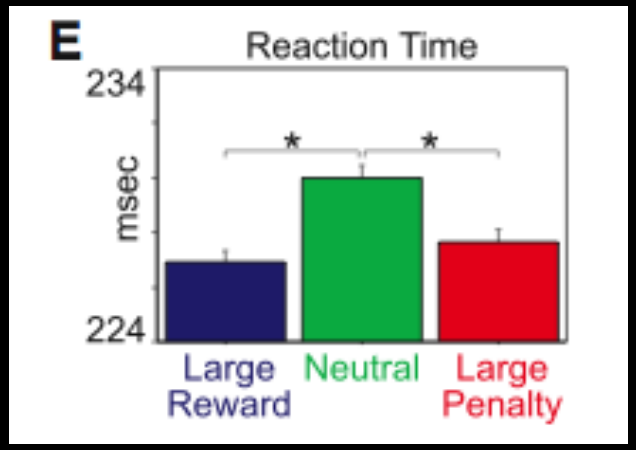

Large penalty
small reward

B

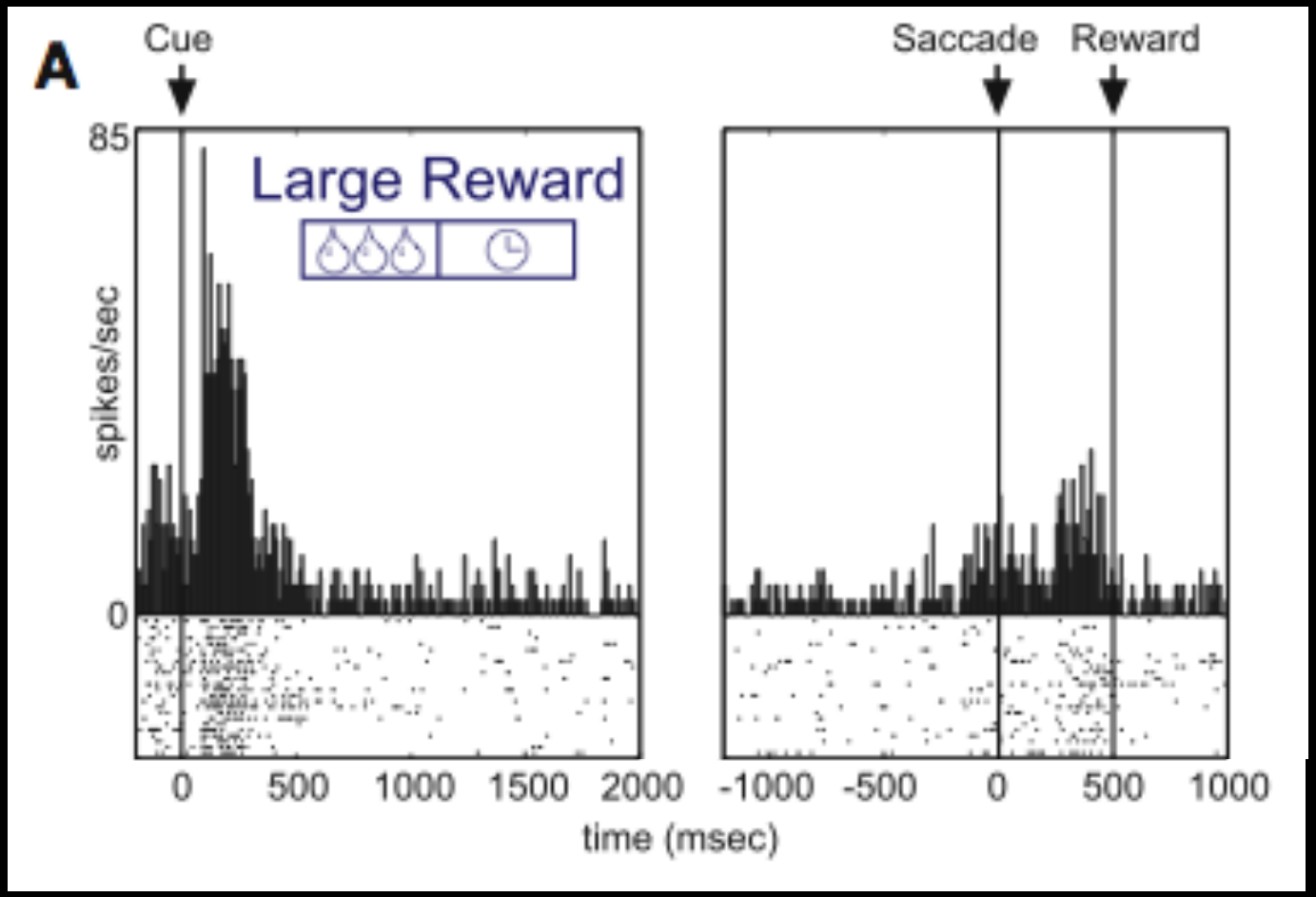
Condition	Reward Size	Penalty Length	Motivation	Valence
Large Reward	0.3 cc	1 sec		
Neutral	0.1 cc	1 sec		
Large Penalty	0.1 cc	8 sec		


B
Condition
Large Reward
Neutral
Large Penalty

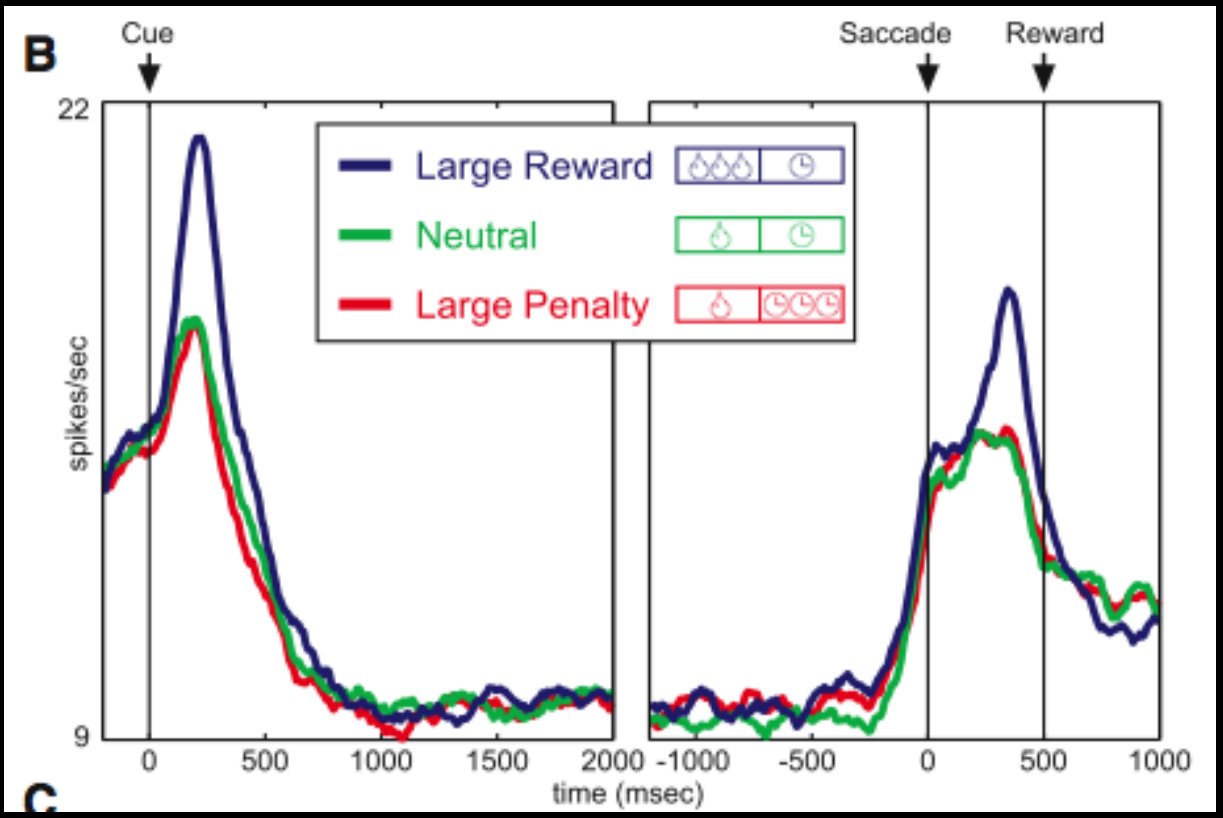

C
Penalty Choice Rate
10
0
Percent
*
*
Large Reward
Neutral
Large Penalty

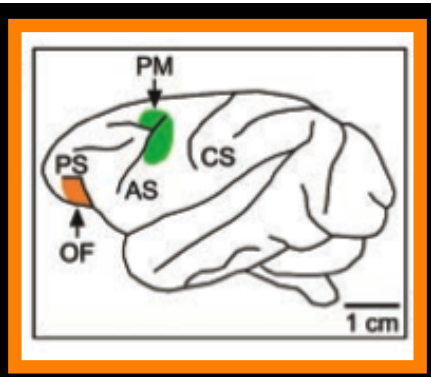

E
Reaction Time
234
224
msec
*
*
Large Reward
Neutral
Large Penalty


Large
Reward


A
Cue
Saccade
Reward
85
0
spikes/sec
Large Reward
0
500
1000
1500
2000
-1000
-500
0
500
1000
time (msec)

OF neurons encode value

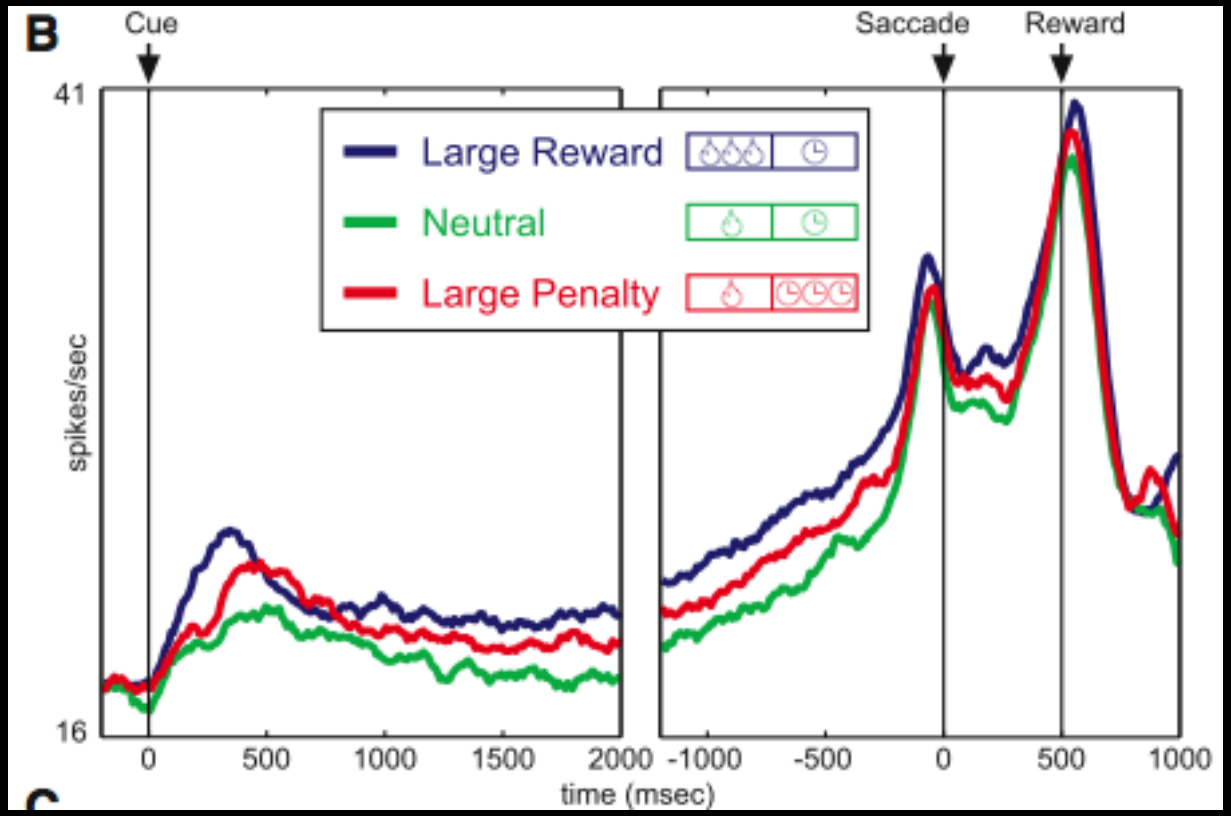


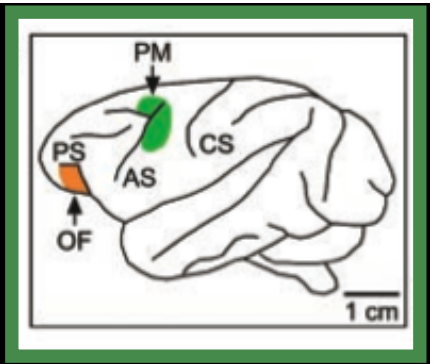


B

Condition	Reward Size	Penalty Length	Motivation	Valence
Large Reward	0.3 cc	1 sec		
Neutral	0.1 cc	1 sec		
Large Penalty	0.1 cc	8 sec		

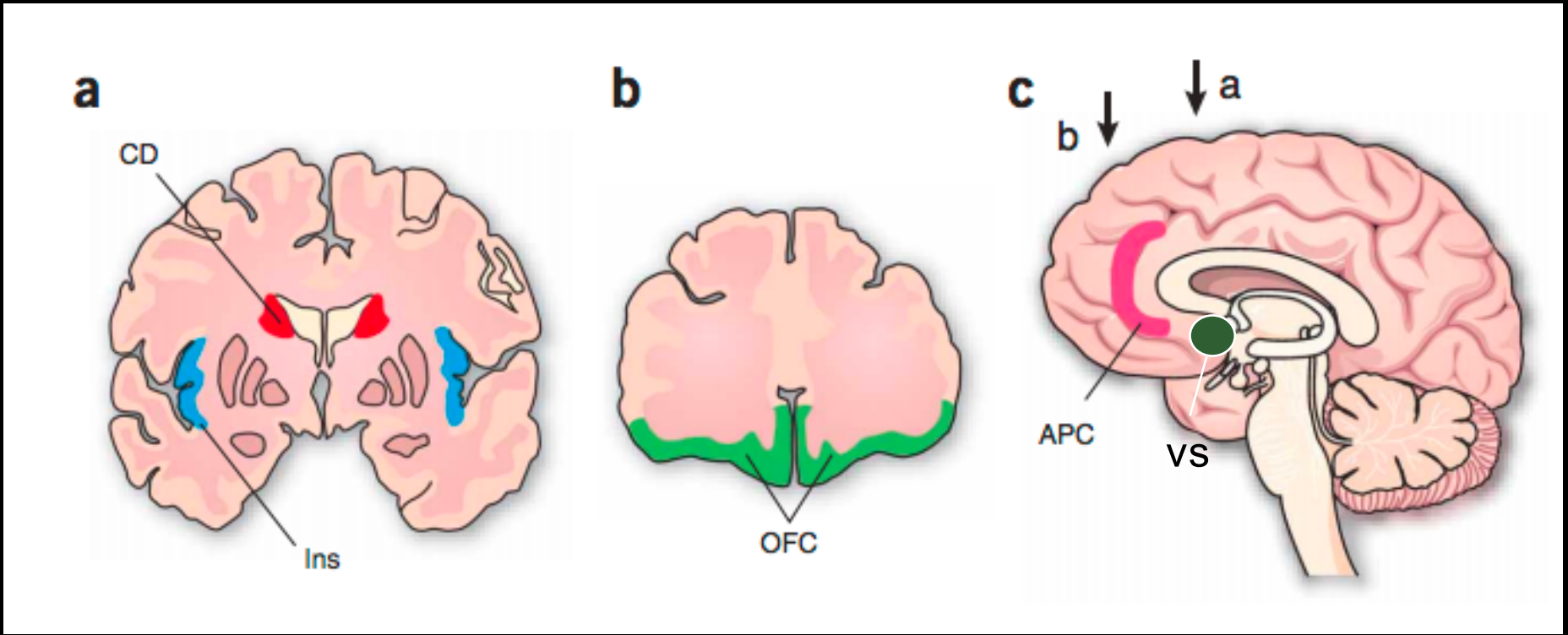
PM neurons encode motivation





B

Condition	Reward Size	Penalty Length	Motivation	Valence
Large Reward	0.3 cc	1 sec	●	●
Neutral	0.1 cc	1 sec	•	•
Large Penalty	0.1 cc	8 sec	●	•



VS activated with cooperation in PD
CD activated when partner is trusted