Vaux's swift

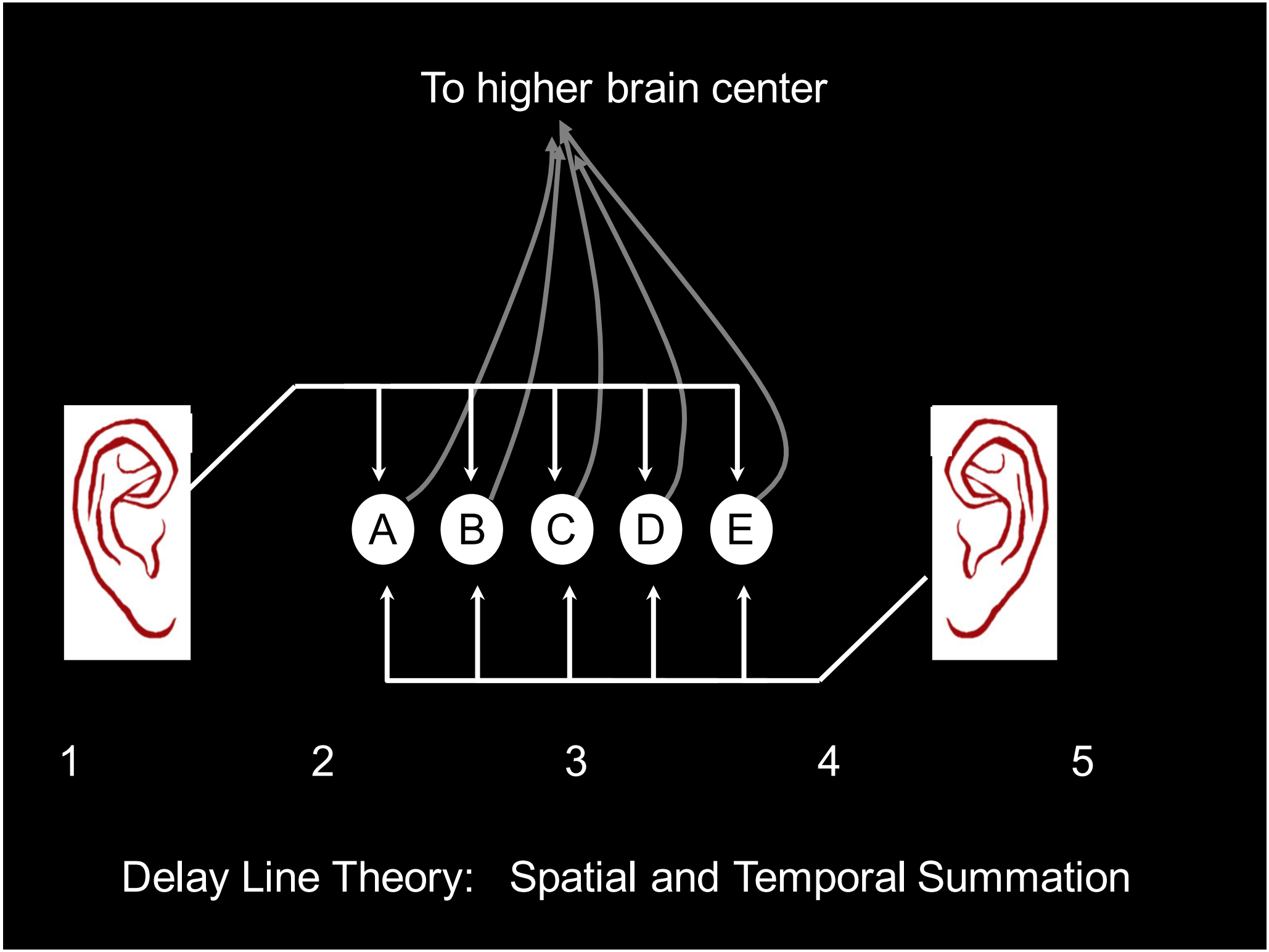
Evening Field Trip
Sept. 19th (Wednesday)

sunset 7:13
depart Reed 6:30 (w/pizza)

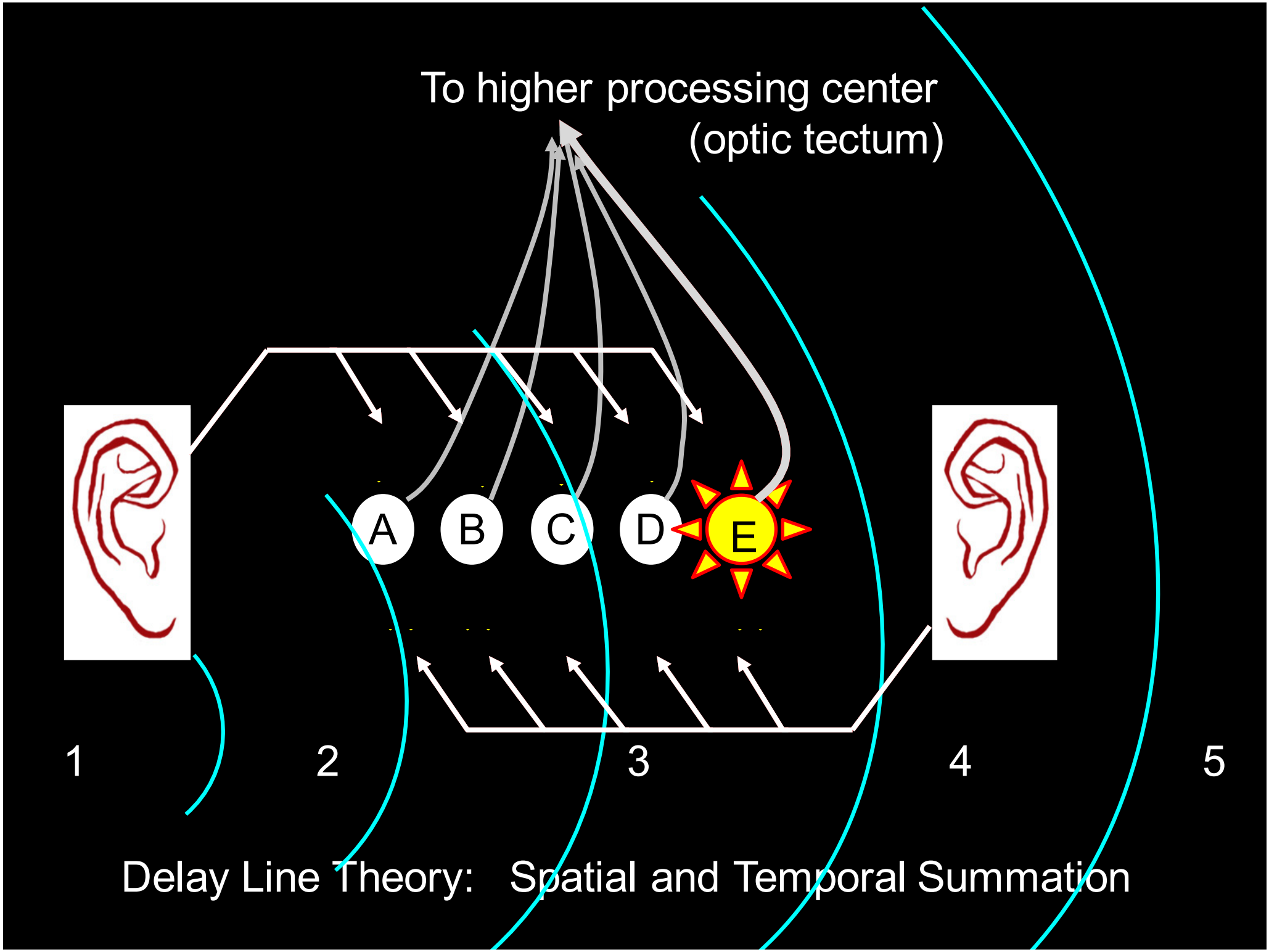
Chapman School
27th Ave NW and Pettygrove

Van drivers?

http://www.audubonportland.org/livingwithwildlife/brochures/VauxsSwifts



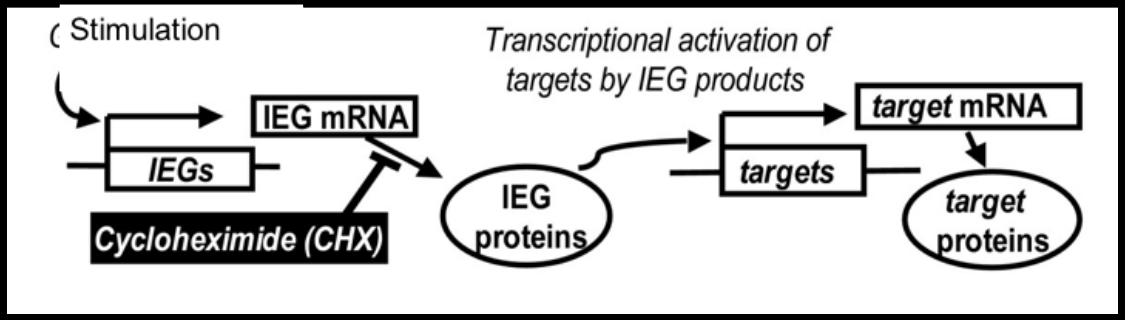
Delay Line Theory: Spatial and Temporal Summation

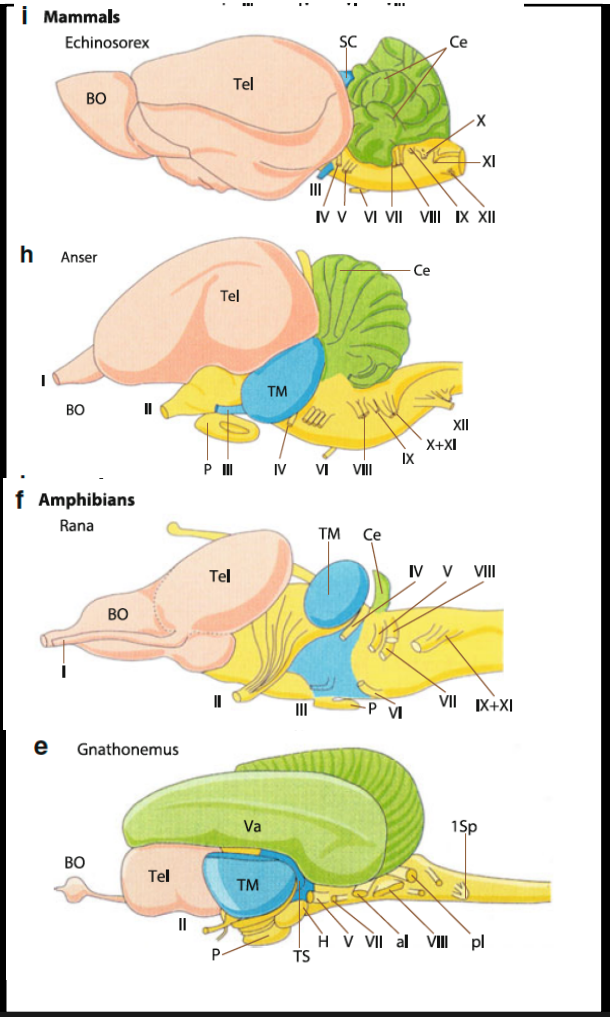


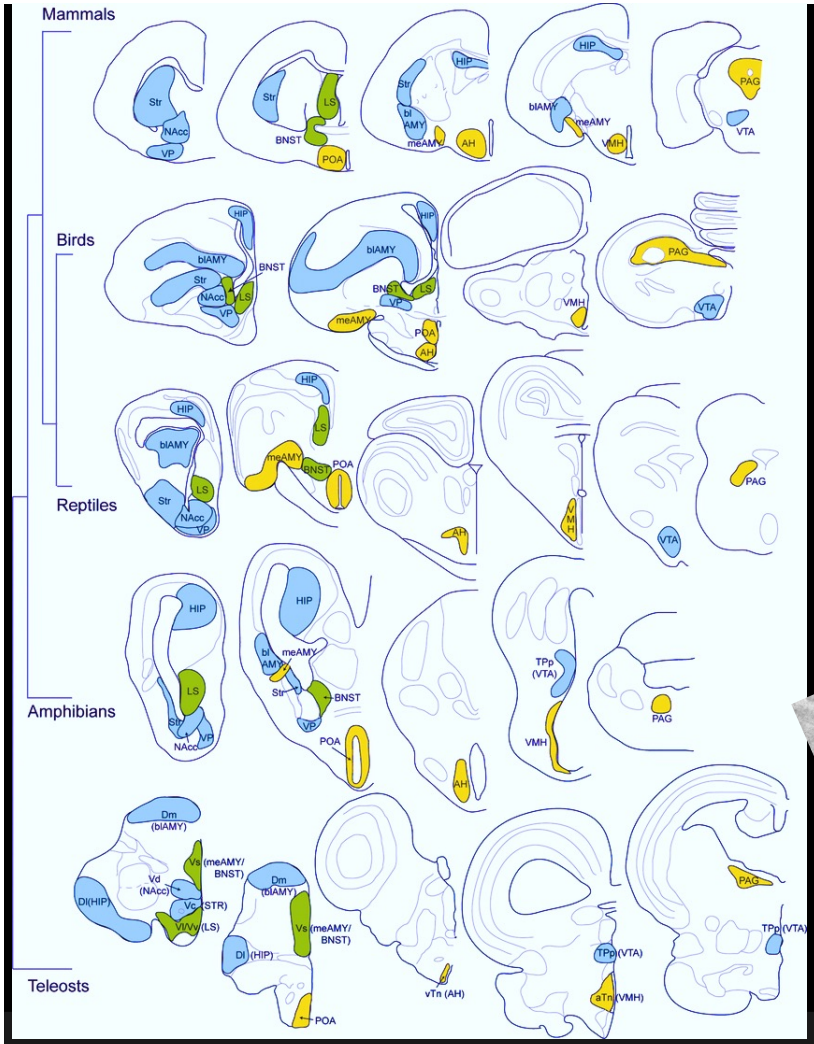
Delay Line Theory: Spatial and Temporal Summation

What did you learn last Thursday?

Plasticity : requires protein synthesis







social
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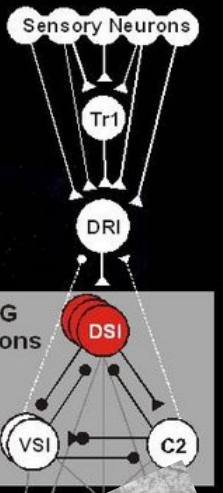
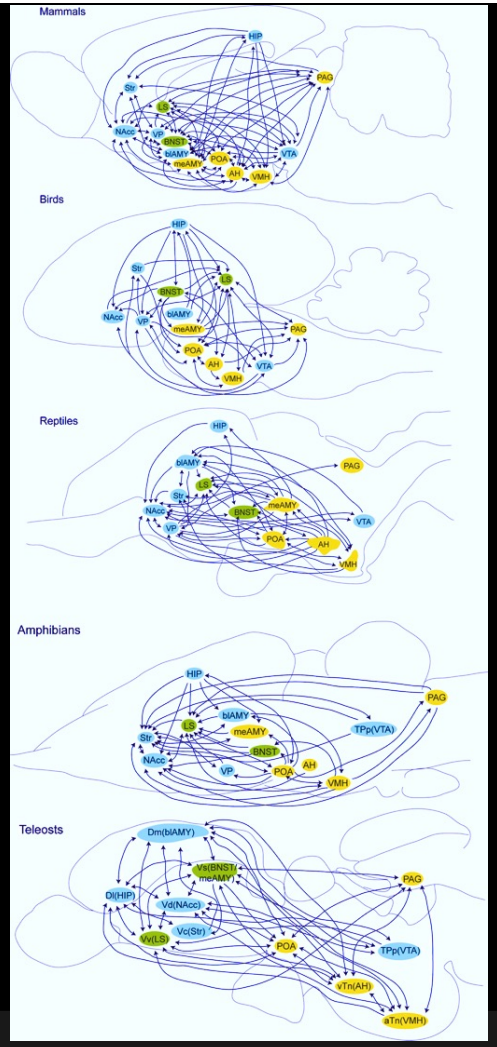
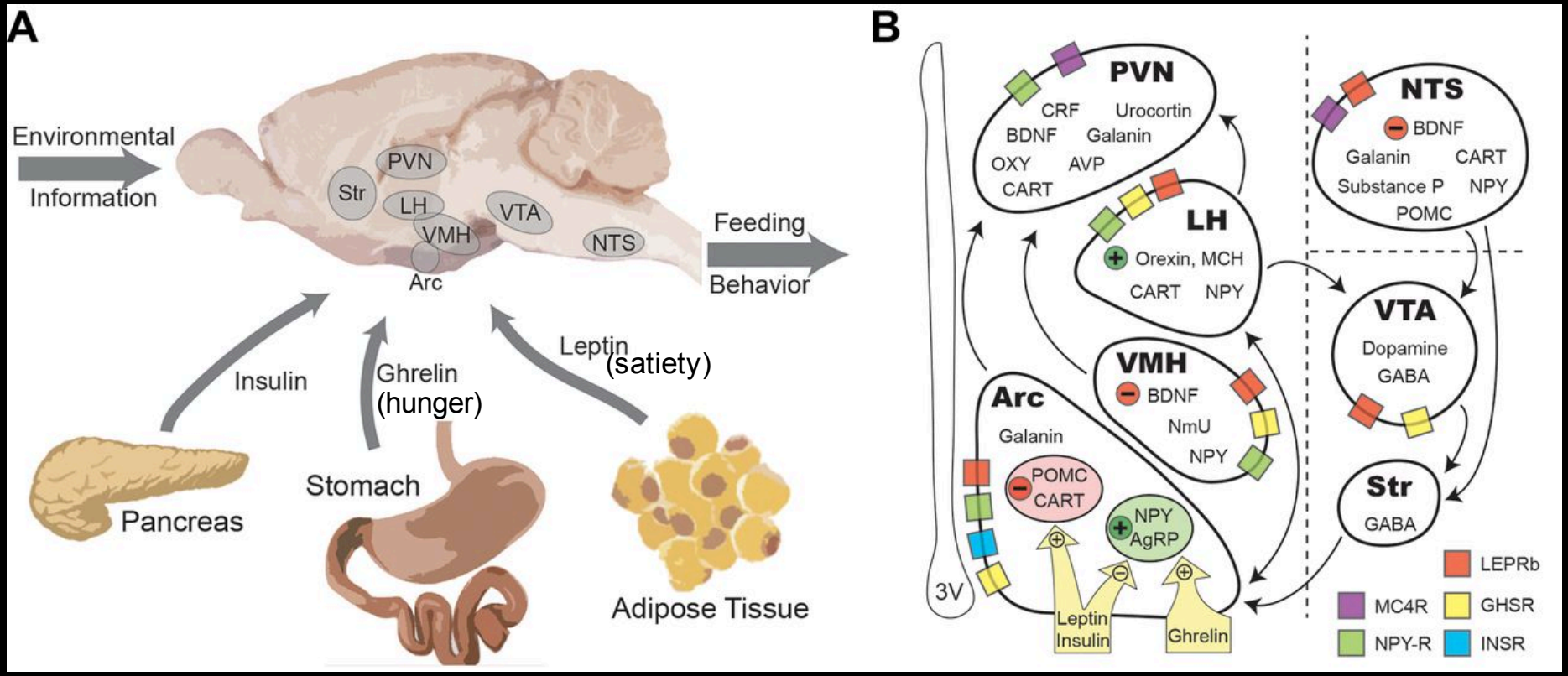


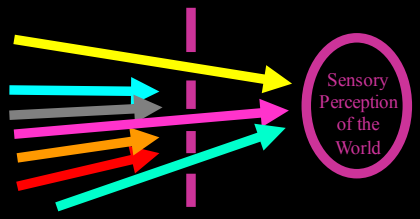
Hom

y?

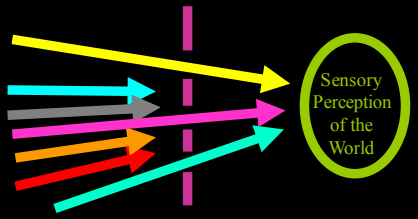


O'Conne1l & Hofmann (2011) Frontiers in Neuroscience

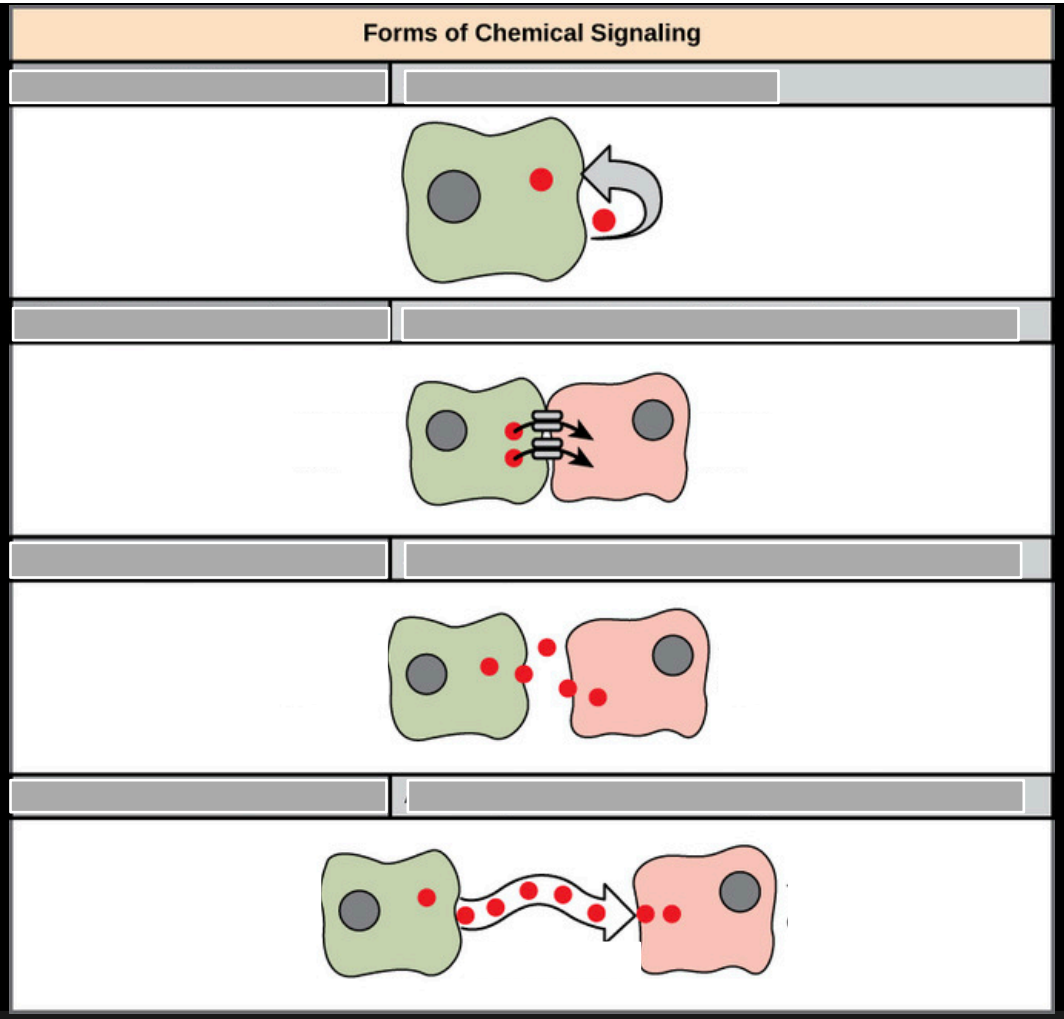


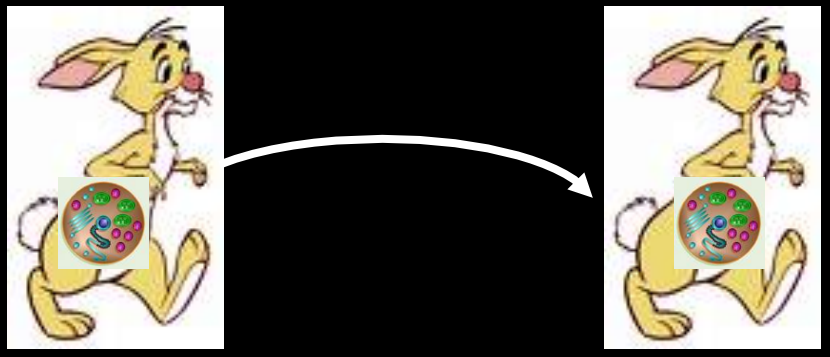


Species 1

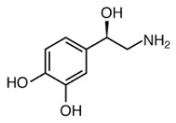
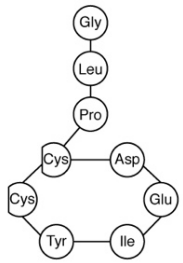
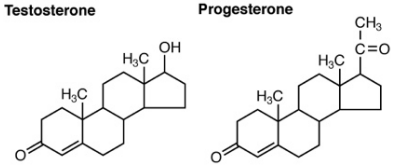


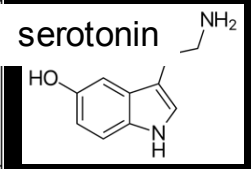
Modulation



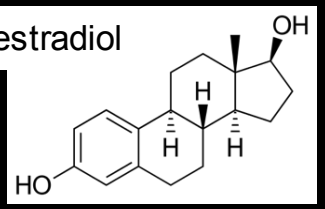


Exocrine (allocrine) - released

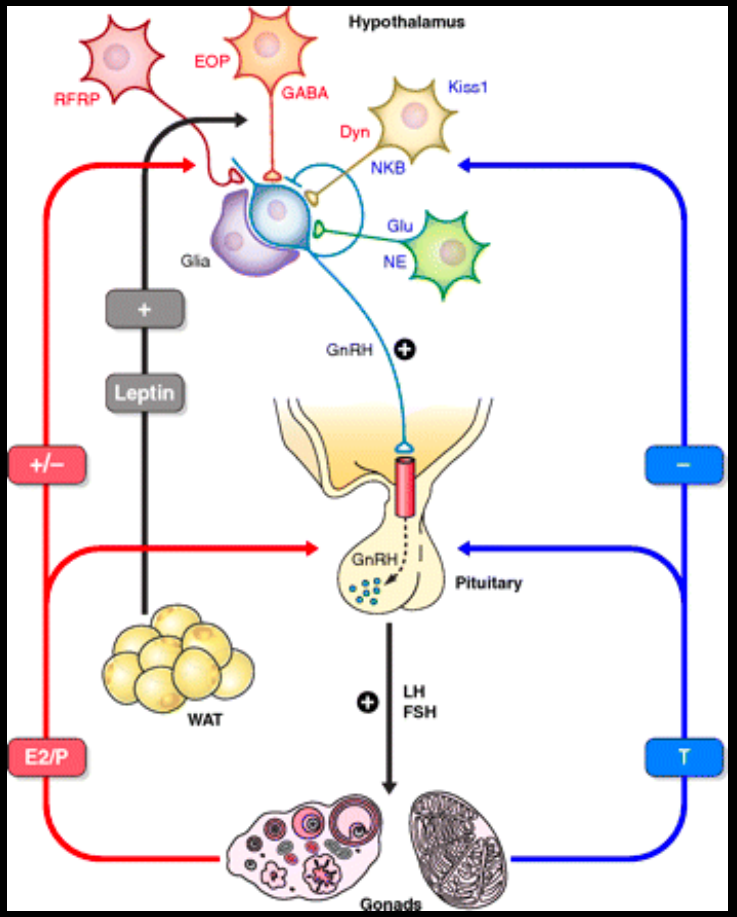
Hormone Class	Components	Example(s)
Amine Hormone	Amino acids with modified groups (e.g. norepinephrine's carboxyl group is replaced with a benzene ring)	**Norepinephrine** 
Peptide Hormone	Short chains of linked amino acids	**Oxytocin** 
Protein Hormone	Long chains of linked amino acids	**Human Growth Hormone** 
Steroid Hormones	Derived from the lipid cholesterol	**Testosterone** **Progesterone** 

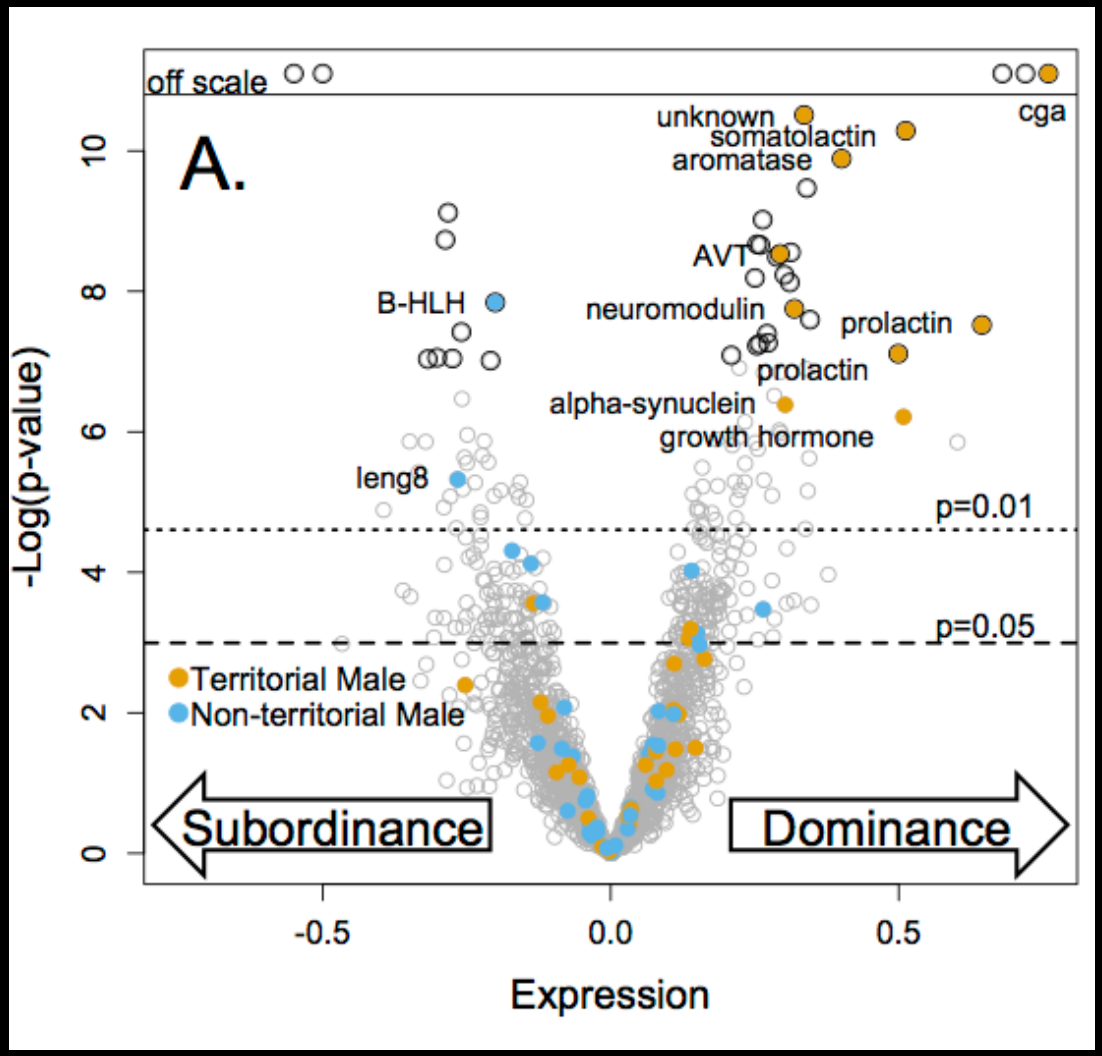
serotonin 

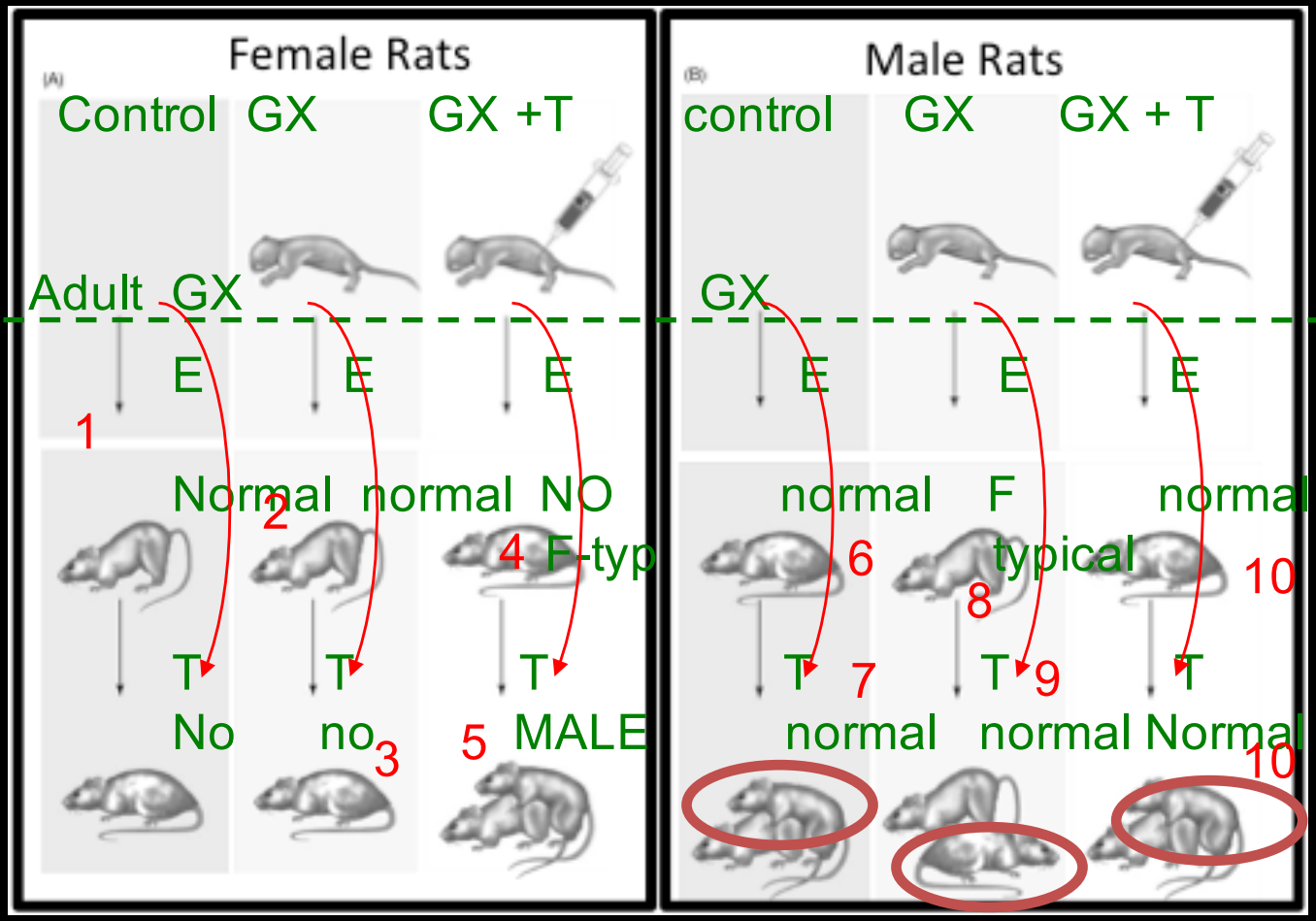
Aromatase

estradiol 

HPG - axis



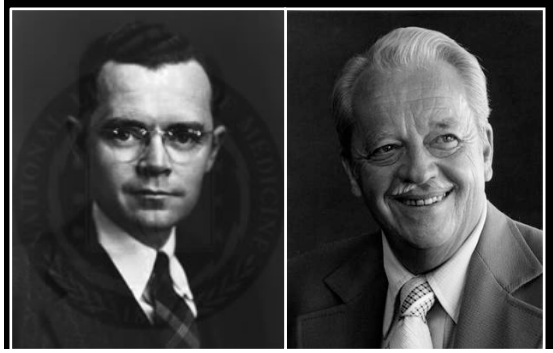

A.
off scale
cga
unknown
somatolactin
aromatase
AVT
B-HLH
neuromodulin
prolactin
prolactin
alpha-synuclein
growth hormone
leng8
p=0.01
p=0.05
Territorial Male
Non-territorial Male
Subordinance
Dominance
-Log(p-value)
0
2
4
6
8
10
-0.5
0.0
0.5
Expression

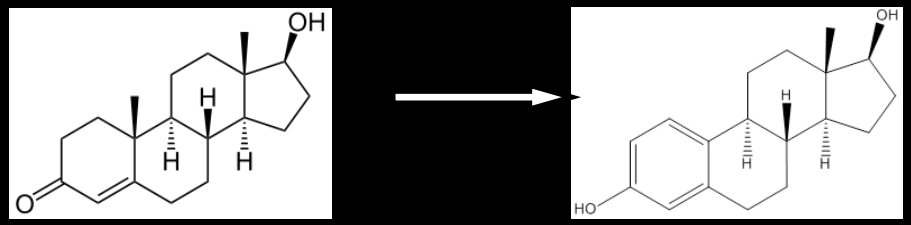


organizational

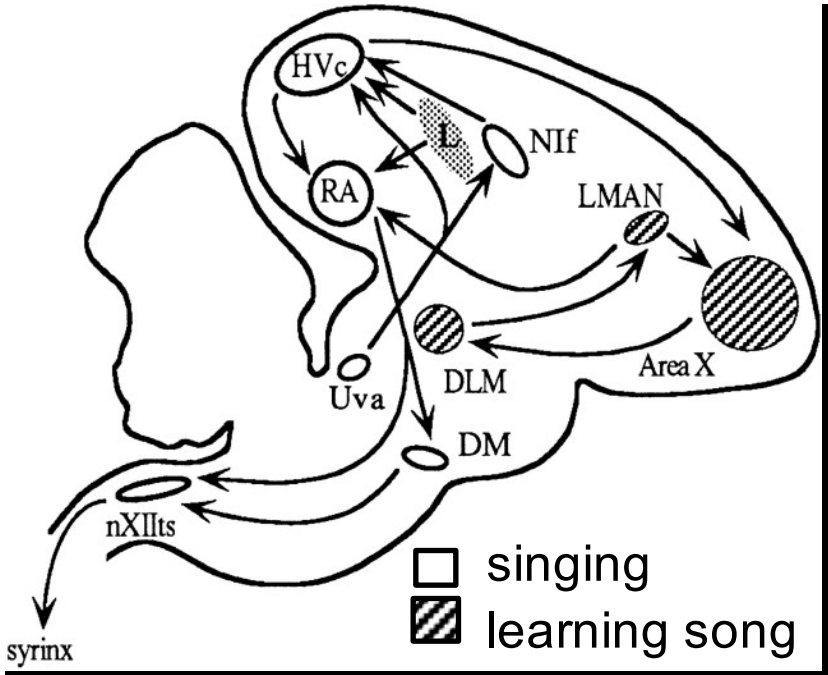
activational

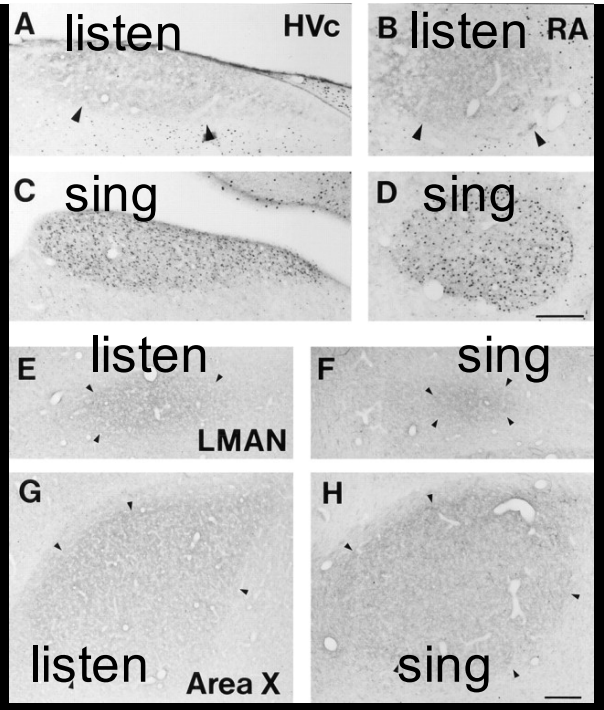
Actually different animals
For E and T adult injections



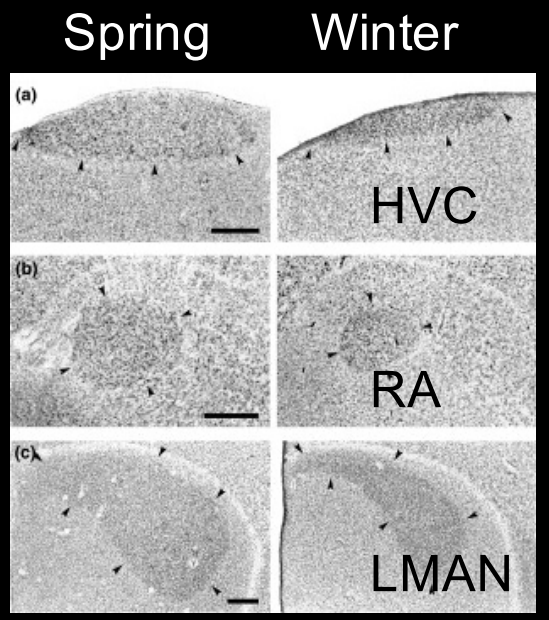


Testosterone Estrogen

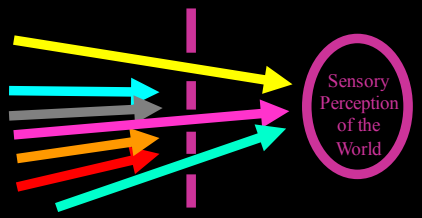




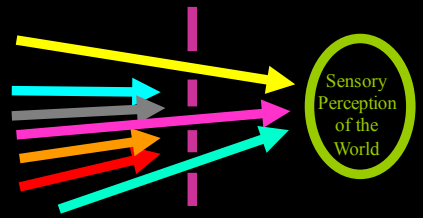
neuron activity (IEG)



neuron number



Species 1



Plasticity

Neural, not gonadal, origin of brain sex differences in a gynandromorphic finch

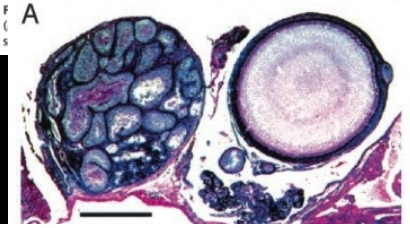
Robert J. Agate, William Grisham, Juli Wade, Suzanne Mann, John Wingfield, Carolyn Schanen, Aarno Palotie, and Arthur P. Arnold

PNAS 2003;100;4873-4878; originally published online Apr 2, 2003; doi:10.1073/pnas.0636925100

Male coloration

Female coloration

Testes

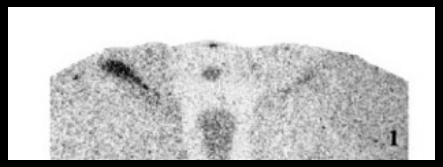


Ovaries

No female (W) Chromosome

Female (W) Chromosome

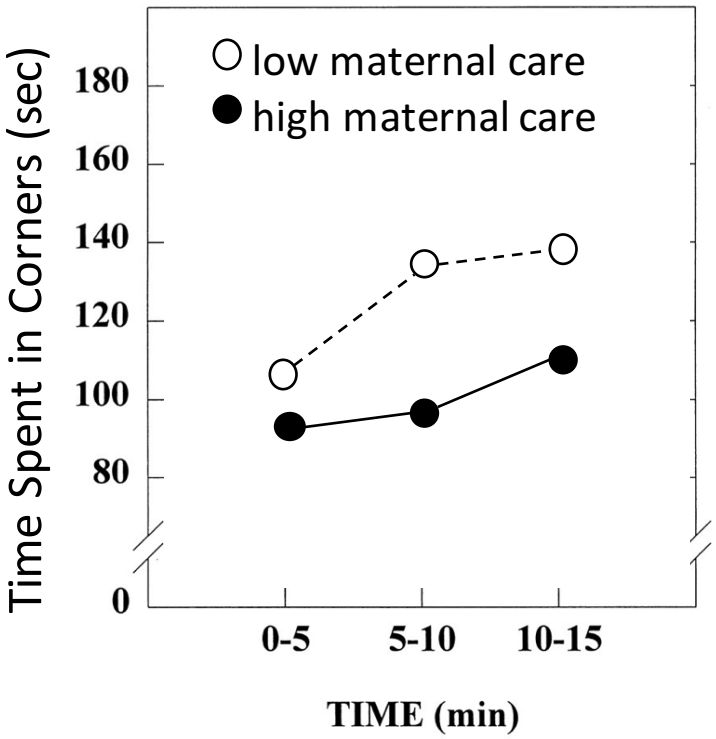
HVC nuclues



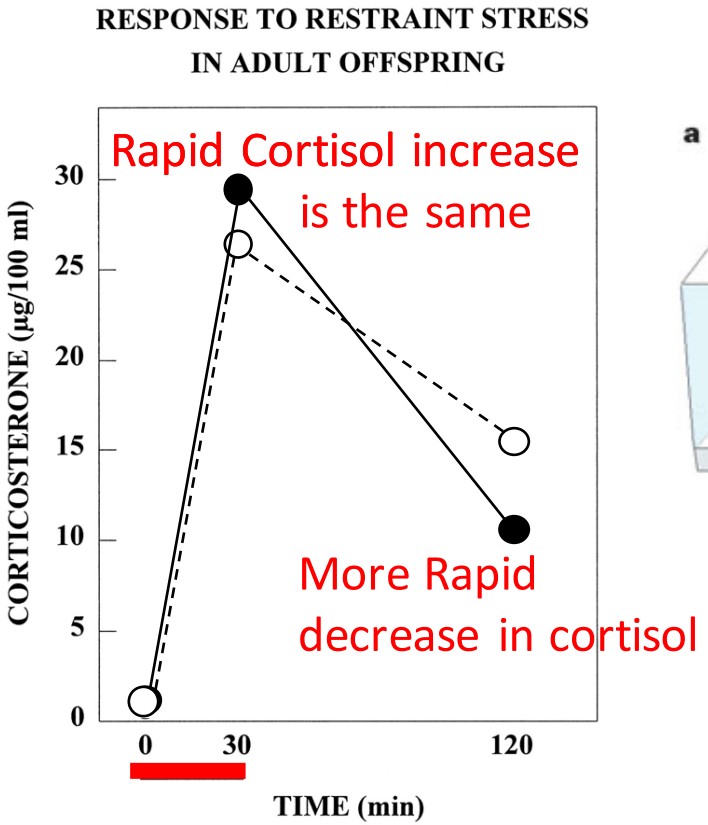
NO HVC nuclues

ZZ

ZW

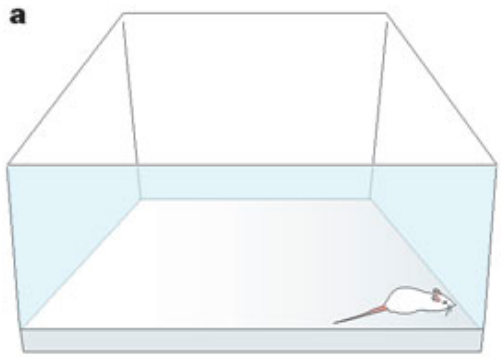


Measure of stress / lack of exploration

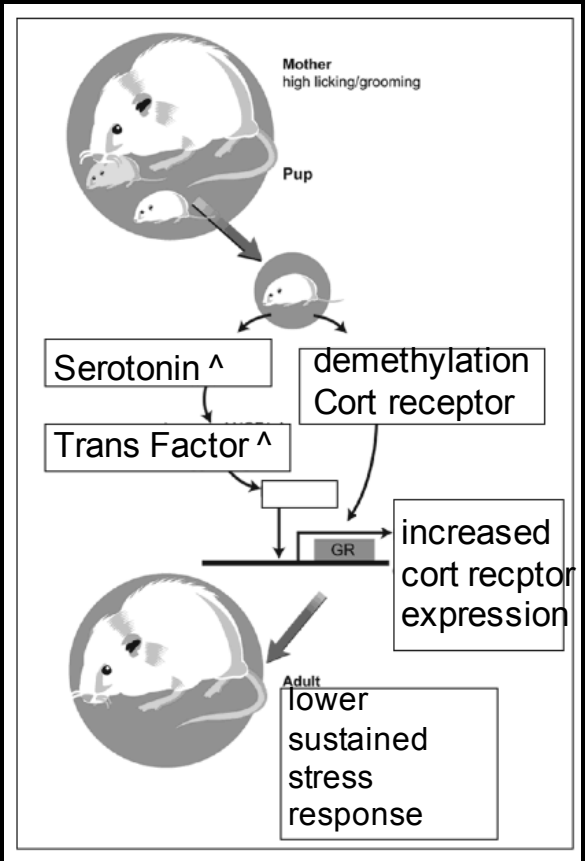


Restraint
Stress

OPEN FIELD TEST



Hippocampus
#
Hypothalamus(PVN)
> CRF
Pituitary (anterior)
> ACTH via blood
Adrenal Cortex
> Cortisol via blood



organizational

activational

Timescales

development

plasticity

modulation

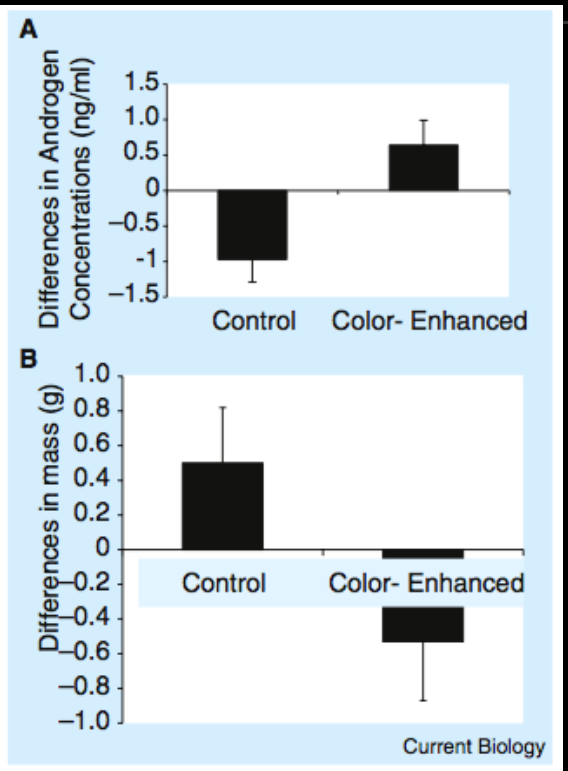
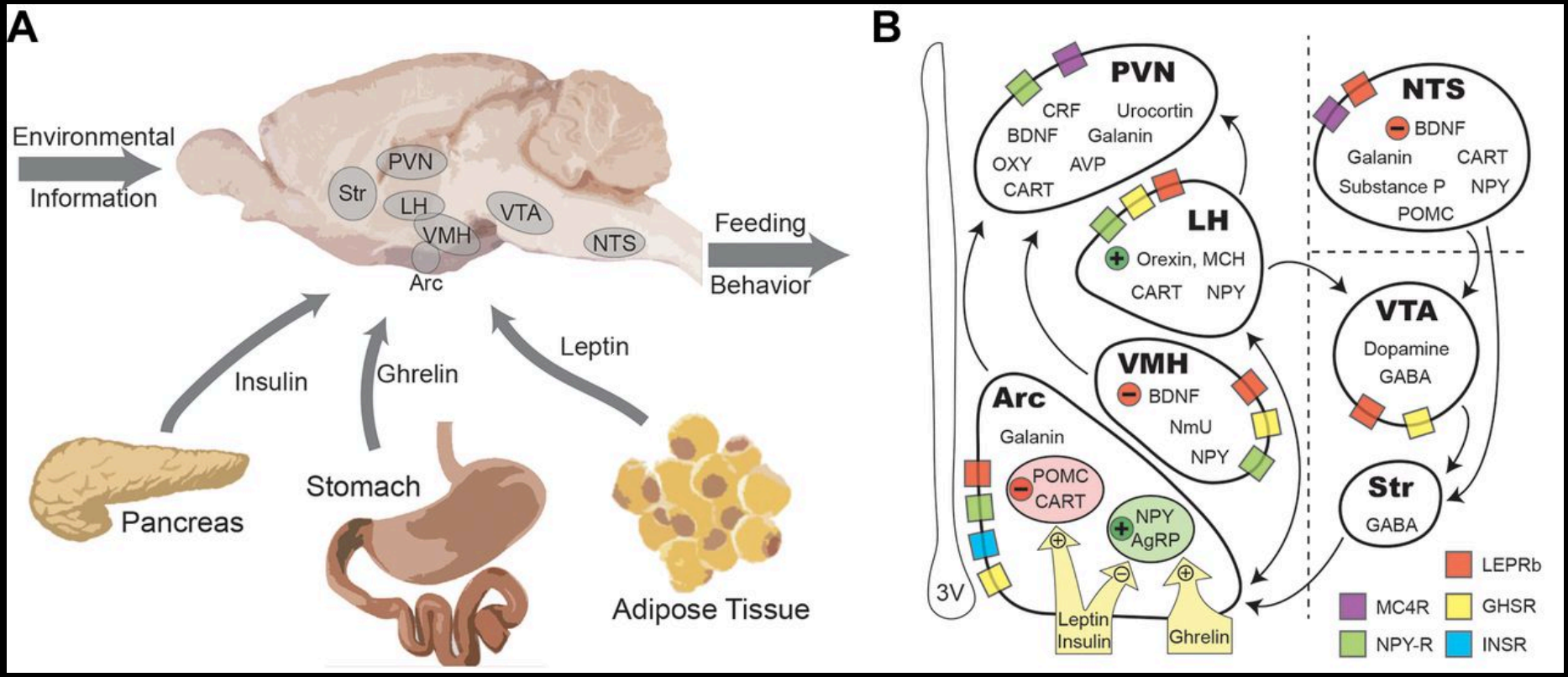


Figure 1. Color enhancement alters androgen levels and body mass of male barn swallows.

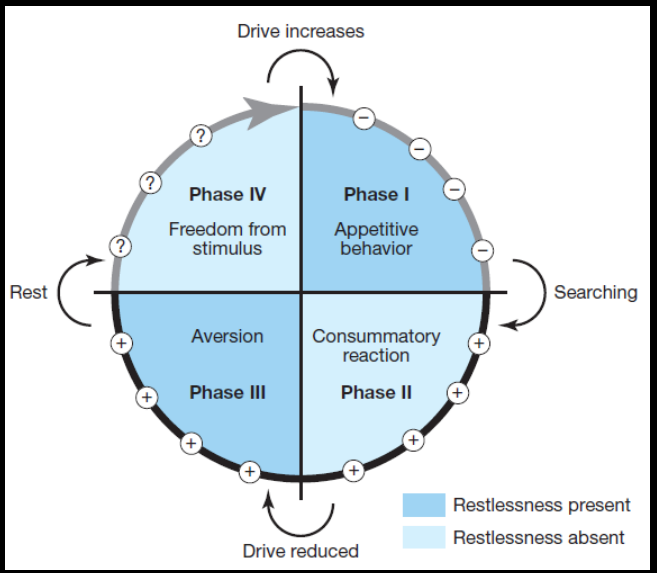
Sexual signal exaggeration affects physiological state in male barn swallows

Rebecca J. Safran[1,2,*], James S. Adelman[1], Kevin J. McGraw[3], and Michaela Hau[1]

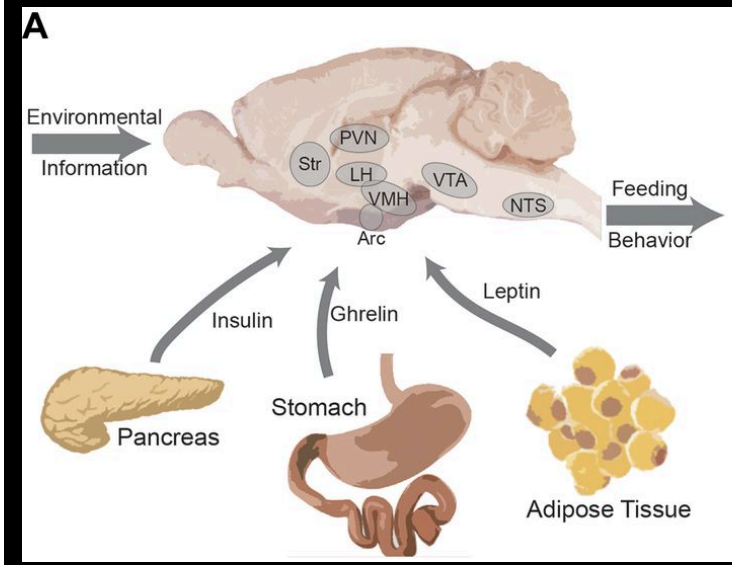

A
Environmental
Information
PVN
Str
LH
VTA
VMH
NTS
Arc
Feeding
Behavior
Insulin
Ghrelin
Leptin
Pancreas
Stomach
Adipose Tissue
B
PVN
CRF
Urocortin
BDNF
Galanin
OXY
AVP
CART
LH
Orexin, MCH
CART
NPY
NTS
BDNF
Galanin
CART
Substance P
NPY
POMC
VTA
Dopamine
GABA
VMH
BDNF
NmU
NPY
Arc
Galanin
POMC
CART
NPY
AgRP
Str
GABA
3V
Leptin
Insulin
Ghrelin
LEPRb
MC4R
GHSR
NPY-R
INSR

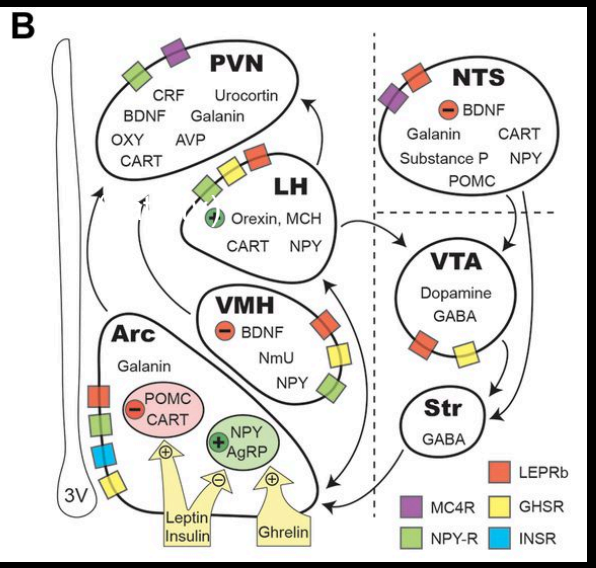
Goal Directed Behavior

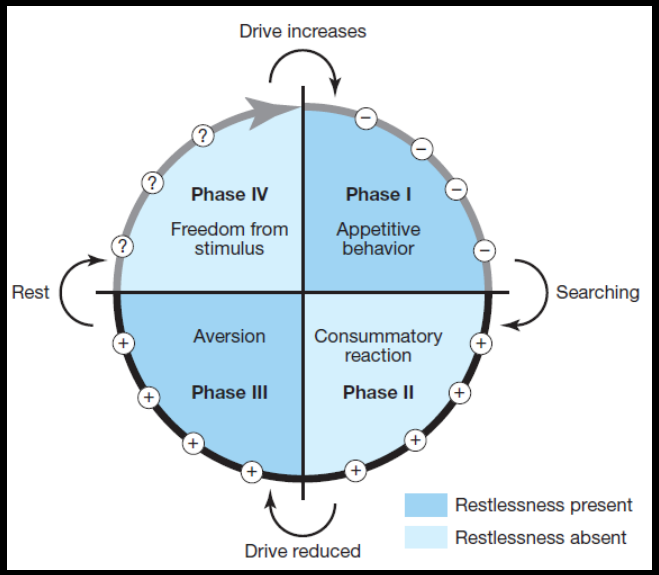
- Wallace Craig model (1900)
- Appetitive behaviors “drive” an individual towards a goal, e.g. foraging (hunger = drive).
- Consumatory behaviors satisfy a drive. e.g. feeding
- Aversion occurs once a drive is satisfied.
- without stimulus behavior is reset.

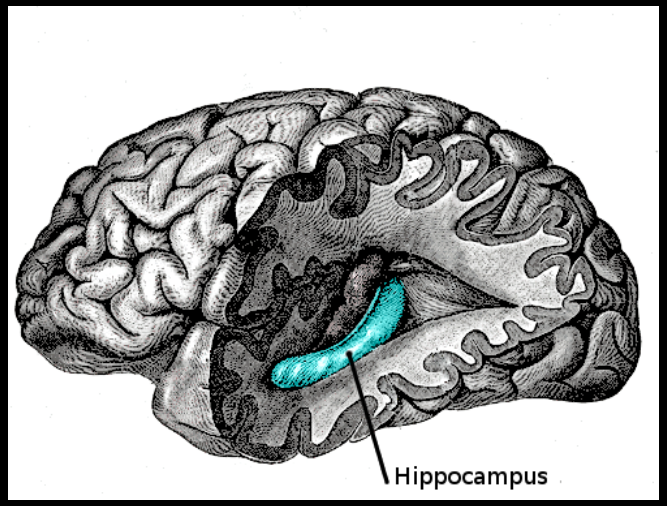


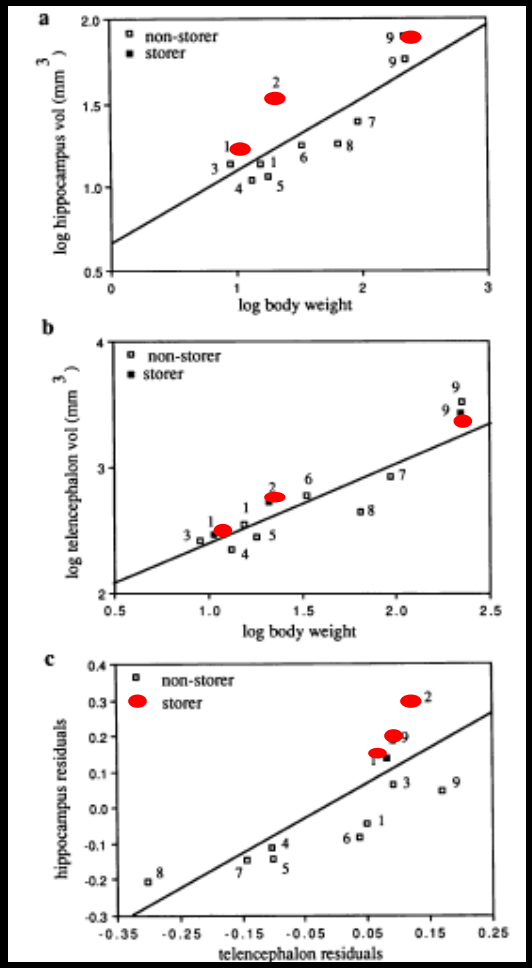
Modulation


A
Environmental
Information
PVN
Str
LH
VMH
VTA
NTS
Arc
Feeding
Behavior
Insulin
Ghrelin
Leptin
Pancreas
Stomach
Adipose Tissue


B
PVN
CRF Urocortin
BDNF Galanin
OXY AVP
CART
LH
Orexin, MCH
CART NPY
VMH
BDNF
NmU
NPY
Arc
Galanin
POMC
CART
NPY
AgRP
3V
Leptin
Insulin
Ghrelin
NTS
BDNF
Galanin CART
Substance P NPY
POMC
VTA
Dopamine
GABA
Str
GABA
LEPRb
MC4R
GHSR
NPY-R
INSR


Drive increases
Phase IV
Freedom from stimulus
Phase I
Appetitive behavior
Rest
Searching
Aversion
Phase III
Consummatory reaction
Phase II
Drive reduced
Restlessness present
Restlessness absent

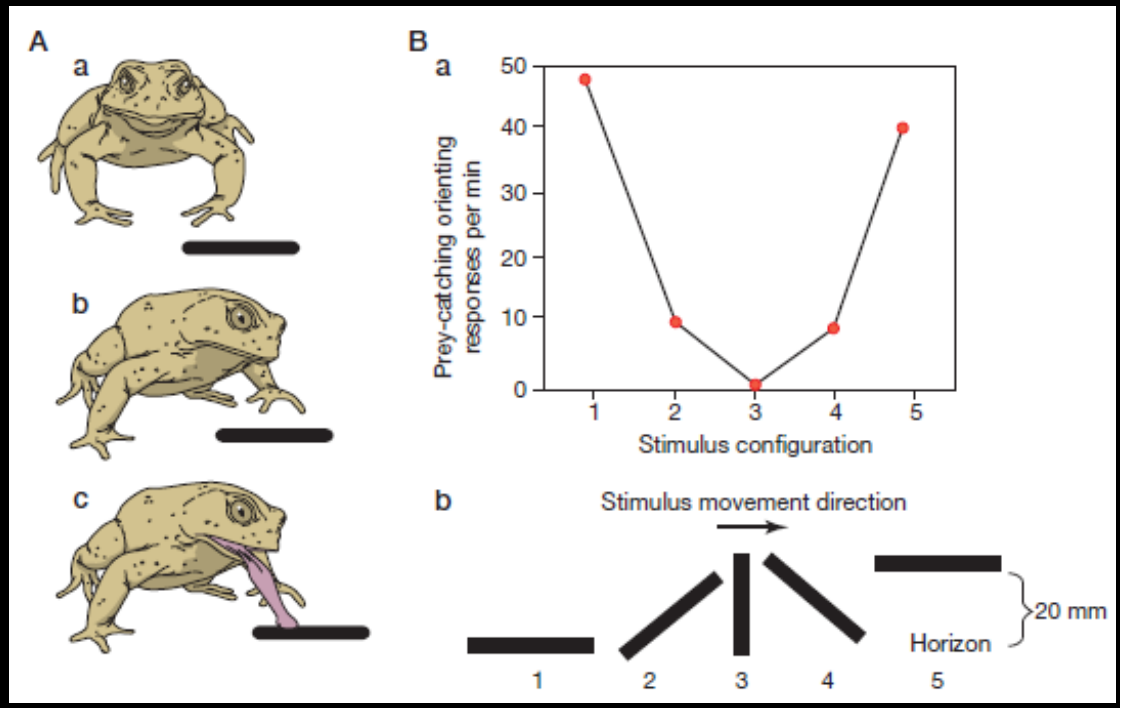

Hippocampus


a
non-storer
storer
log hippocampus vol (mm 3)
log body weight
b
non-storer
storer
log telencephalon vol (mm 3)
log body weight
c
non-storer
storer
hippocampus residuals
telencephalon residuals

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‖



PROCEEDINGS OF THE IRE November

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

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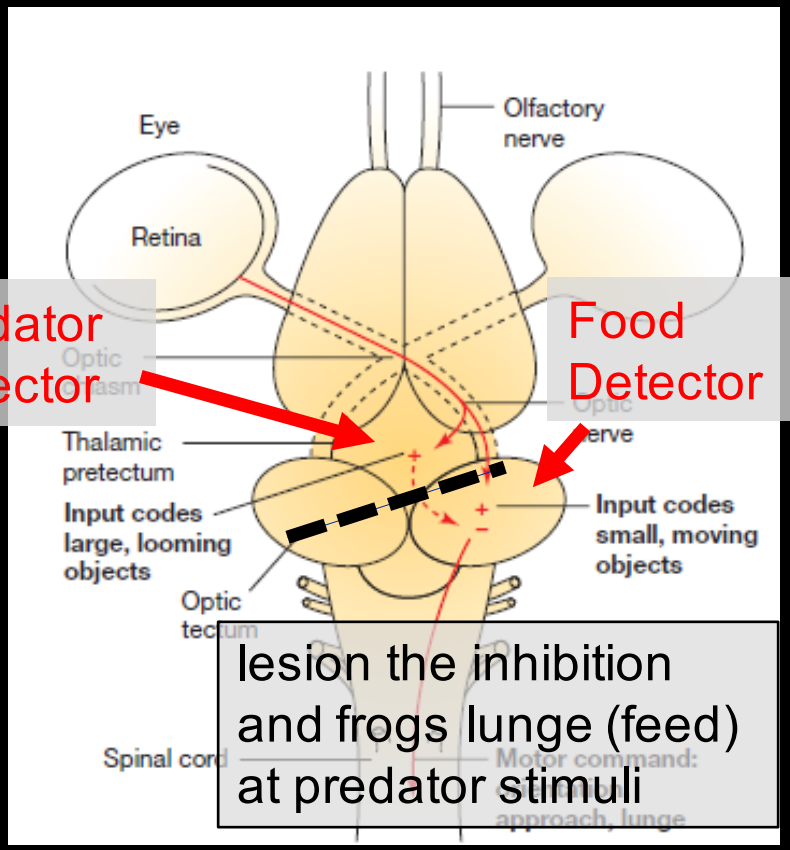
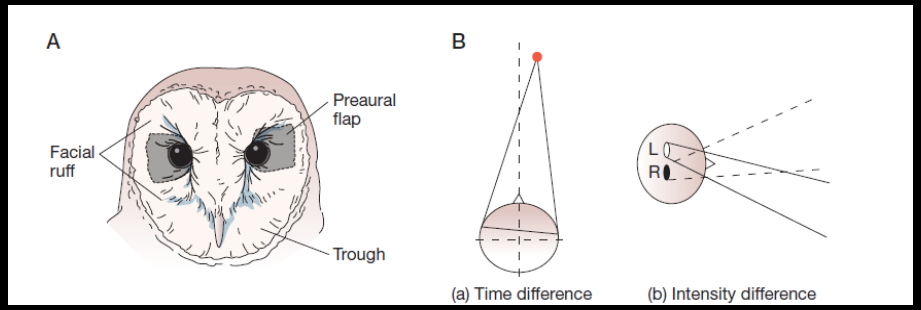


"feature detectors" to process stimuli


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

Optimal Foraging

- How to do you divide your time between more and less profitable prey?
- To make it simple, assume there is a one type of profitable and one type of unprofitable prey.
- Should you be a generalist and eat both, or a specialist and eat only the more profitable prey?

Optimal Foraging: lets build a model

- How much is each prey worth? **(E)** (benefit)
- What are the costs of obtaining it ? **(T)** (cost = time)
- What do you want to maximize? **(E/T)**
  - benefits as a function of costs
- So then we need to calculate the benefits and the costs to any food encounter.

Optimal Foraging: calculating E/T

- Prey 1 is more profitable, & Prey 2 less profitable
  - ($E_1 > E_2$)
- They are encountered at different rates (λ_1, λ_2)
- It takes different handling time (H_1, H_2).
- Predators search for prey for a certain amount of time (S)

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

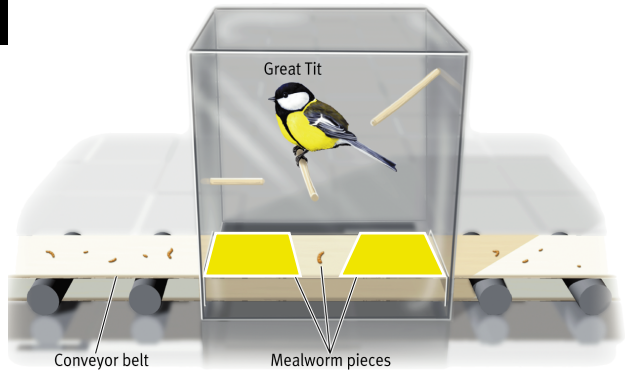
$T = S + (S(\lambda_1 H_1 + \lambda_2 H_2))$

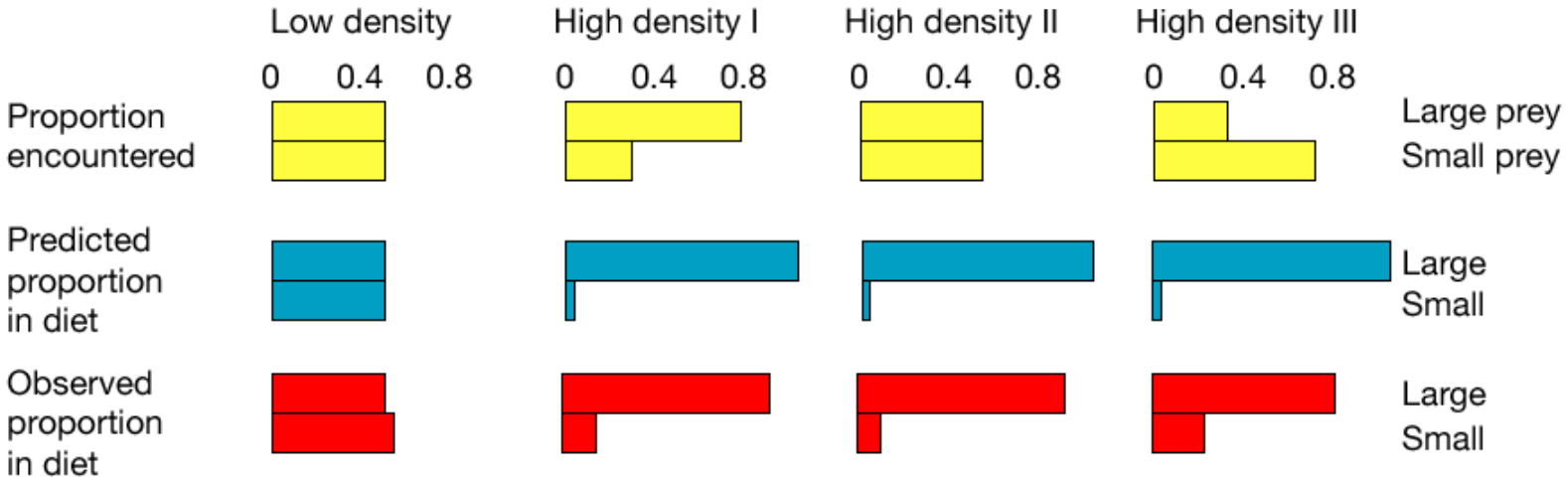
For specialist: $E = S\lambda_1 E_1$

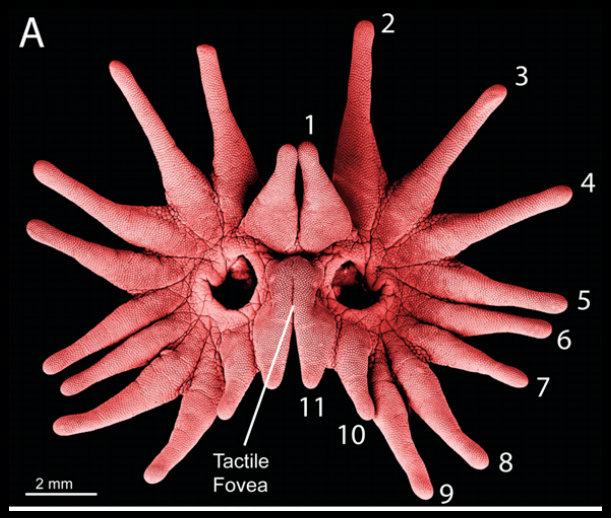
$T = S + S\lambda_1 H_1$

$$(E_1 H_2 / E_2) - H1 > 1/\lambda_1$$

be a specialist when encounter rate for profitable prey is high but notice λ_2 has dropped out of the equation. It doesn't matter what the ratio of the two items is, only the abundance of the profitable prey.


Great Tit
Conveyor belt
Mealworm pieces


Low density
High density I
High density II
High density III
0
0.4
0.8
Proportion encountered
Large prey
Small prey
Predicted proportion in diet
Large
Small
Observed proportion in diet
Large
Small



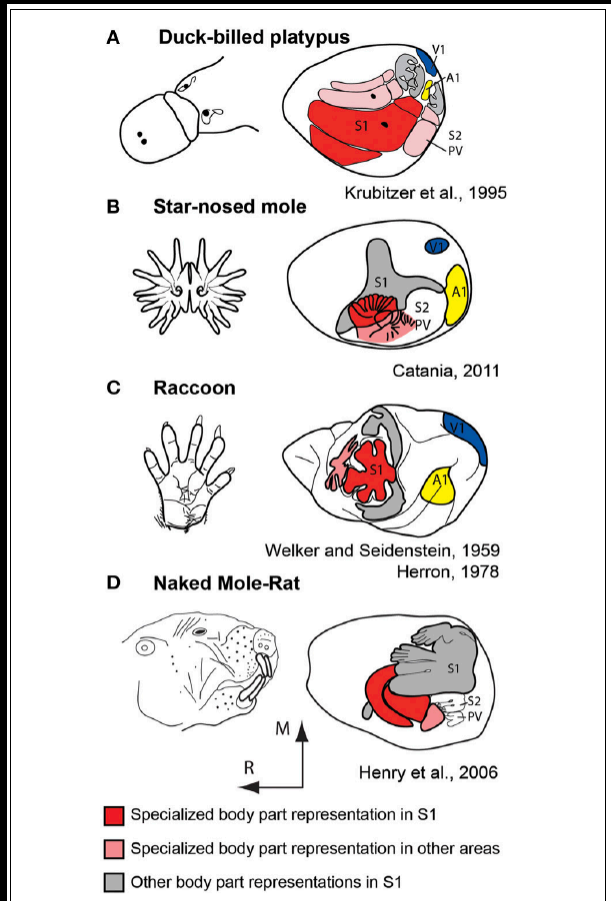
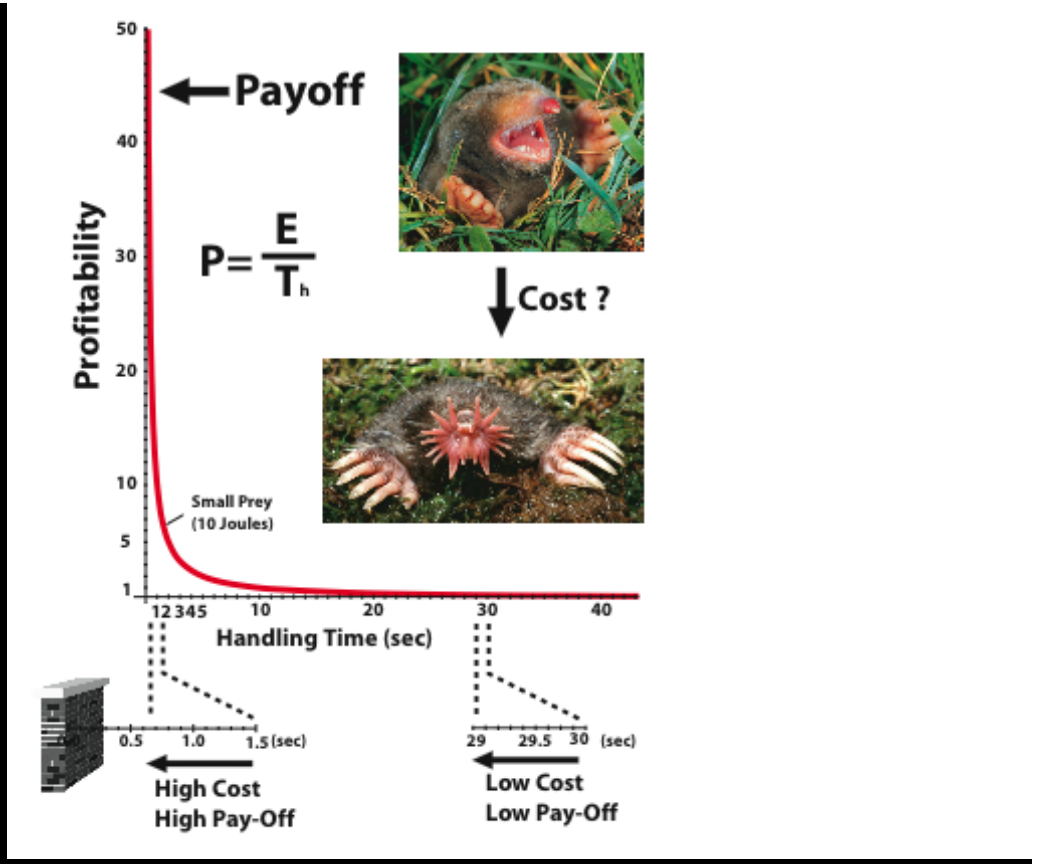


FIGURE 7 | Examples of extreme cortical magnification of behaviorally relevant effectors for somatosensory cortex of the duck-billed platypus (A), star-nosed mole (B), raccoon (C), and naked mole-rat (D). Although

Star-nose mole

Eastern mole

Star Nosed Mole



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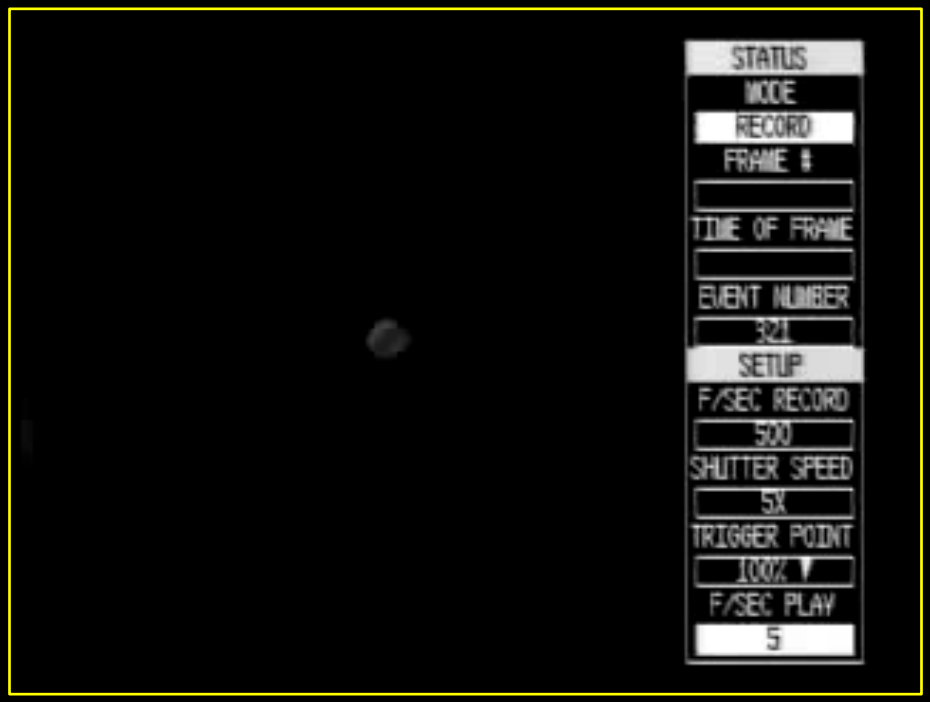
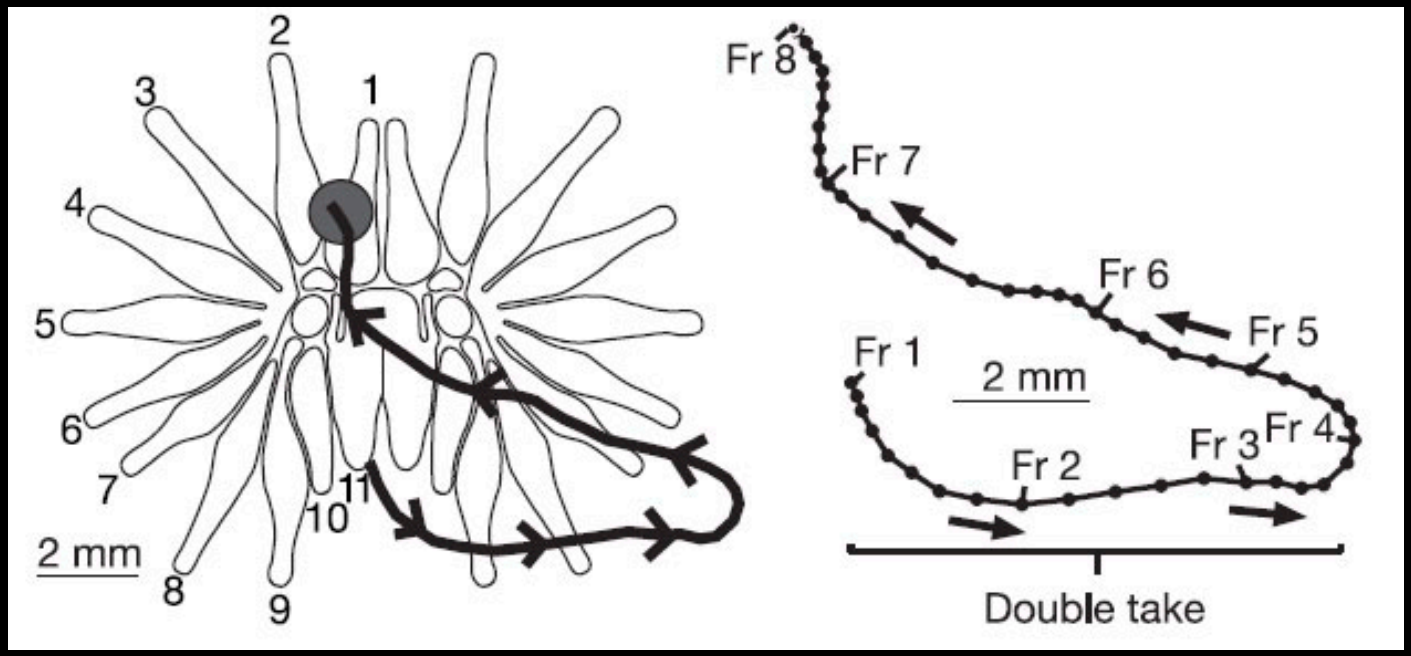
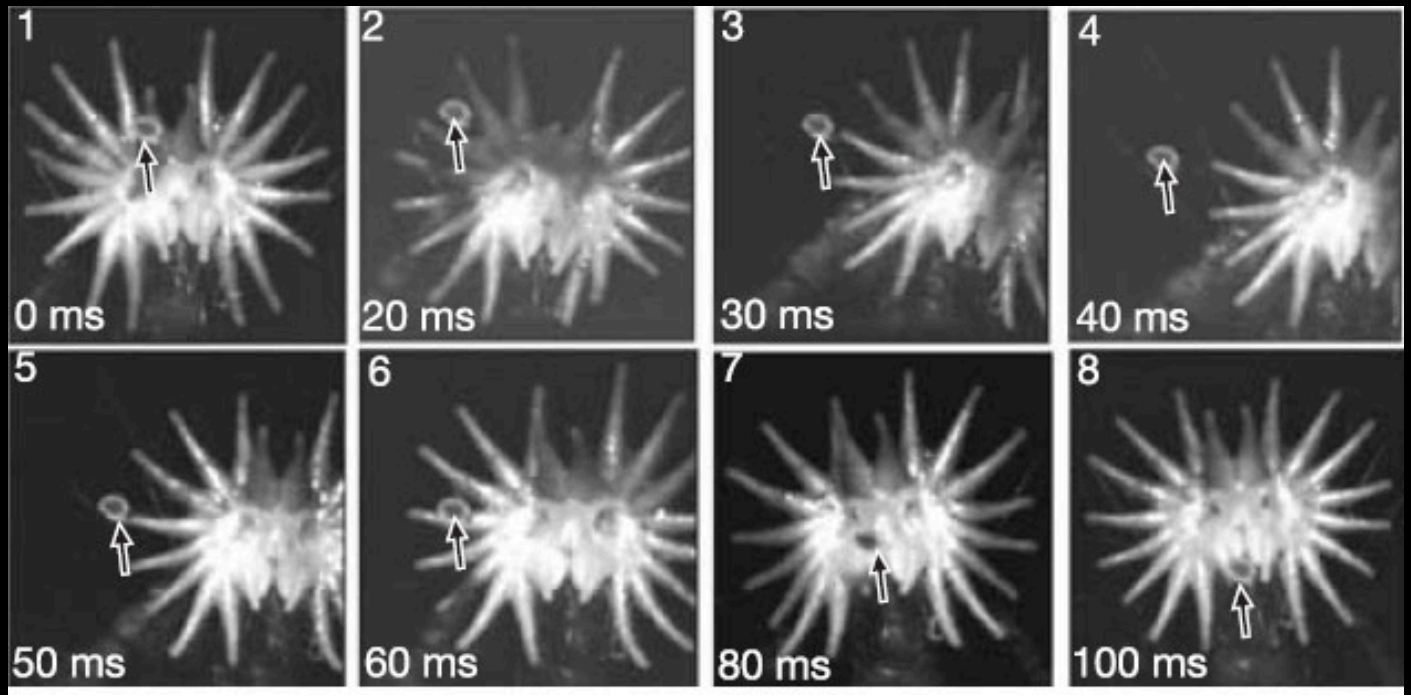
Double take

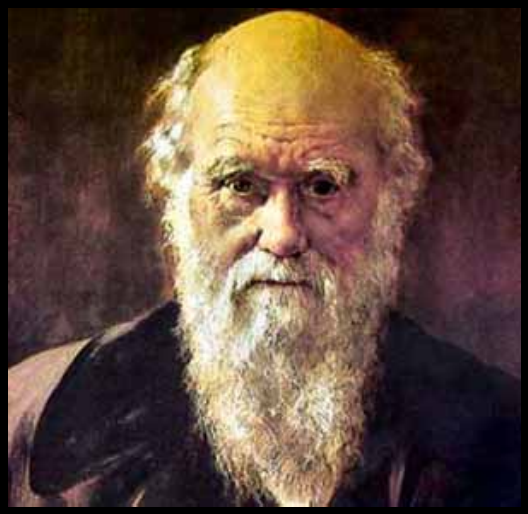

STATUS
MODE
RECORD
FRAME #
TIME OF FRAME
EVENT NUMBER
321
SETUP
F/SEC RECORD
500
SHUTTER SPEED
5X
TRIGGER POINT
100%
F/SEC PLAY
5


1
2
3
4
5
6
7
8
9
10
11
2 mm
Fr 8
Fr 7
Fr 6
Fr 5
Fr 4
Fr 3
Fr 2
Fr 1
2 mm
Double take


1
0 ms
2
20 ms
3
30 ms
4
40 ms
5
50 ms
6
60 ms
7
80 ms
8
100 ms

Star-nose mole
is a generalist

OTHER TRICKS WITH A STAR

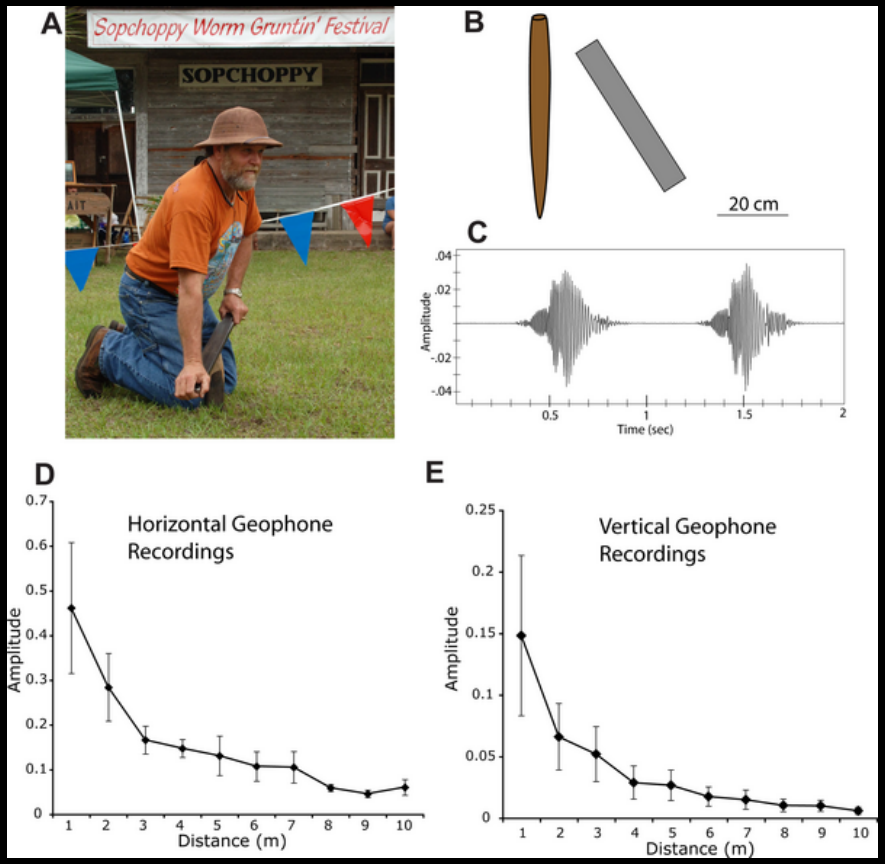


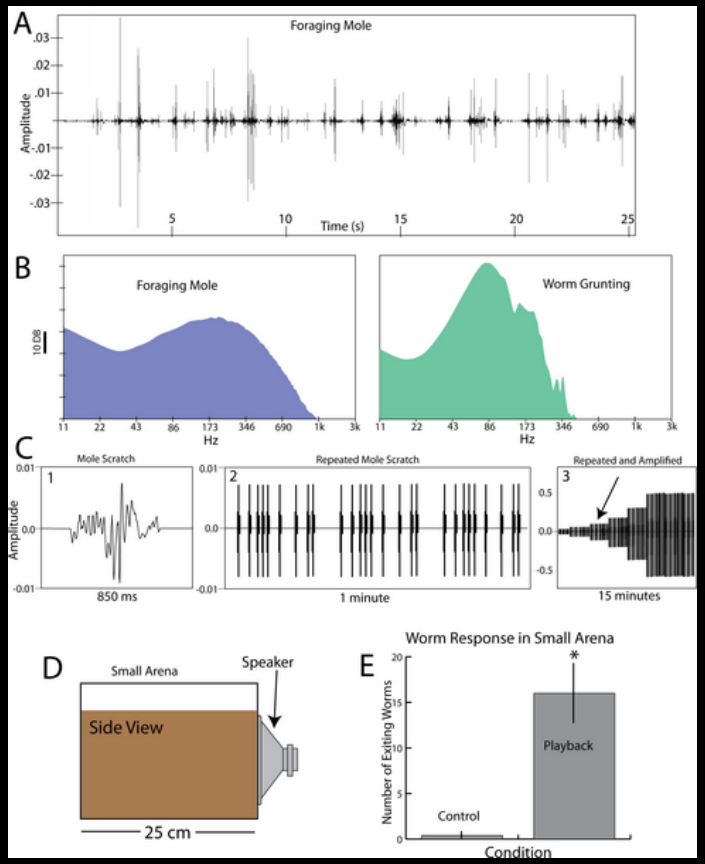
Worm Grunting

‘‘It has often been said that if the ground is beaten or otherwise made to tremble, worms believe that they are pursued by a mole and leave their burrows.’’ . . .

‘‘Nevertheless, worms do not invariably leave their burrows when the ground is made to tremble, as I know from having beaten it with a spade, but perhaps it was beaten too violently’’.

Darwin C (1881) *The Formation of Vegetable Mould Through The Action Of Worms With Observations On Their Habits.* (Reprint, 2002). McLean





(Catania, 2008, PLoS ONE)