

**Master Biology and Health,
Mention Neuroscience, M1 NeuroBIM**

UE HIGHER BRAIN FUNCTIONS

Tuesday 9th of January 2018

*Please, answer on two separate copies to **two** out of the **four** following questions. Each subject corresponds to one hour essay.*

Subject from Aline Desmedt (duration: 1h00)

- 1- Give the definition of post-traumatic stress disorder (PTSD), and then describe the cardinal feature of this psychiatric disorder.
 - 2- What about the current animal models of PTSD? What are the main limits of these models?
 - 3- Describe a recent animal model of the key feature of PTSD (traumatic memory).
- (Important: maximum 2 pages.)**

Subject from Etienne Coutureau / Alain Marchand (duration: 1h00)

In an experiment on Pavlovian *second-order conditioning* Holland & Rescorla (1975) presented hungry rats with light, tone and food stimuli in two phases, followed by a test:

Phase 1:

A 10 s flashing of houselight (CS1), immediately followed by 2 food pellets (US) delivered in a magazine, for a total of 40 trials over 5 days (8 trials/day).

Phase 2:

A 10 s tone (CS2), immediately followed by CS1, without food, for a total of 18 trials over 3 days.

Test:

8 presentations of CS2 alone.

Question 1 (5 points): What kind of behaviors are you expecting over the course of phase 1?

Question 2 (3 points): Each daily session was 2 hours in duration. What was the purpose of these long periods between presentations of CS1?

The figure 1 represents the modulation of frontal eye field (FEF) neuronal responses in monkeys performing an attention task. In the task, monkeys fixated on a central fixation spot (yellow dot in gray panels) and depressed a manual lever. The brief appearance of a peripheral cue (white square, first panels) instructed the monkey that, after a delay (1 s), a change in the orientation of a flashed grating stimulus may occur at the cued location (50% of trials). During the grating flash epoch that followed the delay, an array of six oriented gratings was flashed twice, and the monkey was rewarded for releasing the lever if the grating at the cued location changed its orientation and for holding the lever if a change did not occur. The diagram depicts trials without a change. The five remaining gratings were distracters. The neuronal response histograms below show the average response of a population of 106 FEF neurons on correct trials in which monkeys were cued to attend either to the location coinciding with the receptive field (RF) of a FEF neuron (red) or to a location in the opposite hemifield (gray). The dotted half circle in each panel depicts the neuronal RF. Data are from only trials on which the grating orientation did not change

Subject from Thomas Michellet (duration: 1h00)

Important: maximum 2 pages.

Remark: be careful, this is an endless question. Therefore, be straightforward and don't get lost in unnecessary details.

1. What the hippocampus does not? Which kind of memories are not affected by hippocampal lesions? Give examples or at least the kinds of tasks that are not disturbed by hippocampal lesions.
2. What the hippocampus does? Again, provide short examples to support your statements.

Since 60 years the role of the hippocampus has been deeply investigated by a plethora of researchers all over the world. Although there is still a lot to do they are nevertheless insights on hippocampal function. Please answer with **concision** to the following questions.

Subject from Jacques Micheau (duration: 1h00)

Question 5 (4 points): Describe an experiment testing the instrumental incentive value of CS1 and CS2.

Question 4 (3 points): During the test, presentations of CS2 induced an approach to the food magazine. Did you expect CS2 to acquire associative strength during phase 2? Does this result agree with Rescorla & Wagner's model?

Question 3 (5 points): During phase 2, presentation of CS1 was not followed by any food. What should happen to the associative strength of CS1 according to Rescorla & Wagner's model? (Explain in terms of prediction error).

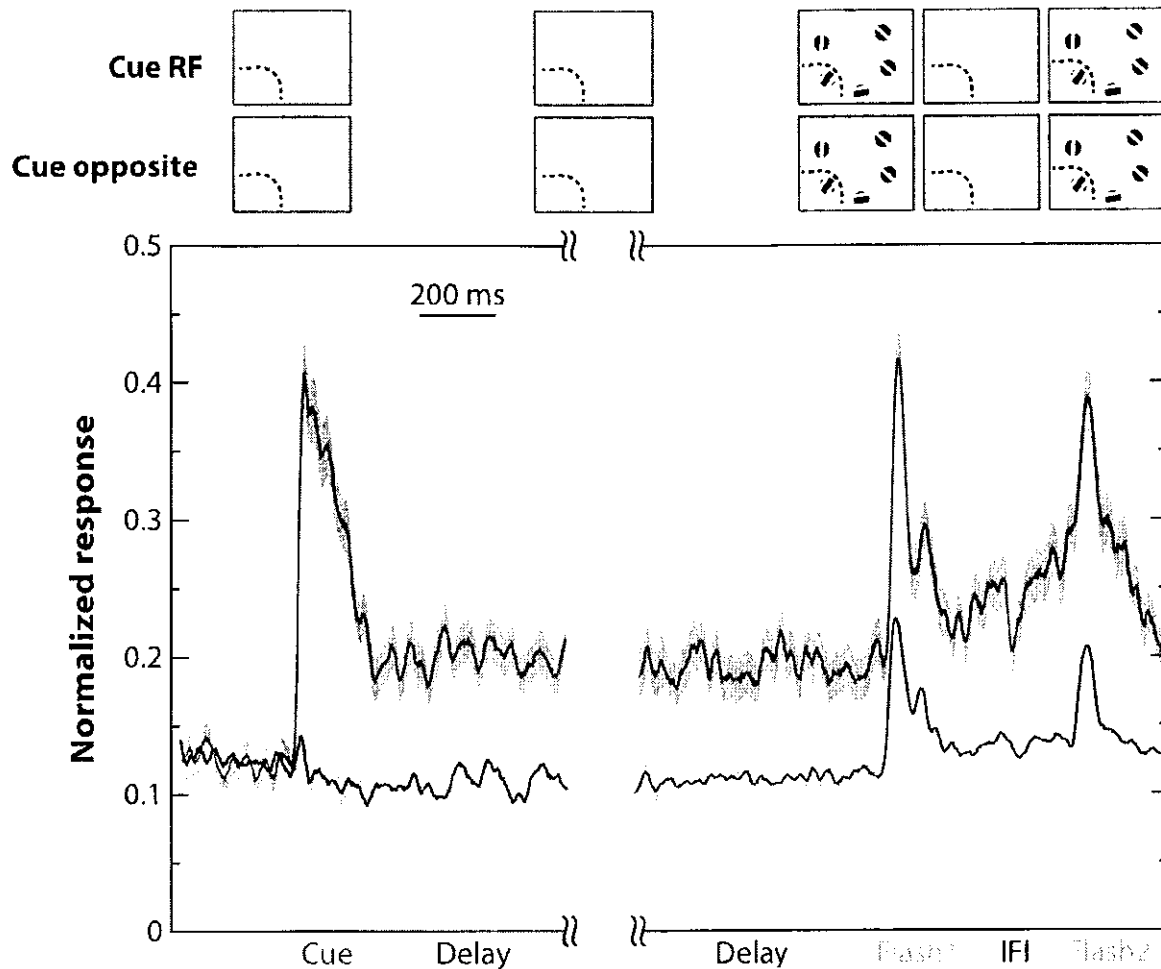


Figure 1

- 1) Give a definition of a receptive field.
- 2) What conclusions can be drawn from the analysis of the fig1 results ? In which aspect of attention the FEF is involved ?
- 3) Could you propose an experiment in order to assess the involvement of FEF neurons in bottom-up control of attention ?
- 4) Give a brief definition and synonyms of the terms bottom-up and top-down control of attention.

A patient was shown drawings in which the shape of an object is drawn in dots and then asked to mark with a pencil each dot. The figures here (fig 2) show the responses of this patient.

5) What conclusion about the patient's brain damage can be drawn from this picture ? What are the name and the main characteristics of this syndrome?

Figure 2

