Hemispheric Interaction in Cognitive Processes

Brenda Milner

2009 Balzan Prize for Cognitive Neurosciences

Balzan GPC Adviser: John Krebs
Researchers: Denise Klein, Joelle Crane, Kate Watkins (Researchers); Ami Tsuchida (Postdoctoral Fellow); Xiaoqian Jenny Chai (Research Associate)
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Brenda Milner is Dorothy J. Killam Professor of Psychology at the Montreal Neurological Institute and Professor in the Department of Neurology and Neurosurgery at McGill University.

The research project funded with the Balzan Prize awarded to Dr. Milner seeks to illuminate the nature of hemispheric interaction in the human brain and to show how the integration of information between the two hemispheres enables remembering. To this end, fine-grained behavioural paradigms were combined with task-based functional magnetic resonance imaging (fMRI) experiments as well as resting-state fMRI to allow the examination of patterns of interaction between distant brain regions.

Dr. Milner's lab studied a cohort of healthy young right-handed subjects in order to determine how individual differences in patterns of hemispheric connectivity relate to the natural variation in capability for different types of memory task and to the cognitive strategies adopted by each individual. The project combines behavioural, brain imaging (fMRI, resting-state fMRI, DTI) and computational approaches. Building on this initial line of research, Dr. Milner's post-doctoral fellow Dr. Ami Tsuchida then advanced an inter-institutional collaboration with a team at Bordeaux University in France to further investigate the relationship between interhemispheric organization and cognition. The Neuroimaging Group at Bordeaux, headed by Bernard Mazoyer and Nathalie Tzourio-Mazoyer, has been interested in asking similar questions about the behavioural and neural correlates of hemispheric specialization and interhemispheric integration, and this group has collected a unique dataset of nearly

400 healthy volunteers balanced for gender and handedness (BIL&GIN: Mazoyer et al. 2016).

Dr Tsuchida, and another member of the team Dr Xiaoqian Jenny Chai, now a Canada Research Chair (Tier 2) in Developmental Cognitive Neuroscience at the Montreal Neurological Institute, are continuing to analyse the data aimed at examining specific questions regarding the role of interhemispheric connectivity architecture in shaping individual differences in memory functions. Globally the work continues to advance our understanding of how large-scale brain networks support learning, memory and language.