

Cognition Colloquium

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Cytoarchitectonics – Decoding functional specialization, brain parcellation, and variation

Cytoarchitecture is experiencing a renaissance during the past two decades because of the increased power and precision of cytoarchitectonic maps of cortical and subcortical areas to relate brain function to its microstructural substrates. *Julich-Brain* cytoarchitectonic maps provide a reference modality to also align with other aspects of brain organization such as axonal and chemo-architecture. Feature extraction from cytoarchitecture plays an increasing role to inform modeling and simulation, e.g., informing *The Virtual Brain* by regional cell numbers and parameters of distributions. Thus, cytoarchitecture is not only indicative of the WHERE of a function or a finding in the brain, but also related to the WHAT, i.e., what is behind a certain region in a map, what are the underlying properties of the tissue to fulfil a certain function in a network. These question about WHAT cannot be answered without going into microscopical details. Interestingly, cytoarchitecture exhibits intra-area and across-area variations, which lead to concepts of brain parcellation that are beyond a simplistic understanding of the cortex as a mosaic of areas or of pure gradients. Cytoarchitectonic maps of *Julich-Brain* provide an interface between the different levels of organization, to study structure-function relationships.



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