Shapes of the Language Network: From Primates to Second Language Acquisition

Organizers:
Alfred Anwander
Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Tomás Goucha
Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

As most cognitive brain networks, the language network was considered as a static and universal circuit resulting from the genetic endowment that enabled humans to speak. In an age where neuroscience is moving to combining phylogeny and ontogeny with environmental influences, we have to acknowledge the dynamic properties of this network over lifetime and evolutionary scales. Starting with a phylogenetic perspective, we will approach the perisylvian network of non-human primates and its involvement in auditory processing. Not only do our closest relatives possess precursors of meaning retrieval from auditory input, but also of auditory sequence processing. The commonalities and evolutionary differences will help to trace the anatomical path to human language. Also in humans, the language network dynamically adapts to the tasks it has to perform. Its shape is differentially determined by linguistic properties of the mother tongue of each individual and also by its modality in the case of sign language. This puts into question the universality in brain wiring for language. Acquiring a second language is an ideal way to show these plastic changes at different time points from early bilingual children to adult language learners. The extent to which different circuits are recruited also provide insights on how the brain networks adapt to bilingual experience and in general to novel cognitive tasks. However, these studies investigating anatomical connectivity only infer the functions of these brain structures indirectly. That is why the in vivo intraoperative assessment of the brain connectivity can provide us crucial insights. It can also help us refine our knowledge about the detailed structure of these white matter structures. This symposium brings together basic neuroscience with clinical application, giving new insights in the brain circuitry that can be translated into improvements for the neurosurgical patients.

Primate precursors of the language network: Auditory sequence processing
Christoper Petkov, Laboratory of Comparative Neuropsychology, Newcastle University Medical School, Newcastle, United Kingdom

Shaping of the structural language network by the mother tongue
Alfred Anwander, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Processing two languages in one brain: Specific and shared networks
Manuel Carreiras, Basque Center on Cognition, Brain and Language, Donostia-San Sebastián, Spain ; IKERBASQUE, Basque Foundation for Science, Bilbao, Spain, University of the Basque Country, UPV/EHU Bilbao, Spain

The connectomal anatomy of language revisited: lessons from brain stimulation mapping
Hugues Duffau, Department of Neurosurgery, Gui de Chauliac Hospital, Montpellier University Medical Center, Montpellier, France ; National Institute for Health and Medical Research (INSERM), U1051 Laboratory, Inst. f. Neuroscience, Montpellier, France