DEPT. OF MOLECULAR BIOLOGY AND GENETICS
AARHUS UNIVERSITY

Keynote Lecture: The brain and space

Friday 8 June 2012 at 15:15
Lakeside Lecture Theatres ("Søauditorierne")
Per Kirkeby Auditorium, Bldg. 1250

May-Britt Moser

Kavli Institute for Systems Neuroscience
NTNU, Trondheim, Norway

Self-location is represented by hippocampal and parahippocampal cells that are active at certain places in the environment or when an animal moves in a certain direction. Grid cells, place cells, border cells and head direction cells are examples of such cells.

In the first part of my talk, I will discuss fundamental properties of grid cells, including its topographical organization along the dorsal-ventral axis of the entorhinal cortex. Grid cells fire selectively at regularly spaced positions in the environment such that, for each cell, activity is observed only when the animal is at places that together define a repeating triangular pattern tiling the entire environment covered by the animal, much like the holes of a Chinese checkerboard. The scale of the grid map is topographically organized in that the spacing of the grid increases from the dorsal to the ventral end of medial entorhinal cortex. But is there only one spatial map or many? I will show that the organization of the grid map is modular and that the multiple maps are functionally independent. Grid cells are co-localized with other functional cell types such as head-direction cells and border cells. It is assumed that these cell types contribute together to a dynamically updated metric representation of current location in the medial entorhinal cortex. Because the entorhinal cortex is the main input source to the hippocampus, we asked whether all cell types in the entorhinal cortex project to the hippocampus, or if only grid cells contribute with information to the hippocampal place cells. Based on studies using a virus-mediated approach to selectively express photoresponsive channel proteins in entorhinal cells with projections to the hippocampus, I will suggest that grid cells, head direction cells and border cells all provide direct input to the hippocampus, with grid cells providing the principal contribution.