

3D density maps: a powerful tool for studying sulcal imprint variation on extant human endocasts

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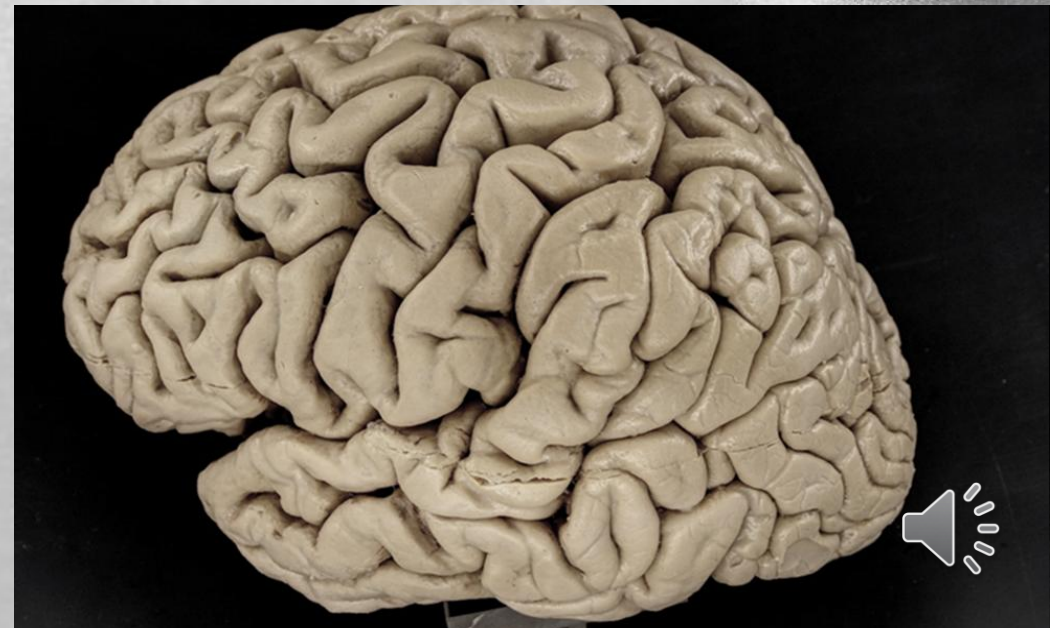
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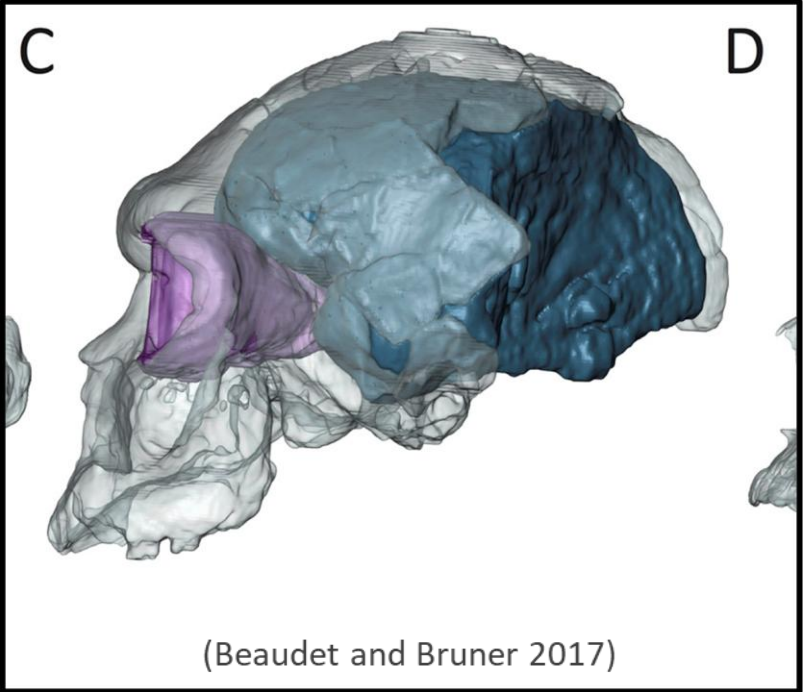
Introduction - The Brain

- ◆ How did the human brain evolve?
 - ◆ Allometric and non-allometric increases of brain volume and reorganizational events (Holloway, 2008)
 - ◆ Reduction of primary visual cortex
 - ◆ Relative increase in both posterior association and prefrontal cortex
 - ◆ Increased cerebral asymmetries
 - ◆ Broca's and Wernicke's regions



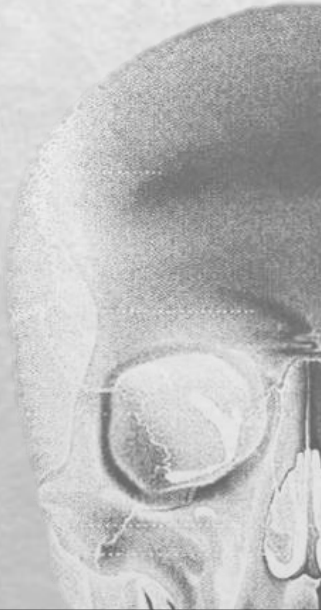
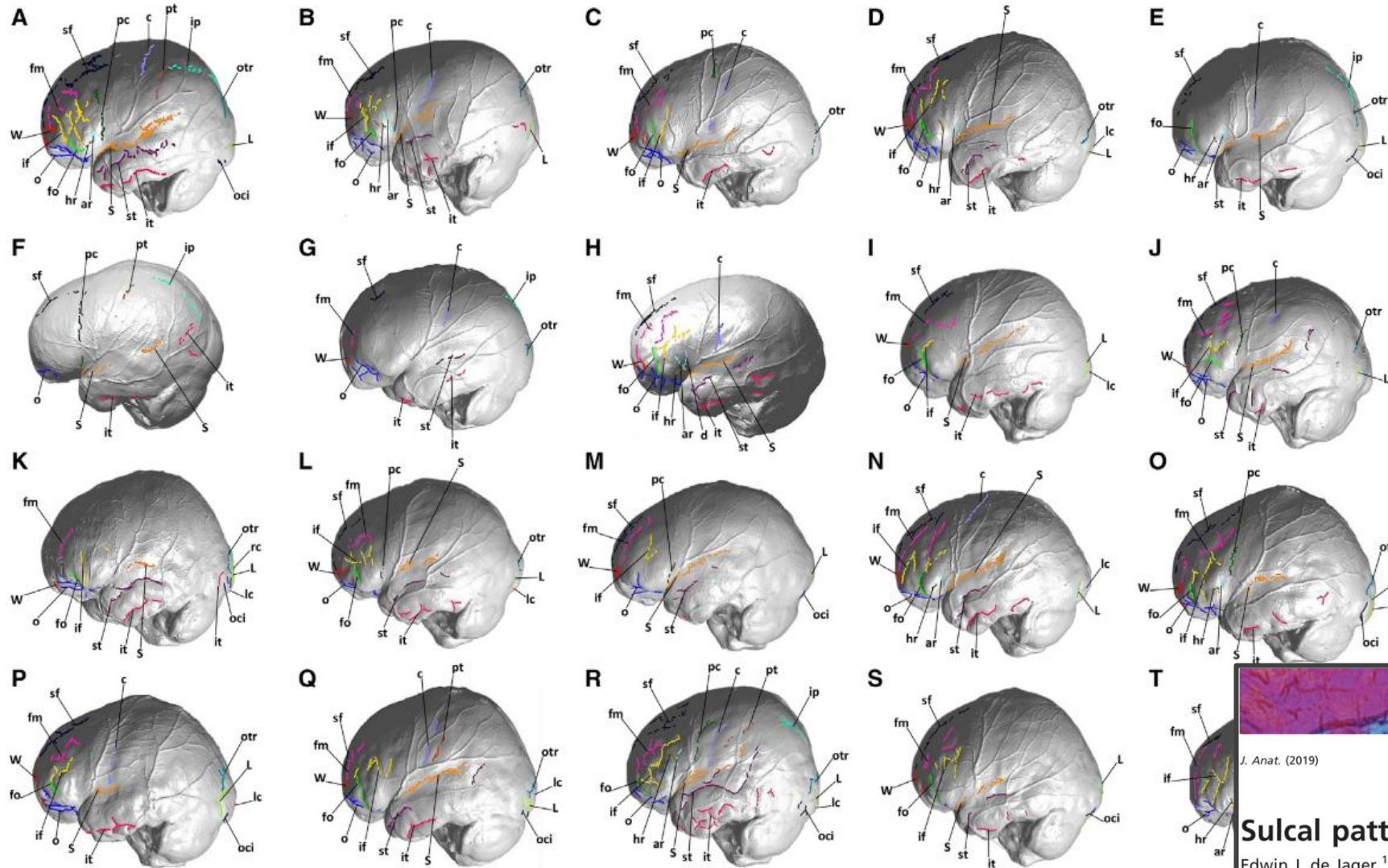
Introduction - Endocasts



Natural endocasts	Synthetic endocasts	Modern imaging
 <p data-bbox="445 1196 675 1239">Taung child</p>	 <p data-bbox="1332 1292 1587 1328">(Holloway, 2018)</p>	 <p data-bbox="1862 1196 2275 1232">(Beaudet and Bruner 2017)</p>



Introduction



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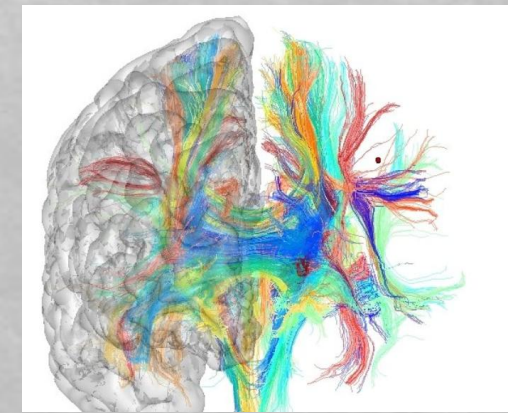
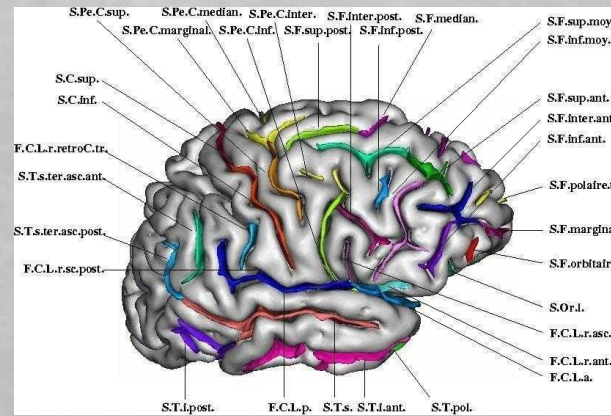
Sulcal pattern variation in extant human endocranials

Edwin J. de Jager,¹ Albert N. van Schoor,¹ Jakobus W. Hoffman,² Anna C. Oettlé,^{1,3} Caroline Fonta,⁴ Muriel Mescam,⁴ Laurent Risser⁵ and Amélie Beaudet^{1,6}

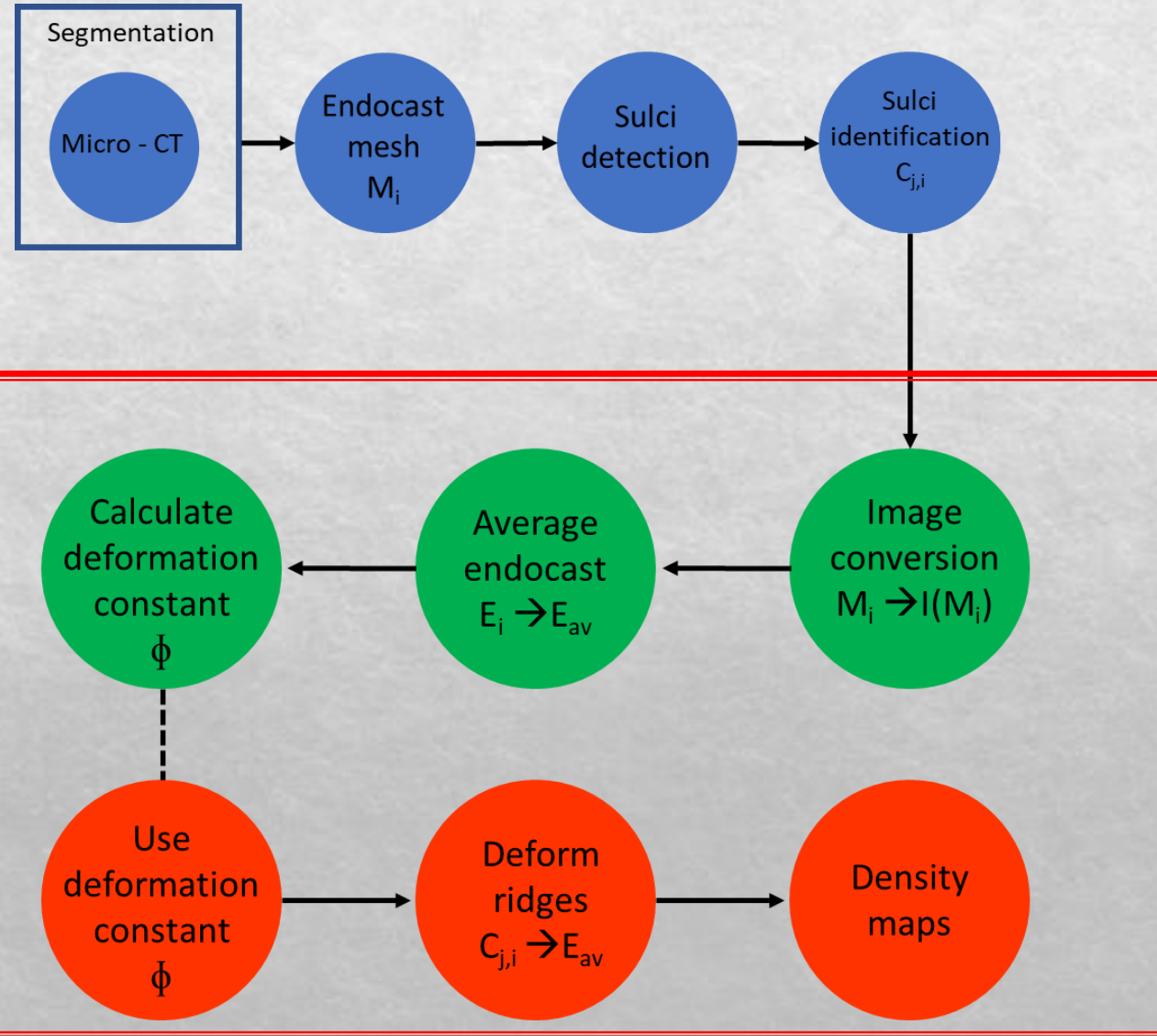
Introduction: 3D imaging techniques to endocasts

- ◆ Interindividual variation **density-based approach** to population-specific brain atlases (Toga and Thomson, 2001) e.g., keyhole surgery (Ribas, 2010)

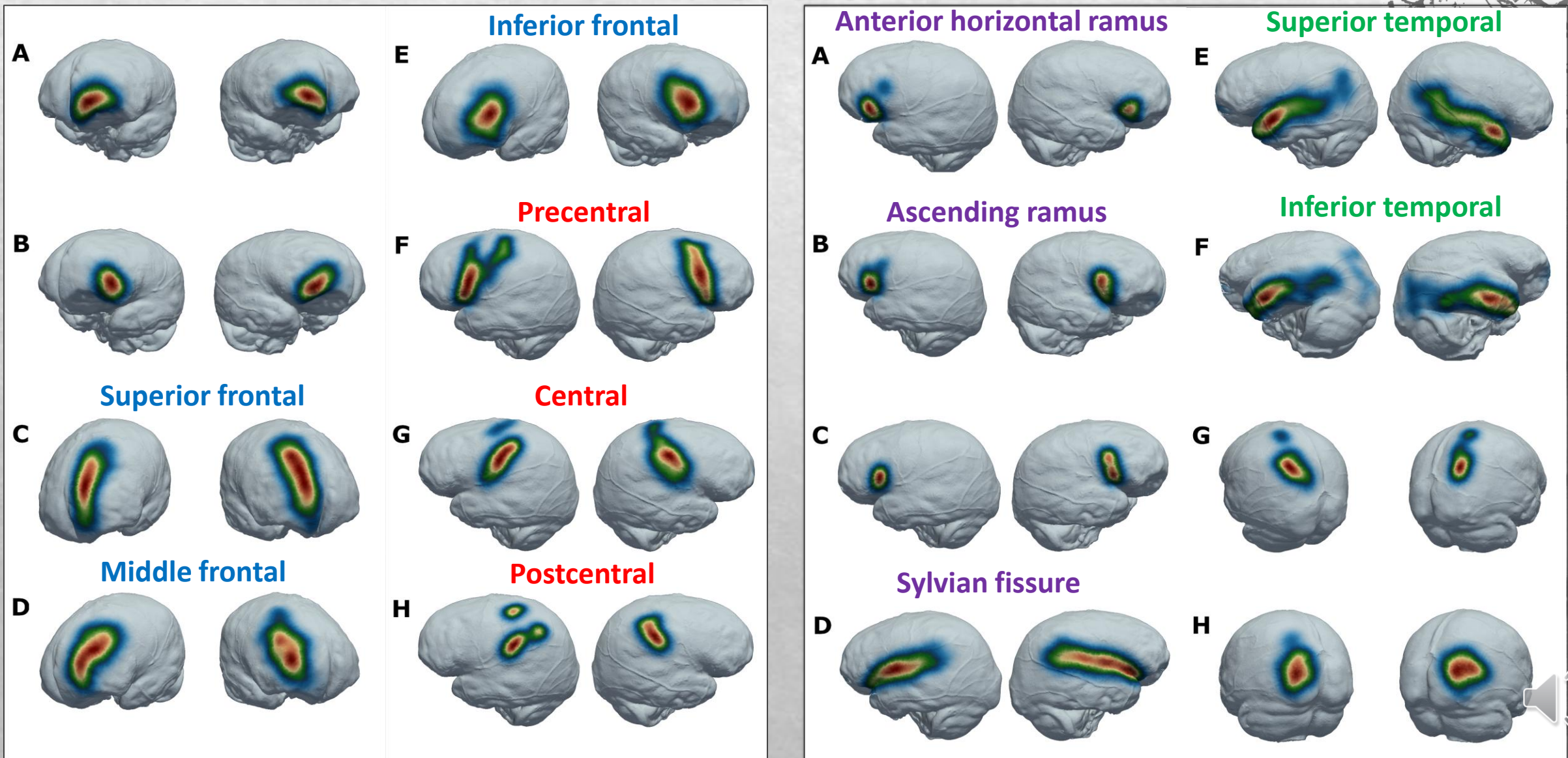
→ Conceptually adapted to characterize the variation of the sulcal pattern imprints in a sample of extant human endocasts.



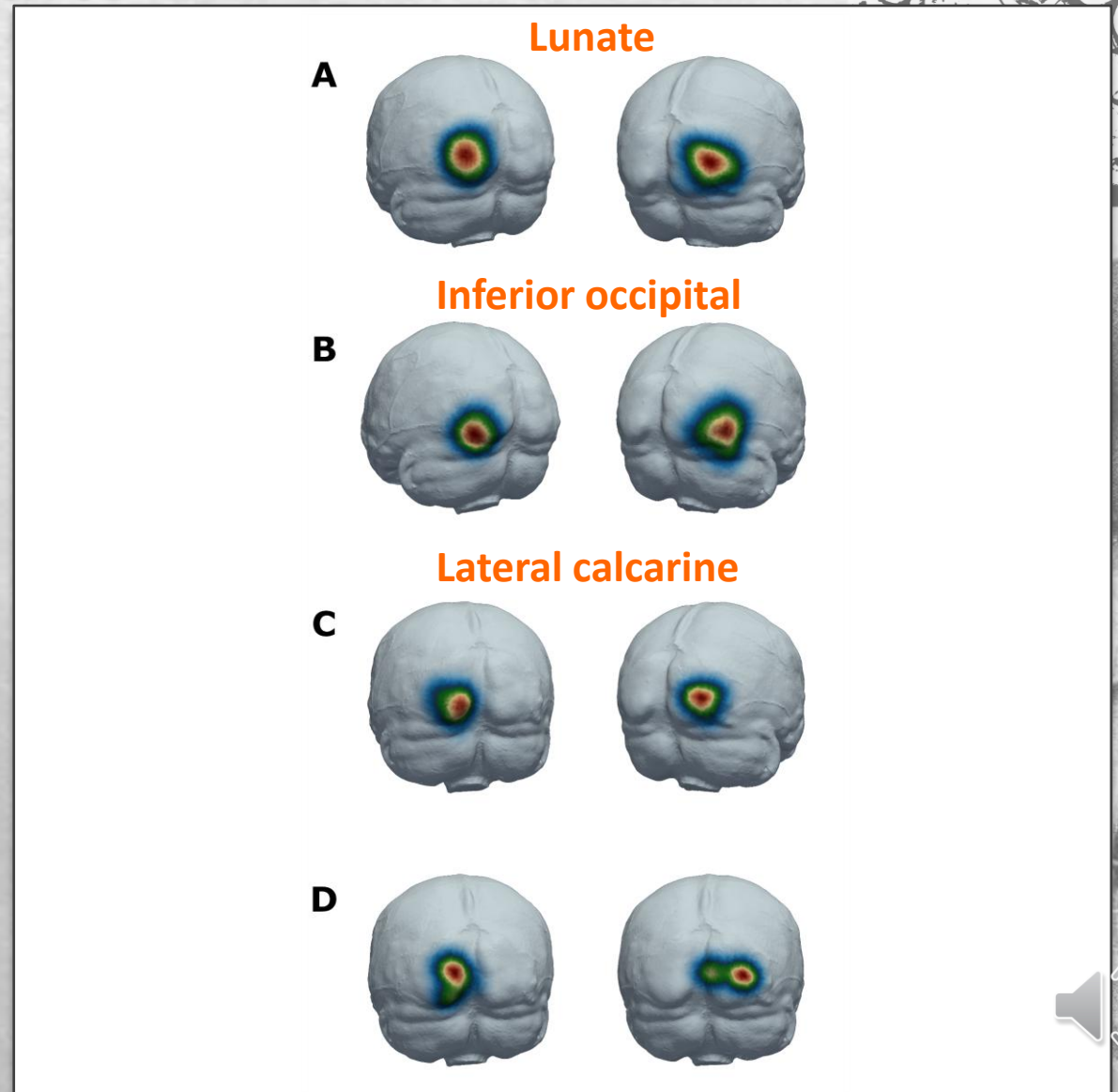
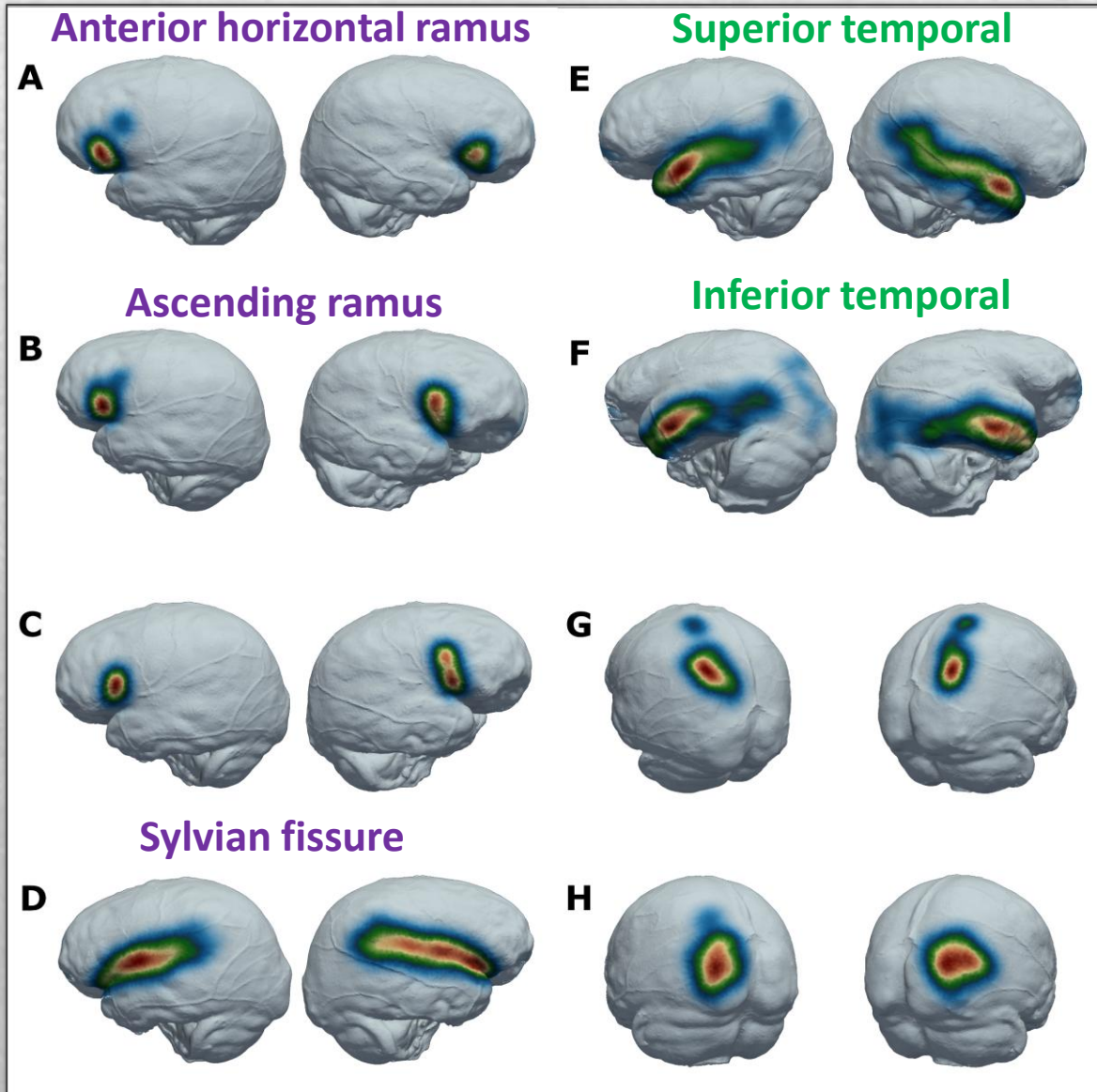
Methodologies



Results

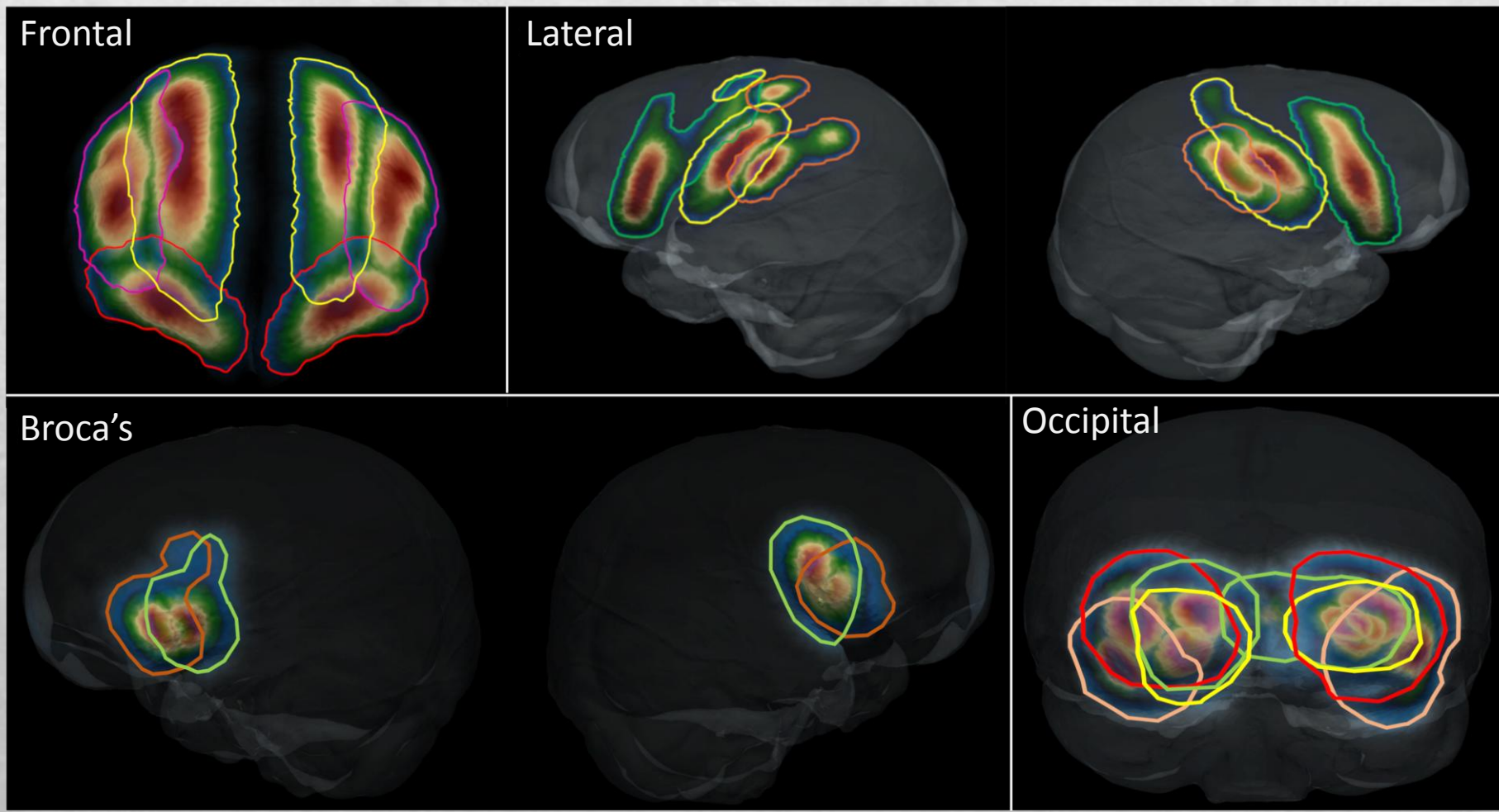


Results



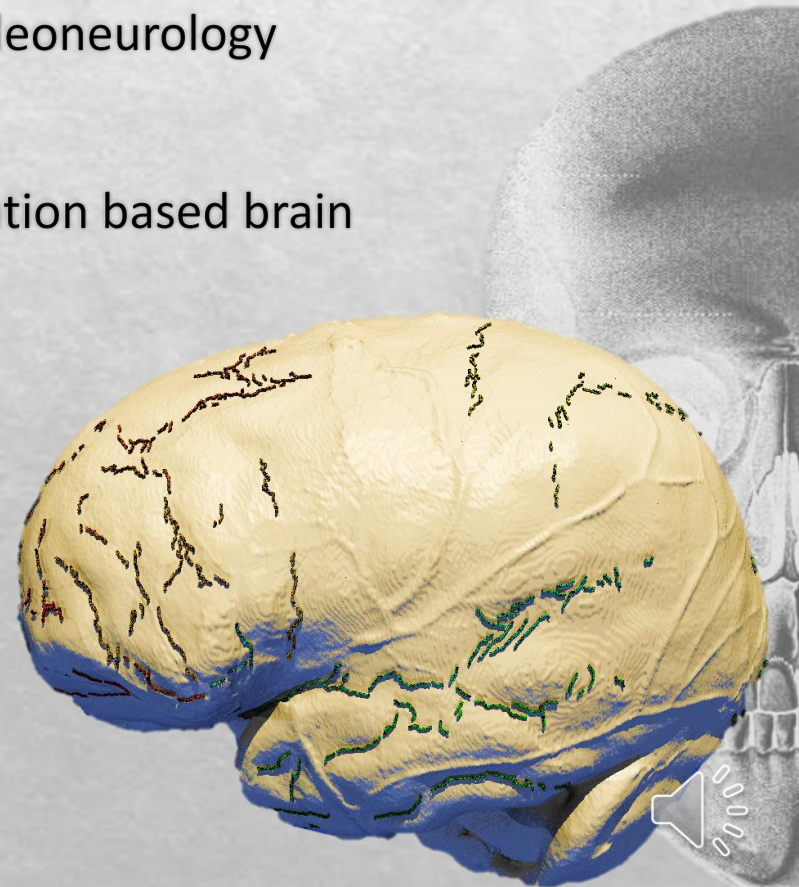
Results

◆ Overlap



Discussion

- ◆ Reliable identification of main sulci of Frontal lobe, Temporal lobe as well as the Sylvian fissure (Connolly, 1950; Ono et al., 1990)
- ◆ Significant overlapping of imprints identified in debatable sulci in paleoneurology
 - ◆ E.g., Lunate sulcus (Holloway, 1981; Falk, 1983)
- ◆ First description of sulcal imprints on human endocasts using population based brain atlas approach
 - ◆ Confidence of imprint based on average distribution
 - ◆ Overlapping could not be visualised with older methods
 - ◆ Increase in samples → improve statistical power



Acknowledgments

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(References available on request)

