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Nicole Labra, Yann Leprince, Denis Rivière, Mathieu Santin, Jean François Mangin, Lou Albessard-Ball, Amélie Beaudet, Douglas Broadfield, Emiliano Bruner, Kristian J. Carlson, et al.

### ► To cite this version:

Nicole Labra, Yann Leprince, Denis Rivière, Mathieu Santin, Jean François Mangin, et al.. Comparative study of manual identification of brain foldings in a living human brain using a proxy-endocast obtained from MRI. *Bulletins et Mémoires de la Société d'anthropologie de Paris*, 2023, 35 ((s)), <10.4000/bmsap.11242>. <hal-04125446>

**HAL Id: hal-04125446**

**<https://hal.science/hal-04125446v1>**

Submitted on 5 Jul 2024

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## Comparative study of manual identification of brain foldings in a living human brain using a proxy-endocast obtained from MRI

*Étude comparative de l'identification manuelle des plis cérébraux sur un cerveau humain, en utilisant un proxy-endocast obtenu par IRM*

**Nicole Labra, Yann Leprince, Denis Rivière, Mathieu Santin, Jean François Mangin, Lou Albessard-Ball, Amélie Beaudet, Douglas Broadfield, Emiliano Bruner, Kristian J. Carlson, Zachary Cofran, Dean Falk, Emmanuel Gilissen, Aida Gómez-Robles, Simon Neubauer, Alannah Pearson, Carolin Röding, Yameng Zhang, Aurélien Mounier et Antoine Balzeau**



### Édition électronique

URL : <https://journals.openedition.org/bmsap/11242>  
DOI : 10.4000/bmsap.11242  
ISSN : 1777-5469

### Éditeur

Société d'Anthropologie de Paris

### Référence électronique

Nicole Labra, Yann Leprince, Denis Rivière, Mathieu Santin, Jean François Mangin, Lou Albessard-Ball, Amélie Beaudet, Douglas Broadfield, Emiliano Bruner, Kristian J. Carlson, Zachary Cofran, Dean Falk, Emmanuel Gilissen, Aida Gómez-Robles, Simon Neubauer, Alannah Pearson, Carolin Röding, Yameng Zhang, Aurélien Mounier et Antoine Balzeau, « Comparative study of manual identification of brain foldings in a living human brain using a proxy-endocast obtained from MRI », *Bulletins et mémoires de la Société d'Anthropologie de Paris* [En ligne], 35(S) | 2023, mis en ligne le 14 janvier 2023, consulté le 24 décembre 2023. URL : <http://journals.openedition.org/bmsap/11242> ; DOI : <https://doi.org/10.4000/bmsap.11242>

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Ce document a été généré automatiquement le 24 décembre 2023.



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# Comparative study of manual identification of brain foldings in a living human brain using a proxy-endocast obtained from MRI

*Étude comparative de l'identification manuelle des plis cérébraux sur un cerveau humain, en utilisant un proxy-endocast obtenu par IRM*

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- 1 The use of virtual endocasts allows investigation of the folding configurations of the cerebral cortex of extinct species. However, is that really possible? Our goal is to help answer this question by qualifying and quantifying the subjective identifications of the foldings on endocasts compared to their real configurations on the brain. We invited 14 paleoneurologists to manually reconstruct the foldings they could recognize in a proxy-endocast obtained from an in-vivo MRI. MRI data were obtained on a volunteer (female, 33 y/o) during a unique session with complementary sequences. The brain structures segmentation and the folding labelling were obtained with Morphologist with the T1. The MRI UTE sequence was used to segment the bone and create the proxy-endocast with the BrainVisa software. Paleoneurologists were asked to label the endocast. Their manual reconstructions were compared with the real sulci using the Dice index in conjunction with a similarity measure based on position and shape of the foldings. Results show that foldings located closer to the base of the skull are more accurately identified in location and shape than those located in the superior region of the brain, such as the Central Sulcus that was largely misidentified and positioned closer to the precentral region. Traces that appear to be foldings but are not were also identified. The nature of some of these traces remains unknown while in

particular one misidentified trace corresponds to another type of structure: the parieto-occipital suture. We hope that the information presented in this work will help the palaeoanthropology community to be more careful with the identification of foldings that might be false or largely misidentified and to validate those that are generally well reconstructed, providing support and confidence in the subsequent studies that derive from them.

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