

Glasser, M.F., et al (2016). A multi-modal parcellation of human cerebral cortex. *Nature*, 536, 171–178. doi:10.1038/nature18933

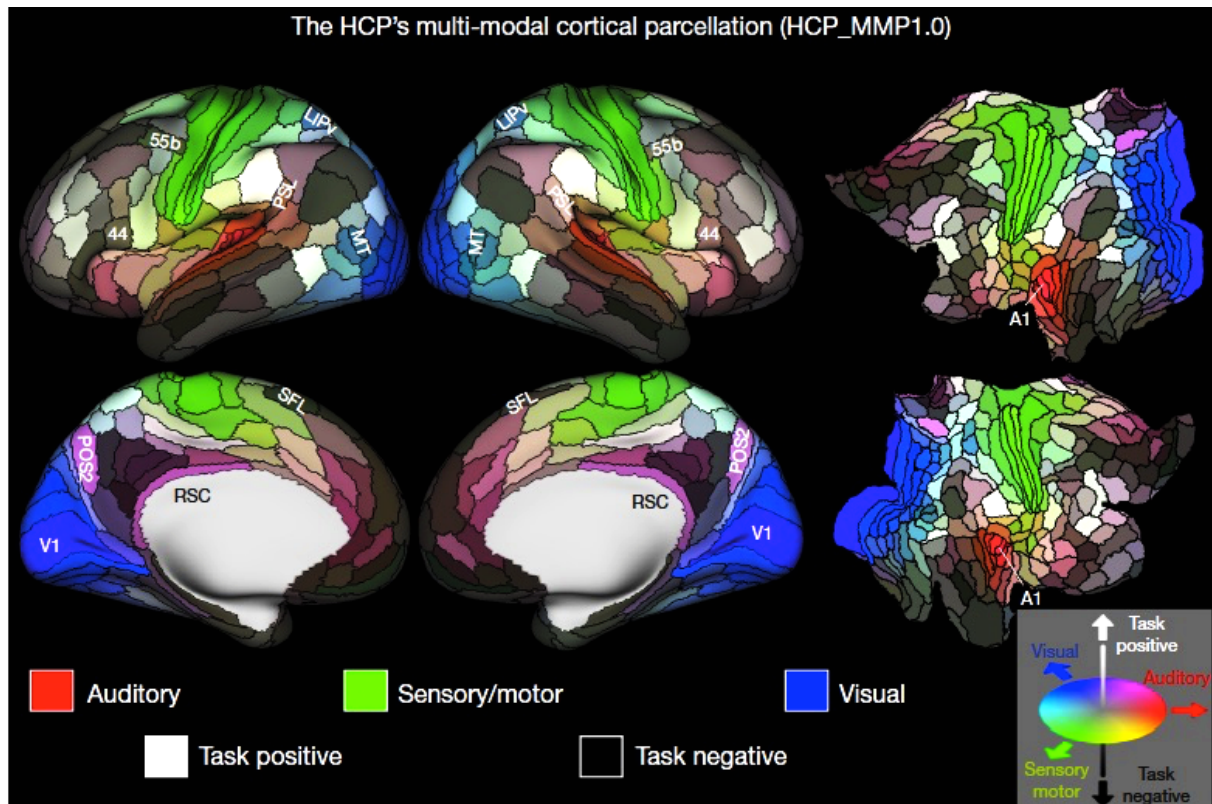


Figure 3 | The HCP's multi-modal parcellation, version 1.0 (HCP\_MMP1.0). The 180 areas delineated and identified in both left and right hemispheres are displayed on inflated and flattened cortical surfaces. Black outlines indicate areal borders. Colours indicate the extent to which the areas are associated in the resting state with auditory (red), somatosensory

(green), visual (blue), task positive (towards white), or task negative (towards black) groups of areas (see Supplementary Methods 5.4). The legend on the bottom right illustrates the 3D colour space used in the figure. Data at <http://balsa.wustl.edu/WN56>.

**Abstract.** Understanding the amazingly complex human cerebral cortex requires a map (or parcellation) of its major subdivisions, known as cortical areas. Making an accurate areal map has been a century-old objective in neuroscience. Using multimodal magnetic resonance images from the Human Connectome Project (HCP) and an objective semi-automated neuroanatomical approach, we delineated 180 areas per hemisphere bounded by sharp changes in cortical architecture, function, connectivity, and/or topography in a precisely aligned group average of 210 healthy young adults. We characterized 97 new areas and 83 areas previously reported using post-mortem microscopy or other specialized study specific approaches. To enable automated delineation and identification of these areas in new HCP subjects and in future studies, we trained a machine-learning classifier to recognize the multi-modal ‘fingerprint’ of each cortical area. This classifier detected the presence of 96.6% of the cortical areas in new subjects, replicated the group parcellation, and could correctly locate areas in individuals with atypical parcellations. The freely available parcellation and classifier will enable substantially improved neuroanatomical precision for studies of the structural and functional organization of human cerebral cortex and its variation across individuals and in development, aging, and disease.

- Moves beyond the 52 regions of Brodmann to a total of 180 distinctive regions.
- Simultaneously compared the brains of 210 healthy young adults on 112 different variables, e.g., myelination, task fMRI, functional connectivity, etc.
- This is Version 1.0. It is likely that this cortical parcellation map will be modified with additional research.