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The brain network - from cell to macroscale circuits to function

Wednesday 22 September 2021 18:30 (1 hour)

How does our brain give rise to brain function, cognition and behaviour? Understanding the fundamental features of brain networks ('the connectome') and linking the different levels and scales of brain connectivity to each other is key in tackling this challenge. We will start by discussing the organization of brain networks and network theories of how 'principles of wiring'may shape integration, functional specialisation and diversity. We will particularly take a look at how variation in these connectome properties may give rise to variation in behavior, but also how they may shape a landscape of brain disconnectivity within and across disease. One key factor in understanding brain connectivity (and disconnectivity) is to understand how connectivity is organised across scales, from genes to cells to macroscale circuits to behaviour. Celebrating game-changing initiatives such as the BigBrain project, the Allen Human Brain Atlas and the UKB (among many others) who provide the field with exciting new ways to link connectivity across scales, we will discuss the opportunities that 'multiscale neuroscience'can bring to understand brain network organization in health and disease.

The Sievers Computational Neuroscience Initiative (SCNI) builds cross-disciplinary experience in neurological sciences research and neuroinformatics to establish a computational neuroscience approach to modelling brain states in healthy ageing and disease.
The SCNI provides training and mentoring for tomorrow's researchers to undertake and partake in complex studies, and to build the computer infrastructures and brain-based datasets to support this research.

Martijn van den Heuvel is a multidisciplinary scientist with a background in Cognitive Artificial Intelligence (MSc, 2004) and psychiatric medical imaging (PhD, 2009). His research focus is the network of connectivity of the human and animal brain, the connectome, with the aim to get better understanding of the fundamental rules of wiring of nervous systems, and in particular how these rules of wiring are associated with brain function and disfunction in health and disease. His field of expertise includes structural and functional MR imaging combined with network science, bridging the field of mathematics, informatics, psychology and medicine. He heads the dutchconnectomelab.org at the Brain Center Rudolf Magnus, Utrecht, The Netherlands. Martijn received Dutch Research Council NWO-VIDI and NWO-VENI awards, an international MQ Fellowship (www.joingmq.org), and the 2013 Dutch Brain Trophy of the Dutch Brain Foundation.

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