

## Summary

This work has been motivated by the desire to enhance our knowledge about specific cognitive requirements of navigation in multiple reference frames environments and to understand the roles of the hippocampus and posterior parietal cortex in this behavior. The main conclusions of this thesis are:

- (a) We have developed a novel behavioral test called the Enemy Avoidance Task. The initial set of experiments has shown that laboratory rats are able to plan their movement with respect to a to-be-avoided moving object. Behavioral performance in the task may be quantitatively evaluated.
- (b) The aforementioned ability is crucially dependent on the functional integrity of the dorsal hippocampus. To the contrary, functional inactivation of the dorsal hippocampi by local infusion of tetrodotoxin did not cause any impairment in the ability of the animal to estimate its distance from a non-moving object. The finding suggests a specific role of the hippocampus in dynamic cognitive processes required for flexible navigation strategies such as continuous updating of information about the position of a moving stimulus. These results are at odds with the two major theories of hippocampal function (Cognitive map theory and Declarative memory theory) and therefore suggest that revision of the theories is necessary.
- (c) Lesion to the posterior parietal cortex does not critically impair avoidance behavior in the Enemy Avoidance Task.
- (d) We have analyzed the importance of inertial stimuli generated by arena rotation in the AAPA task (avoidance of a room-frame bound sector on a rotating arena). Inertial stimuli are critically important in the acquisition phase of the task, but are not indispensable once the task is already learnt. Following an initial training period, visual stimuli are sufficient to solve the task.
- (e) Lesion to the posterior parietal cortex does not cause major impairment in the place avoidance task on rotating arena in neither of the reference frames. However, indirect evidence from the “frame-preference test” shows that PPC lesion may produce changes in cognitive coordination, i.e. the ability to separate the frames. However, further research is needed to confirm the hypothesis.