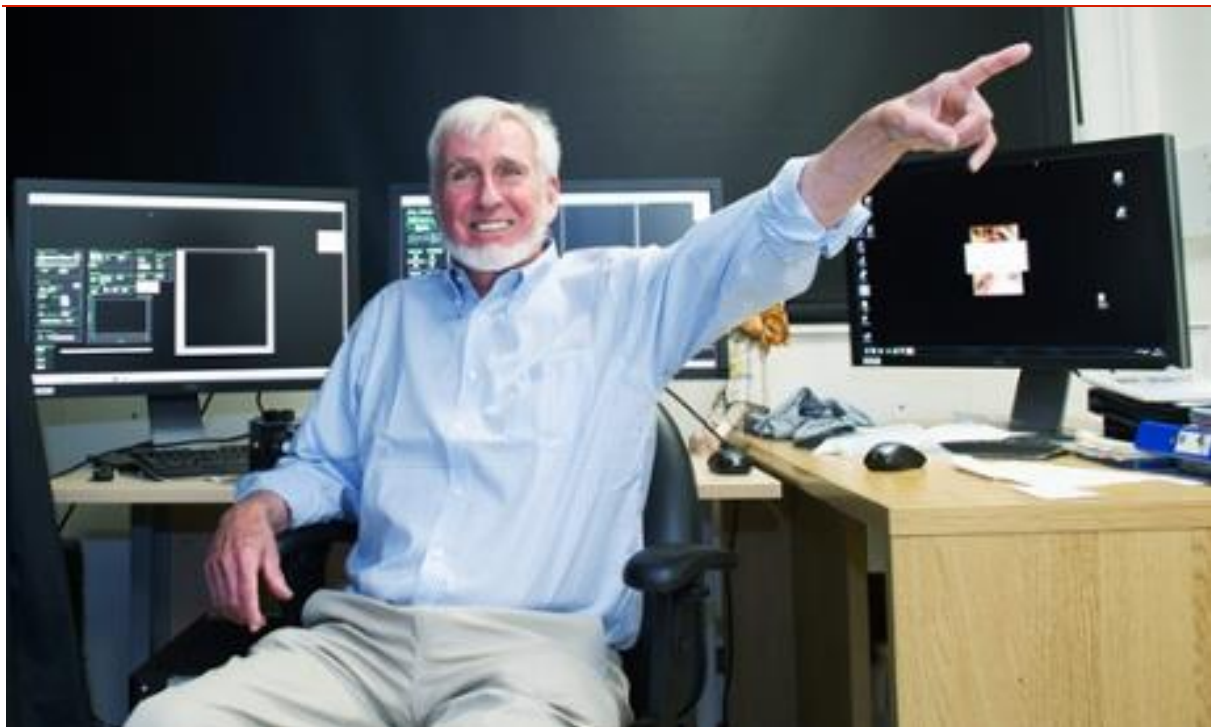


## Nobel prize find: search for ‘soul of rat’ revealed brain’s navigation system

Nobel prizewinning discovery shows just how beautiful our brains can be in the patterns they create and weave

- 
- Hugo Spiers
  - 
  - [The Guardian](#), Monday 6 October 2014 12.42 EDT
  - [Jump to comments \(3\)](#)
- 



Professor John O'Keefe at his laboratory in University College London after hearing that he had won the Nobel Prize in Physiology or Medicine. Photograph: EPA

John O'Keefe – who shares this year's Nobel Prize in Physiology or Medicine – once jokingly told me that he was searching for the soul of the rat, but missed and struck lucky with his discovery of place cells – a kind of “you are here” mapping signal in the brain.

His discovery and the accompanying theory went on to dominate thinking about how our brain stores long-term memories, and spawned a whole field of research.

O'Keefe also guessed that one day somebody would find evidence for a grid-like co-ordinate system in the brain that the place cells were using to chart space. No one realised it would be as strikingly elegant as it turned out to be in the discoveries of Edvard and May-Brit Moser. The first reports of grid cells had neuroscientists gaping in amazement.

Why are these cells so important? A major aim of neuroscience is to provide a description for how our thoughts and behaviour arise from individual cells. This is not so hard for sensation and action, but when it comes to recalling the past or planning a route through space it's a huge challenge, and that's where place cells and grid cells come in. They provide a tangible link between the activity of a single cell and complex "higher-level" behaviour.

In 2000, Eleanor Maguire at University College London (UCL) and her colleagues discovered that part of a brain region called the hippocampus [gets bigger in London taxi drivers with years of navigating the city](#). Along this shows a link between the hippocampus and spatial memory, but with the knowledge of place cells this result helps explain what the neurons may be doing. Recording from place cells and grid cells as animals perform complex behaviours has not only revealed hidden mechanisms, but has also shown just how beautiful our brains can be in the patterns they create and weave.

Researchers have found that place-cell activity patterns created by rats' brains as they run through a new environment are "replayed" during sleep at a rate 16 times faster than the rate during running. More recently, place cells have also been found to code "time", clocking how many seconds a rat has been running on a wheel.

This is a lively and dynamic field of science and it is right that the Nobel committee has chosen to honour these pioneers.

- *Dr Hugo Spiers is head of the Spatial Cognition Group at UCL*