2007 Finalist

Marianne Fyhn, Ph.D.

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eppendorf & Science PRIZE FOR NEUROBIOLOGY

Dr. Marianne Fyhn was born in Morehead City, North Carolina, but grew up in Norway where she earned her M.Sc. on the bioenergetics of arctic seabirds (1998) and her Ph.D. in neuroscience in the lab of Drs. May-Britt and Edvard Moser at the Norwegian University of Science and Technology. Her studies focused on the spatial representation of neurons in the hippocampus and entorhinal cortex of free roaming rats; while working on her Ph.D., she discovered grid cells with their remarkable repetitive receptive fields, tessellating the environment and leaving a hexagonal firing pattern. In 2005 she was awarded the Donald B. Lindsey award for outstanding Ph.D. thesis, followed by two prestigious Norwegian prizes for young scientists in 2006 and 2007. Dr. Fyhn is currently a postdoc in the Moser Lab, and her scientific goal is to understand the neuronal basis of navigation and memory. Outside the lab she enjoys fly fishing, mountaineering and outdoor activities with her two children.

The grid map in the brain

The ability to find one's way depends on neural algorithms that intergrate information about place, distance and direction. During the past 30 years, the neurons of the hippocampus were thought to constitute a cognitive map of the environment; this was questioned, however, when it turned out that the "place cells" of the hippocampus were not abolished by disruption of the intrahippocampal network—suggesting that the place representation is computed upstream of the hippocampus.

Dr. Fyhn has been the first to record in an area of entorhinal cortex that directly connects with the dorsal hippocampus, and she found that spatial location is represented with similar accuracy in the medial entorhinal cortex (MEC) as in the hippocampus. This led to the discovery of the MEC grid cells that fire in a hexagonal array over the entire area covered by a moving animal, irrespective of the extrinsic features of the environment. Grid cells co-exist with head-direction cells and conjunctive grid-head-direction cells, pointing to the MEC as a hub for the brain network that makes us find our way through the environment. Her work on the interaction between MEC and the hippocampus showed that grid cell dynamics determine pattern separation processes in the hippocampus. These findings introduce new avenues for studies on how neural networks generate patterns that are not a mere reflection of the sensory input.