Institute of Information Processing and Decision Making (IIPDM)

and

The Max Wertheimer Minerva Center for Cognitive Processes and Human Performance

Invite you to a public lecture by

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Brain electrical correlates of memory representations

Where are memories stored in the brain? Both empirical and theoretical work suggests that memories are represented as activation patterns in exactly those cortical areas in which online processing of information during perception or motor planning does take place. I will review a series of studies in which we recorded event-related brain potentials in the EEG to monitor memory-related activity of cortical cell assemblies. In particular, we analyzed slow-waves, which prevail in the EEG with constant amplitude for several seconds [5]. These slow waves are tightly correlated in timing and topography with BOLD signals in the f MRI.

The experiments show that storage and retrieval of long-term memory (LTM) contents produce a material-specific slow-wave topography, e.g. distinct patterns for spatial or verbal material [4]. This topography evoked by LTM tasks was by and large the same as when similar contents had to be manipulated in working memory [2]. Moreover, in both cases, the slow wave patterns were not only distinct for the different materials, rather, the maximum amplitude of each slow wave pattern varied systematically with the task demands. More demanding long-term memory search and more demanding working memory transformations resulted in an increase of a negative slow wave with a maximum at left-frontal areas for verbal and at parietal for spatial material. In sum, these studies not only proved a distinct topography for different representations but also that each topography is specifically modulated by the task demands [3]. Moreover, the congruent topography strongly supports the idea that working memory and long-term memory contents are activated within the same cortical areas. The areas, however, which are recruited for a particular working memory task are not congenitally predetermined. We observed that the very same haptic working memory task activated systematically central-parietal areas in sighted controls but occipital areas in congenitally blind people [1]. Thus suggests kind of an omnipotency of cortical areas for information processing and storage.

<u>References:</u>

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3 Rösler, F. and Heil, M., The principle of code-specific memory representations. In R.H. Kluwe,

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G. Lüer and F. Rösler (Eds.), *Principles of learning and memory*, Birkhäuser, Basel-Boston-Berlin, 2003, pp. 71-92.

4 Rösler, F., Heil, M., and Hennighausen, E. Distinct cortical activation patterns during long-term memory retrieval of verbal, spatial and color information. *Journal of Cognitive Neuroscience 7*, 51-65. 1995.

5 Rösler, F., Heil, M., and Röder, B. Slow negative brain potentials as reflections of specific modular resources of cognition. *Biological Psychology 45*, 109-141. 1997.

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Eshkol Building, 29th Floor – Senate Room # 2904
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