COGS1
Section B
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Office Hours: Thursday 9:30-10:30am @ SSRB 235
Some important information before we start

- **Quizzes**
  - *Graded* quizzes will be at the end of every section (~15mins)
  - Lowest quiz score will be dropped
  - Online **extra credit** reading quizzes starting week 3

- **Readings**
  - The syllabus will describe which segments of the posted readings you should do

- **Section procedure**
  - I will present a pool of topics we can discuss. Because we might not have time to go over everything, we will take a vote over which material you want to go over the most.

- **Piazza**
  - Please use this tool to your advantage by [Join us here!](https://piazza.com/ucsd/winter2018/cogs1) asking and answering questions. Please make sure your question hasn’t already been answered before you post.
Brief review for the topics of last week

• Adult neurogenesis - Lara Rangel
• Split brain
• Memory formation
Adult neurogenesis
Review questions

1. What is the definition of adult neurogenesis? Where does it happen in adult human brain?
2. What is the new estimate of the number of neurons in the human brain?
3. Know the process and stages of new neuron development. What happens to newborn neurons? How can we observe newborn neurons?
4. Many things can influence adult neurogenesis. Proliferation and survival are regulated by what factors?
Review questions - continued

5. How does new neuron development help us to understand the importance of the hippocampus for learning and memory? What is the role of dentate gyrus?

6. Know the rationale behind the animal experiments introduced in the reading “Saving New Brain Cells”. Understand the experiment designs and results.

7. From the reading “Saving New Brain Cells”, know that learning enhances the survival of new neurons in the adult brain along with the limitations of its ability to rescue cells.
Review questions - continued

8. What is Broca’s Aphasia? Know its major cause and symptoms.

9. What is Wernicke’s Aphasia? Know its major cause and symptoms.

10. From reading, “Brain Facts Review, Chapter 4”, what brain region is missing in patient H.M. and what are his symptoms? What can we learn from the case study of H.M?

11. From reading, “Brain Facts Review, Chapter 4”, know the various types of memories and their differences.
1. What is the definition of adult neurogenesis? Where does it happen in adult human brain?

There are two main neurogenic regions

The **subgranular zone** of the dentate gyrus:

The **subventricular zone** of the lateral ventricle:

[Image: Illustration of brain structures showing the subventricular and subgranular zones.]

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Huart, Rombaux, and Hummel, 2013
2. What is the new estimation of the number of neurons in human brain?

New estimates of the number of neurons in the human brain range from roughly **80 billion** to **120 billion**.

Herculano-Houzel 2009
3. Know the process and stages of new neuron development. What happens to newborn neurons? How can we observe newborn neurons?
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**Doublecortin**: a microtubule-associated protein expressed in the first 2-3 weeks
3. Know the process and stages of new neuron development. What happens to newborn neurons? How can we observe newborn neurons?

**5-bromo-2’-deoxyuridine (BrdU):** a thymidine analog that is incorporated into the DNA of dividing cells during their S-phase.

Mak et al., 2013
4. Many things can influence adult neurogenesis. Proliferation and survival are regulated by what factors?

**Proliferation (rate of division):**

- **Stress**  
  Schoenfeld and Gould, 2012  
  decreases

- **Physical Exercise**  
  van Praag et al., 1999  
  increases

- **Antidepressants**  
  Boldrini et al., 2009  
  increases

- **Aging**  
  Kuhn et al., 1996  
  decreases

- **Seizures**  
  Jessberger and Parent., 2015  
  increases
4. Many things can influence adult neurogenesis. Proliferation and survival are regulated by what factors?

**Survival:**

- **Learning**  
  Dupret et al., 2007

- **Alcohol**  
  Crews and Nixon, 2004

- **Dietary Restriction**  
  Kitamura et al., 2006

- **Enriching Environments**  
  Tashiro et al., 2007

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**Diagram:**

- Increases
- Decreases
5. How does new neuron development help us to understand the importance of the hippocampus for learning and memory? What is the role of dentate gyrus?

The dentate gyrus is important for helping us discriminate between similar experiences.

Neurons in the dentate can detect differences between experiences by demonstrating highly selective and specialized activity.

Gilbert et al., 2001
Aimone et al., 2011
5. How does new neuron development help us to understand the importance of the hippocampus for learning and memory? What is the role of dentate gyrus?

Adult-born neurons may facilitate the allocation of selective and dedicated activity for new experiences in the dentate gyrus.
6. Know the rationale behind the animal experiments introduced in the reading “Saving New Brain Cells”. Understand the experiment designs and results.
7. From the reading “Saving New Brain Cells”, know that learning enhances the survival of new neurons in the adult brain along with the limitations of its ability to rescue cells.

Some limitations:
- Training cannot occur outside of a critical window
- Learning must be of the right type
  - Must be sufficiently challenging
  - Not emotional learning
- Learning only aids in survival, not proliferation
8. What is Broca’s Aphasia? Know its major cause and symptoms.

- Stutter, omit some words and cannot finish a whole sentences
- [Real example from UK](#)
9. What is Wernicke’s Aphasia? Know its major cause and symptoms.

- Fluent but meaningless of the sentences
- **Real example**
10. From reading, “Brain Facts Review, Chapter 4”, what brain region is missing in patient H.M. and what are his symptoms? What can we learn from the case study of H.M?

Henry Gustav Molaison (February 26, 1926 – December 2, 2008)
11. From reading, “Brain Facts Review, Chapter 4”, know the various types of memories and their differences.

- **Memory types vary in time:**
  - Long-term, short-term, and working memory

- **Memory types vary in content:**
  - Declarative v.s. non-declarative (procedural)
  - Emotional aspects of memory
Split brain
Review questions

1. What is split-brain surgery (corpus callosotomy)? What is the purpose of it?
2. What is the corpus callosum, and what is its function?
3. What is a seizure? What are the two types of seizures, and where do they normally occur?
4. What are the expertise(s) of the left and right hemisphere?
5. Know the *four* lobes of the brain and the major function of each.
6. What does it mean that information is processed contralaterally in our brain?
Review questions - continued

7. Know the axes in brain anatomy and the directional terms. Know the three planes of section and their differences.

8. According to the reading, “The Split Brain”, how does the cognitive ability of split brain patients differ from healthy individuals? What are the symptoms of a split brain patient?

9. According to the reading, “The Split Brain”, what is the modular model?
Review questions - continued

10. Explain the following results in split brain patients:
1. What is split-brain surgery (corpus callosotomy)? What is the purpose of it?
2. What is the corpus callosum and what is its function?
3. What is a seizure? What are the two main types of seizures, and where do they normally occur?

- Partial seizure
- Generalized seizure

*Why might seizures result in increases of neurogenesis?
4. What are the expertise(s) of the left and right hemisphere?

Left side
- Language
- Cause & effect reasoning
- Schema
- Visual search task

Right side
- Face
- Emotion
- Visuomotor task

You are not a left brained or right brained person!
5. Know the *four* lobes of the brain and the major function of each.
6. What does it mean that information is processed contralaterally in our brain?
7. Know the axes in brain anatomy and the directional terms. Know the three planes of section and their differences.
8. According to the reading “The Split Brain”, how do the cognitive abilities of split brain patients differ from those of healthy individuals? What are the symptoms of a split brain patient?

The interpreter

Testing for synthesis
8. According to the reading “The Split Brain”, how do the cognitive abilities of split brain patients differ from those of healthy individuals? What are the symptoms of a split brain patient?

Looking for illusion
9. According to the reading “The Split Brain”, what is the modular model?
9. According to the reading “The Split Brain”, what is the modular model?