# Two new cytoarchitectonic areas of the human frontal pole

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the brain than in any other species.

#### **OBSERVER-INDEPENDENT BRAIN MAPPING**





Digitized ROI with contour lines and superimposed numbered curvilinear traverses (red lines) indicating where

& Fp2 after nonlinear elastic registration to the MNI reference Areas **F** brain<sup>[5]</sup>(n=10)

detected borders from the right hemisphere of a horizontally cut brain. The black lines mark the sections' locations within the brain. The three graphs show the corresponding Mahalanobis distance functions. Red lines mark the significant borders between areas Fp1 and Fp2.

Observer-independently

Fp2 orofile positio area Fp2 B) 200µm 10% 100%

Individual areas of 10 brains were integrated into one probability map

## META-ANALYTIC CONNECTIVITY MODELLING<sup>[6]</sup>

- Investigation of functional connectivity by coordinate-based metaanalysis of task-related activations
- Database driven approach(Brainmap.org)<sup>[7,8]</sup>
- Delineation of concurrent activation patterns





### Comparison of the cytoarchitecture of areas Fp1 and Fp2

The lateral area Fp1 shows a broader layer II with a higher cell density, a higher cell density in lower parts of layer III, and a broader layer IV than the medial area Fp2. In addition to that, there was a higher cell density in upper layer V of area Fp2, which could not be seen in area Fp1.

#### Probabilistic maps of areas Fp1 & Fp2 projected onto MNI reference brain. Frontal A), medial B) C) view onto the probabilistic maps of the delineated areas Fp1 & Fp2. Visualized as overlays on the MNI reference brain. The resulting cytoarchitectonic probabilistic maps were thus registered in the "anatomical" MNI space<sup>[5]</sup>. The number of overlapping brains for each voxel is color coded; e.g., green means that approximately 6 of 10 brains overlapped in

## Regions that are co-activated above chance with areas Fp1 & Fp2 as seed regions



this voxel

## CONCLUSIONS

- Our probabilistic map represents the first stereotaxic map of the frontal pole.
- Area Fp2 shows a significantly smaller extent than described in a previous study <sup>[2]</sup>, which was based on pure visual architectonic analyses.
- The map provides an anatomical basis for comparison with in vivo neuroimaging data for studying structure-function relationships.
- For the first time, an observer-independent subdivision into two distinct areas was demonstrated.
- The meta-analysis showed that areas Fp1 and Fp2 do not only differ with respect to their cytoarchitecture, but also functionally.

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#### Acknowledgments:

This study was supported by the BMBF project "Research collaboration on cognitive performance and relevant disorders in humans". Title: "Social gaze": Phenomenology and neurobiology of dysfunctions in high-functioning autism (HFA); Sub-project 4: Cytoarchitectonic correlates of frontal lobe function and dysfunction (01GW0612, K.A.).

Further funding was granted by the Helmholtz Alliance for Mental Health in an Aging Society (HeIMA; K.Z., K.A.) and by the Helmholtz Alliance on Systems Biology (Human Brain Model; S.B.E.) and the NIH (R01-MH074457; S.B.E.).