ACADEMIC YEAR
2016 - 2017

1st session

Master Biology and Health,

Mention Neuroscience, M1 NeuroBIM

UE HIGHER BRAIN FUNCTIONS

Tuesday 3rd January 2017

*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-After having defined a "Post-traumatic stress disorder" (PTSD) and described the cardinal feature of this pathology, explain to what extent most of the current classical animal models of this stress-related disorder are highly questionable.

2- Describe a recent animal model for the key paradoxical memory alteration observed in PTSD.

3-Describe a theoretical neurobiological model proposed in order to explain the PTSD-related paradoxical alteration of memory (a figure representing such model is recommended).

Important: maximum 2 pages.

Subject from Aline Marighetto (*duration: 1h00*)

Define declarative memory in human and its translation in animal. Why is it important to investigate this memory and how could we study it in animals?

Important: maximum 2 pages.

Subject from Thomas Boraud (*duration: 1h00*)

Question #1: Describe quickly Pascal's wager (you can use a table). What is its significance in the history of decision making (3 pts).

Question #2: In decision making theory, what is utility? Give at least 2 of the axioms of utility defined by von Neumann. (3 pts +1 pts per axiom above 2).

Question #3: Describe the experiment called "2-armed bandit task" that designed Herrnstein in order to assess decision making in pigeons. What are his conclusions? In this prospect, explain the exploration/exploitation trade-off (4 pts).

Question #5: Under a neurobiologist prospect, what is decision? What is rationality? Describe 2 tests that help to test decision making and learning (3 pts).

Question #6: Using a cartoon, describe the "actor-critic" model (3 pts).

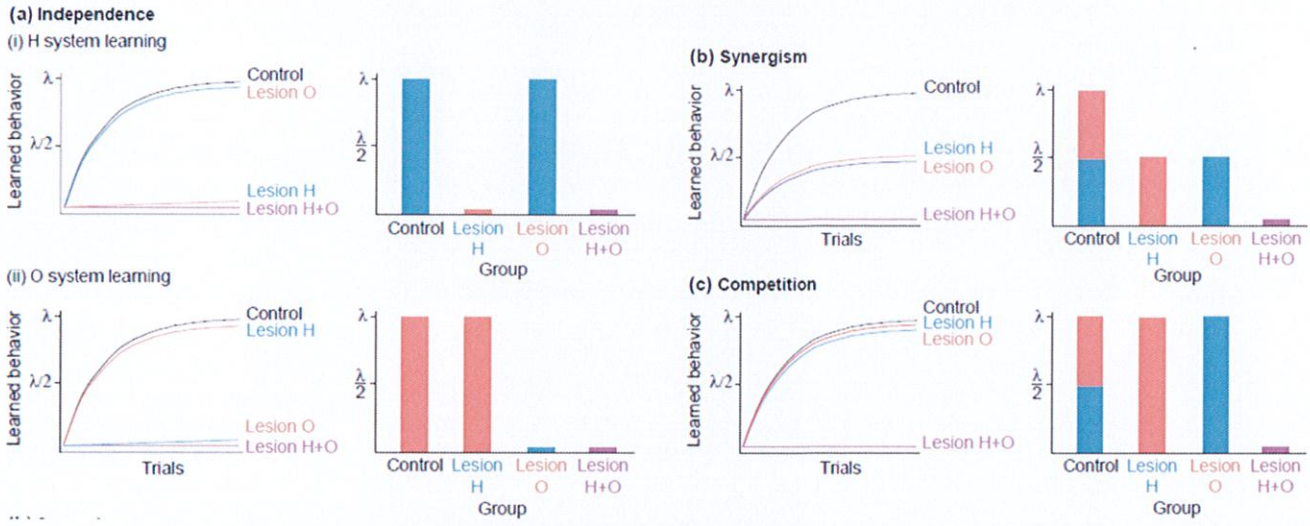
Question #7: What are the basic principles a neural tissue need to decide? What are the ones it needs to learn (4 pts).

Bonus question: Design an experiment that will allow you to assess optimism in human subjects (4 pts).

Subject from Jacques Micheau (*duration: 1h00*)

Memory systems have been deeply investigated but the level of interaction between those is still a matter of debate.

1. In Figure 1 are depicted the different scenarios of interactions between 2 memory systems. Describe and explain each situation.
2. Figure 2 summarizes an experiment from Packard and McGaugh (1996) we have seen in course. Describe and comment.
3. We have also seen a similar experiment from Packard but with glutamate instead of lidocaine injections (Packard, PNAS , 1999 vol. 96(22): 12881-). Based on figure 2 draw a histogram depicting the results of this experiment.
4. Stress the main information raised by these results.
5. Give your opinion and comment by explaining how do you see brain functioning.



Kim and Baxter, 2001, TRENDS in Neurosciences, 24(6): 324-330

Figure 1. Effects of lesions of two brain structures involved in two memory systems.

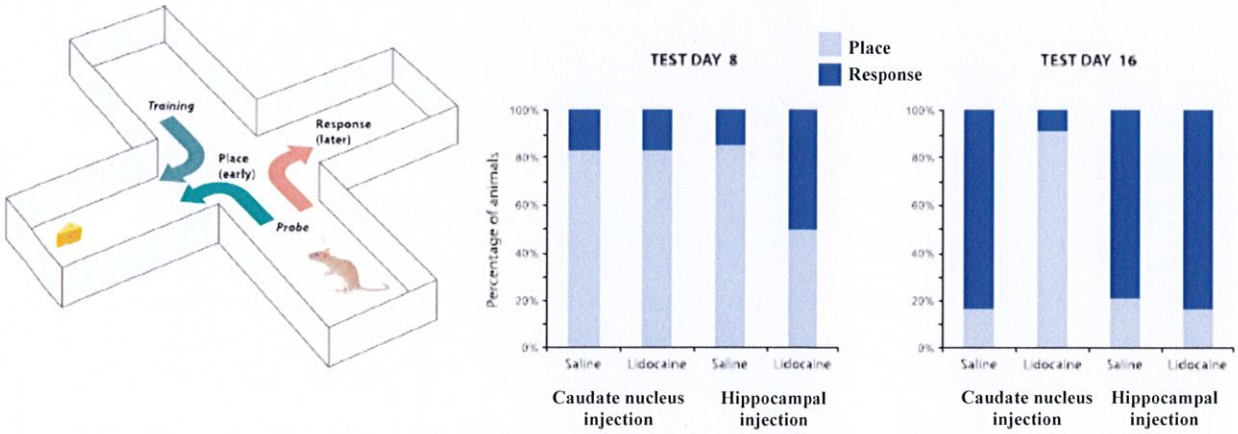


Figure 2. Examples of the hippocampal and striatal contributions to spatial navigation: proportion of rats in the probe trials on days 8 and 16, with either lidocaine (local anesthetic) or saline injections in the caudate nucleus or hippocampus.