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9.01 Introduction to Neuroscience
Fall 2007

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9.01 Recitation (R02)

RECITATION #9: Tuesday, December 11, 2007

Outline of Recitation:

- I. How to study for the final:
 - a. **FINAL IS ON DEC. 20th FROM 9-12 IN DUPONT**
 - b. 2/3 of the final will be on new material = 30 multiple choice & ~ 3 long answers
 - c. 1/3 of the final will be on old material = 15 multiple choice & ~ 2 long answers
 - d. All lectures, assigned chapter readings and problem sets are fair game
- II. Brief review of material:
 - a. **Learning and Memory** (Ch. 24 & 25)
 - b. **Attention** (Ch. 21)
- III. Practice Exam Questions

This is brief summary of the material covered in lecture...you will also be required to know all the material not on this handout.

LEARNING AND MEMORY

To review: (1) read chapter 24 & 25 (2) review lecture PowerPoint slides (3) review Pset #3

Some important points:

Declarative memory (explicit memory) – memory of facts and events

→ experiments: study temporal lobe epilepsy; temporal lobectomy (lesion); electrical stimulation

Long-term potentiation (LTP): high-frequency stimulation, postsynaptic depolarization, lasts for minutes

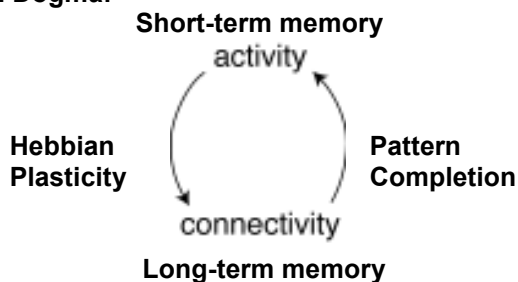
Long-term depression (LTD): neurons fire out of sync; low-frequency

Glutamate NMDA receptor: coincidence detector; transmitter-gated & voltage-gated; permeable to calcium

→ problem 3 of Pset 3

→ blocking of receptors leads to learning impairment (Morris water maze; NR1 mice knockouts)

Central Dogma:



Hebbian synaptic plasticity: neurons that wire together, fire together. Co-activation results in cell assemblies.

Short-term and Working Memory: → Wisconsin card sorting; radial arm maze; delayed-match-to-sample

Nondeclarative memory (implicit memory) -- procedural memory (skills and habits)

→ classical (Pavlovian) conditioning

→ Aplysia californica experiments: habituation and sensitization

→ See additional handouts (Brown Neuro handouts) for more on memory

ATTENTION:

To review: (1) read chapter 21 (2) review lecture notes

Some important points:

Attention: the state of selectively processing simultaneous sources of information

Behavioral consequences of attention:

→ enhanced detection (experiment on p. 646)

- cueing to the correct side of where the target would appear made it easier to detect the flashed target

→ faster reaction times

- attention can alter the speed of visual processing or the time it takes to make a decision to press the button

Neglect Syndrome: appears to ignore objects, people and sometimes his own body to one side of the center of gaze. Common w/ right hemisphere damage

Physiological effects of attention:

→ fMRI imaging of attention to location (p. 649-650)

- the areas of highest brain activity move away from the occipital pole as the attended sector moves out from the fovea
- pattern of brain activity move retinotopically, even though the visual stimuli are the same regardless of which sector it is in

→ PET imaging of attention to features

- numerous cortical areas appear to be affected by attention and the greatest attention effects are seen "late" rather than "early" areas in the visual system
- attention increases brain activity, but the particular areas are dependent on nature of behavioral task performed.

Enhanced neuronal response in parietal cortex: (p.652)

→ a neuron in cortex responds to a target stimuli

→ the response is enhanced if the target presented is followed by a saccade to the target

→ enhancement is spatial selective b/c it is not seen if a saccade occurs in response to a stimulus not in the receptive field

Receptive field change: (p.654)

→ difference in ease of detection at the attended and unattended locations is based on the higher activity evoked by effective stimuli at the attended location = location specificity

Pulvinar nucleus: structure in thalamus in which lesions result in abnormally show responses to stimuli on the contralateral side

Frontal eye fields (FEF): cortical area that is involved in the production of saccadic eye movements and may play a role in the guidance of attention

→ has motor fields = small areas in visual system

- if significant stimulation passes through FEF, then eyes rapidly make a saccade to the motor field of the stimulate neuron

PRACTICE EXAM QUESTIONS ON FOLLOWING PAGE