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CAPE Evaluations!

- Fill out your CAPES before **December 10th at 8AM**!

- If **95%** (or more) students per section complete CAPE, the entire section will get 1% course grade

- CAPE URL: [https://cape.ucsd.edu/students/](https://cape.ucsd.edu/students/)
Last Week’s Topics

- Lecture 13 | Dr. Boyle: Marijuana & the Teen Brain
- Dr. Nitz: Readings
Lecture 13

Marijuana & the Teen Brain,

Dr. Boyle
1. What is the main psychoactive ingredient of marijuana? Why does it have a psychoactive effect?
2. Know the functions of different brain areas discussed in class and how marijuana can affect them:
   a. Hypothalamus
   b. Basal ganglia
   c. Ventral striatum
   d. Amygdala
   e. Brainstem
   f. Cortex
   g. Hippocampus
   h. Cerebellum
3. What are the three types of implicit learning discussed in lecture? What properties does each of them have?

4. What is the cellular modification theory? How does it explain how synaptic efficiency can change?

5. What are endocannabinoids? How do they affect communication between neurons?
1. What is the main psychoactive ingredient of marijuana? Why does it have a psychoactive effect?

Main psychoactive ingredient of marijuana = \( \Delta^9\text{-THC} \) (Delta-9-tetrahydrocannabinol)

Binds to CB1 cannabinoid receptors in the brain, and has an effect on us b/c of that
2. Functions of Hypothalamus

Controls hormonal and homeostatic activities in the brain/body.

- hormones
- appetite
- circadian rhythms
- sexual behavior
2. Functions of Basal ganglia

Controlled motor action performance and planning.

- motor controlled planning
- initiation of actions
- termination of actions

(Start - in prefrontal cortex)

habit pathway
2. Functions of Ventral striatum

- Prediction
- Reward
- Addiction?

Part of basal ganglia

Highest number of CB1 receptors in the brain

<= (kinda like habits gone haywire)
2. Functions of Amygdala

- anxiety
- emotion
- fear

Diagram showing brain structures including hypothalamus, cortex, hippocampus, basal ganglia, ventral striatum, amygdala, brainstem, and cerebellum.
2. Functions of Brainstem

- Vomiting reflex
- Pain sensation
- Sympathetic nervous system reactions
2. Functions of Cortex

- higher cognitive functions
- sensation perception
- judgment and pleasure

- hypothalamus
- basal ganglia
- ventral striatum
- amygdala
- cerebellum
- brainstem
- cortex
- hippocampus
2. Functions of Hippocampus

Hippocampus is important for spatial cognition and memory (esp. declarative)
2. Functions of Cerebellum

- motor control
- coordination
- motor learning
- doubles risk of car accident - DUI
3. What are the three types of implicit learning discussed in lecture? What properties does each of them have?
4. What is the cellular modification theory? How does it explain how synaptic efficiency can change?

Cellular modification theory - learning in habituation, sensitization and conditioning happens due to changes in synaptic strength/efficiency between neurons.
5. What are endocannabinoids? How do they affect communication between neurons?

Endo+cannabinoids =

- Internal (endo = inside) + Cannabinoids (i.e. Δ⁹-THC like molecules)

How do they affect synaptic transmission?
Readings

Brain’s GPS & How Brain Cells Tell Us Where We’re Going,

from Dr. Nitz
1. Understand the function that each of the following type of cells has
   a. **Place cells**
   b. **Grid cells**
   c. **Head direction cells**
   d. **Goal direction cells**
   e. **“Axis-tuned” neurons**

2. Who discovered place cells? Who discovered grid cells? How are these researchers connected?

3. In what animals and what brain region have (i) place cells, (ii) grid cells, and (iii) goal direction cells been found by researchers?

4. What are the ways of how sense of location and memory are related that the readings mention?
1. Functions of place cells & grid cells

**GRID CELLS**

As a person wanders around a new environment, so-called “grid cells” within the brain are thought to provide a base coordinate system.

**PLACE CELLS**

Related “place cells” respond to specific locations such as New York City’s Washington Square Park.
1. Function of head direction cells

Head direction cells fire when the animals head is pointing in a particular direction, for example in where the animal is moving.
1. Function of goal direction cells

Goal direction cells represent the goal and fire when the animal is close to it.

Goal is far away; Goal direction cell doesn’t fire

Goal is nearby; Goal direction cell fires
1. Function of “axis tuned” neurons

“Axis-tuned” neurons: Olson et al. argue that they aren’t head direction cells, b/c the cells fired only when the rats moved along specific paths and were silent when rats were foraging in open space.
2. Who discovered place cells? Who discovered grid cells? How are these researchers connected?

**John O'Keefe**
Works at UCL
Discovered place cells
2014 Nobel Prize in Physiology or Medicine

**May-Britt and Edvard Moser**
Lead Kavli Institute at NTNU
Discovered grid cells
Worked in O'Keefe’s lab
2014 Nobel Prize in Physiology or Medicine
3. In what animals and what brain region have (i) place cells, (ii) grid cells, and (iii) goal direction cells been found by researchers?

Place cells:
- Found in rat hippocampus by O'Keefe and Dostrovsky (1971)

Grid cells:
- Found in rat entorhinal cortex by Hafting, Fyhn, Molden, Moser and Moser (2005)

Goal direction cells:
- Found in bat hippocampus by Sarel, Finkelstein, Las, and Ulanovsky (2017)
4. What are the ways of how sense of location and memory are related that the readings mention?

(1) Method of Loci for memorization:
- Mentally attach different memories to different locations in a place you know well
- Imagine walking through that place and encountering those memories

(2) In Alzheimer's disease, entorhinal cortex (where grid cells are located) is affected first
Quiz time!

- No talking, signing, or communicating of any kind.
- Put *everything* away except a pen or pencil (make sure it’s a black pen and press hard with a pencil)
- When you get your quiz:
  1. Write your name in the “Name” box
  2. Write and bubble in your PID
  3. Sign the Academic Integrity Agreement
  4. Bubble in *this* section (regardless of which you’re assigned to)
- Please have your student ID out when you turn in your quiz!
Write and circle in your PID

Write down your name here

UC SAN DIEGO – DEPARTMENT OF COGNITIVE SCIENCE

| STUDENT PID NUMBER | Last NAME, First NAME | Section you are taking this quiz:
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COURS Number
COGS 1

WINTER 2018
Dr. Mary ET Boyle
Quiz I
Oct 8 – Oct 12, 2018

Quiz VERSION
A B C D E F G H

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COGS 1: QUIZ 1 - Choose the best answer. Please bubble in your answers to the right →

ACADEMIC INTEGRITY

By taking this quiz, you agree that you will follow ALL UCSD ACADEMIC INTEGRITY policies. It is YOUR responsibility to know and understand all of the policies. Failure to follow all UCSD Academic Integrity policies could result in expulsion from UCSD.

Signature       Date

Your signature above certifies that you will follow and that you know that you will suffer the consequence for ANY academic integrity violation.

YOUR ANSWERS GO HERE

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Bubble in the current section

Bubble in the answers

Sign and date here
## COGS 1: FALL 2018

**Section G, week 9**

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