

## **Geometric model of the cortical organisation: neuroanatomic constraints for plasticity**

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The ontogenesis of the cortical organisation must provide the bases for the analysis and interpretation of neuroimaging data. In the adult brain, this cytoarchitectonic, connective and functional organisation is closely related to the principal anatomical landmarks of the cerebral cortex. The mechanisms that shape cortical organisation seem to persist beyond gestation, as is shown by the plasticity of cortical function after lesion. Here we present a theoretical framework for the study of cortical anatomy and we consider its impact on cortical plasticity.

Functional MRI studies have shown that after peripheral or central lesions there is a reorganisation of cortical function with transient or permanent recruitment of cortical regions not previously involved. We introduce a model of cortical plasticity based on fundamental traits of the cortical anatomy, its geometry and connectivity. We begin by defining three basic models of the cortical anatomy: (1) the surface model, concerning the two-dimensional character of its structure, (2) the geometric model, concerning the spatial organisation of the cortical anatomy, and (3) the morphogenetic model, concerning the development of this anatomy. Based on these models, we construct a synthetic atlas of the cerebral cortex, the geometric atlas. We apply the geometric atlas to the analysis of fMRI data concerning the recovery of motor function after cerebral vascular accident.

We show that cortical anatomy can both facilitate and constrain functional reorganisation providing global guides for plasticity.