SWEDISH COLLEGIUM *for* ADVANCED STUDY

From Neuroscience to the Classroom

Symposium at the Swedish Collegium for Advanced Study (SCAS), Uppsala
5-6 April, 2017

MARTIN LÖVDÉN, Karolinska Institutet, Stockholm

Structural Brain Correlates of Human Learning

Abstract:
Skill and knowledge acquisition are associated with a complex pattern of regional growth and shrinkage of the human brain's grey and white matter that can be imaged with Magnetic Resonance Imaging (MRI). I will give an overview of this literature. Stimulated by our recent findings on the progression of changes in human gray matter structure during motor skill acquisition, I argue that growth of regional human grey matter is just an initial and transient phase of learning. This phase is followed by a phase of complete or partial return to baseline once optimal rewiring has occurred. Common requirements for forming complex but robust learnings systems have shaped different brain correlates of learning, such as macrostructural changes, cortical map dynamics, and synaptic plasticity to unfold in a similar expansion-renormalization way. The highly efficient Darwinian learning process may underlie this pattern. Learning is the production of diversity (i.e., replication with variation) followed by selection and stabilization. Growth is helpful for learning, but only selective maintenance is needed for memory. I will discuss the implications of this model for future research on the brain correlates of learning, for lifespan development in human brain structure, and for improving learning ability.

About:
Martin Lövdén is professor of cognitive neuroscience at Karolinska Institutet. He does research on the question of how experience shapes development of brain and cognition across the lifespan. The interactions among behavior, brain structure, brain function, and cognitive performance are studied by experimental (intervention) studies as well as with multivariate statistical modeling of naturally occurring between- and within-person variability and change. His recent work focus on the brain correlates, probed with Magnetic Resonance Imaging (MRI), of cognitive and motor skill acquisition in humans.