

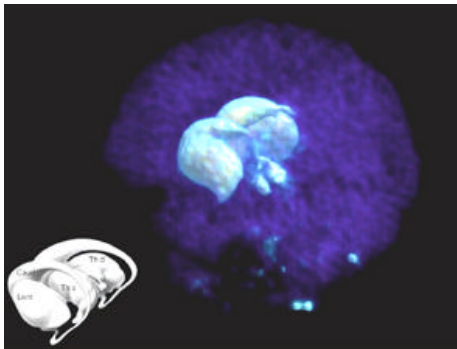
Cognitive and Computational Neuroscience

The challenge of understanding how the brain forms a mind and how the nervous system works, is even more exciting today than it has ever been. The obvious link between body and mind brings the extreme disciplines of biology and psychology together. Understanding of normal brain functioning is an important goal in itself, but is also a prerequisite for studying pathological processes leading to neurological, psychiatric and behavioural disorders.

Brain research has been a prominent activity at Karolinska Institutet since its foundation. Today it is conducted at several departments and entails about 20% of the University's research activities. Studies on the development of the brain and the neuronal networks and mechanisms that underlie various basic brain functions are at a cutting edge internationally. Front-line research is also performed on several disorders affecting the brain from neurodevelopment disorders in children, schizophrenia in the adolescent, spinal cord injuries and multiple sclerosis in adults, to Alzheimer's disease and other degenerative disorders in the elderly population. A main focus of the research is to develop innovative diagnostic tools and devise new treatments.

Karolinska Institutet houses broad and excellent competence in all fields of brain research and neurobiology and many of the neuroscientists at the university are world authorities in their fields. For instance, the studies on the brain using molecular and functional imaging, on neuromuscular disorders, on neural stem cell research, and on spinal cord function and repair are internationally recognised to be of the highest quality.

Karolinska Institutet has recognized cognitive and computational neuroscience as a new strategic research area having an almost unlimited potential to be explored scientifically and commercially in the years to come. At the university there are core facility units for MR and PET, necessary for all research of brain function.



The DA transporter has a dense representation in the basal ganglia (PET data; Farde et al).

The Stockholm Brain Institute at Karolinska Institutet is a centre uniting several research groups in clinical neuroscience with groups in psychology, basic neuroscience and computer science. This unit for cognitive and computational neuroscience implies a systems neurobiology approach to brain functions; from genes, cells and neural networks to cognitive functions and behaviour. The majority of the research conducted is closely integrated with clinical work.

The Stockholm Brain Institute focuses on four specific cognitive functions:

- i) Memory and learning – to unravel the dopaminergic modulation of working memory and long-term memory. Continued exploration of the mechanisms underlying the malfunction of working

memory in ADHD, schizophrenia and dementia; and further develop the promise of working memory training as a treatment modality. Identify early predictors (biomarkers) for people with high risk to develop dementia.

- ii) Language acquisition – to define brain networks of implicit grammar learning, including the role of affect; continued analyses of the global effects of language learning on the brain.
- iii) Emotion and pain control – to define the role of amygdala in fear and anxiety, its relationship to the dopamine system, and changes in the amygdala during treatment of anxiety disorders. Analyzing changes in the affective pain network with pharmacological treatments, including the effects of placebo on pain and anxiety.
- iv) Motor actions – to elucidate the neuronal mechanisms responsible for selection and planning of action, and motor learning considering in particular the interaction between the frontal lobe, striatum and the dopamine systems.

For more information on the Cognitive and Computational Neuroscience projects, please contact:



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