EDVARD MOSER

Norwegian psychologist and neuroscientist, awarded the Nobel Prize in Physiology or Medicine in 2014

- Professor of Neuroscience and Director of the Kavli Institute for Systems Neuroscience at the Norwegian University of Science and Technology
- He is interested in neural network coding in the cortex, with particular emphasis on space, time and memory
- His work includes the discovery of grid cells in the entorhinal cortex, which provides clues to a mechanism for the metric of spatial mapping
- The Nobel Prize was awarded for work identifying the place cells that make up the brain's positioning system

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Edvard Moser is a Professor of Neuroscience and Director of the Kavli Institute for Systems Neuroscience at the Norwegian University of Science and Technology in Trondheim.

He is interested in how spatial location and spatial memory are computed in the brain. His work, conducted with May-Britt Moser as a long-term collaborator, includes the discovery of grid cells in the entorhinal cortex, which provides clues to a neural mechanism for the metric of spatial mapping. The discovery of grid cells was succeeded by identification of other functional cell types, including border cells and speed cells. Collectively the findings point to the entorhinal cortex as a hub for the brain network that makes us find our way.

Together with May-Britt Moser and John O'Keefe, Edvard Moser was awarded the Nobel Prize in Physiology or Medicine in 2014.

TEMAS

- Entrepreneurship / Lidership
- Medicine
- Grid Cells

PROGRAMAS

THE INGREDIENTS OF EXCELLENCE: HOW TO CREATE A WORLD-LEADING RESEARCH ENVIRONMENT

In 2014 I shared the Nobel Prize in Medicine or Physiology with John O'Keefe and May-Britt Moser, 19 years after my PhD and 18 years after accepting a faculty position at the Norwegian University of Science and Technology – traditionally an engineering school with no neuroscience department and only a recently started Faculty of Medicine. Over the subsequent years, May-Britt Moser and I built up a cutting-edge neuroscience laboratory, starting with four hands in an empty basement, and 10-15 years later finding the nuts and bolts of the mammalian sense of location that turned upside-down the way scientists thought about spatial orientation. Today the group has evolved to an institute of 7-8 highly visible research groups, all interested in the neural basis of cognition. I will tell the story of how one of the most exciting adventures in neuroscience became possible and use the

opportunity to reflect on the ingredients of successful research and entrepreneurship, many of which may apply far beyond the scientific community. For non-specialists, with a broader focus and more on memory and memory defects.

GRID CELLS, MEMORY, AND OUR SENSE OF SPACE

The entorhinal cortex and the hippocampus are elements of the brain's circuit for spatial navigation and memory. Interest in the functions of these brain areas was raised half a century ago, when a brain surgery affecting these areas left patient H.M. with a severe loss of episodic memory as well as an inability to navigate in space. This incidence moti-vated attempts to study the activity of neurons in the hippocampus of experimental animals and led, 15 years later, to the discovery of place cells – cells that fire if and only if animals are at certain locations. Over the past 15 years, we have explored the wider circuit of the mammalian positioning system. I will show that the entorhinal cortex contains grid cells – cells with firing fields that tile environments in a periodic hexagonal pattern, like an internal coordinate system – as well as cells that monitor direction, speed and local borders. Col-lectively these cells form the elements of a positioning system that dynamically monitors our changing location in the environment, and that may provide the spatial component of all episodic memories. Deficiencies in the function of this map may be at the core of neuro-logical diseases where spatial orientation is affected, such as Alzheimer´s disease.Academic lecture for broad public but focused on how the brain works:

GRID CELLS AND THE CORTICAL MAP OF SPACE

The medial entorhinal cortex (MEC) is part of the brain's circuit for dynamic representation of self-location. A key component of this representation is the grid cell, whose spatial firing fields tile environments in a periodic hexagonal pattern, like in a Chinese checkerboard. The circuit contains also other functional cell types, such as head direction cells and bor-der cells, which are intermingled among the grid cells. In this lecture, I will discuss how these cell types, all within the same neural circuit, form a rich representation of local space. I will discuss the putative mechanisms of the grid pattern and its developmental origins, as well as possible ways that grid cells could be used in the formation of hippo-campal memory.