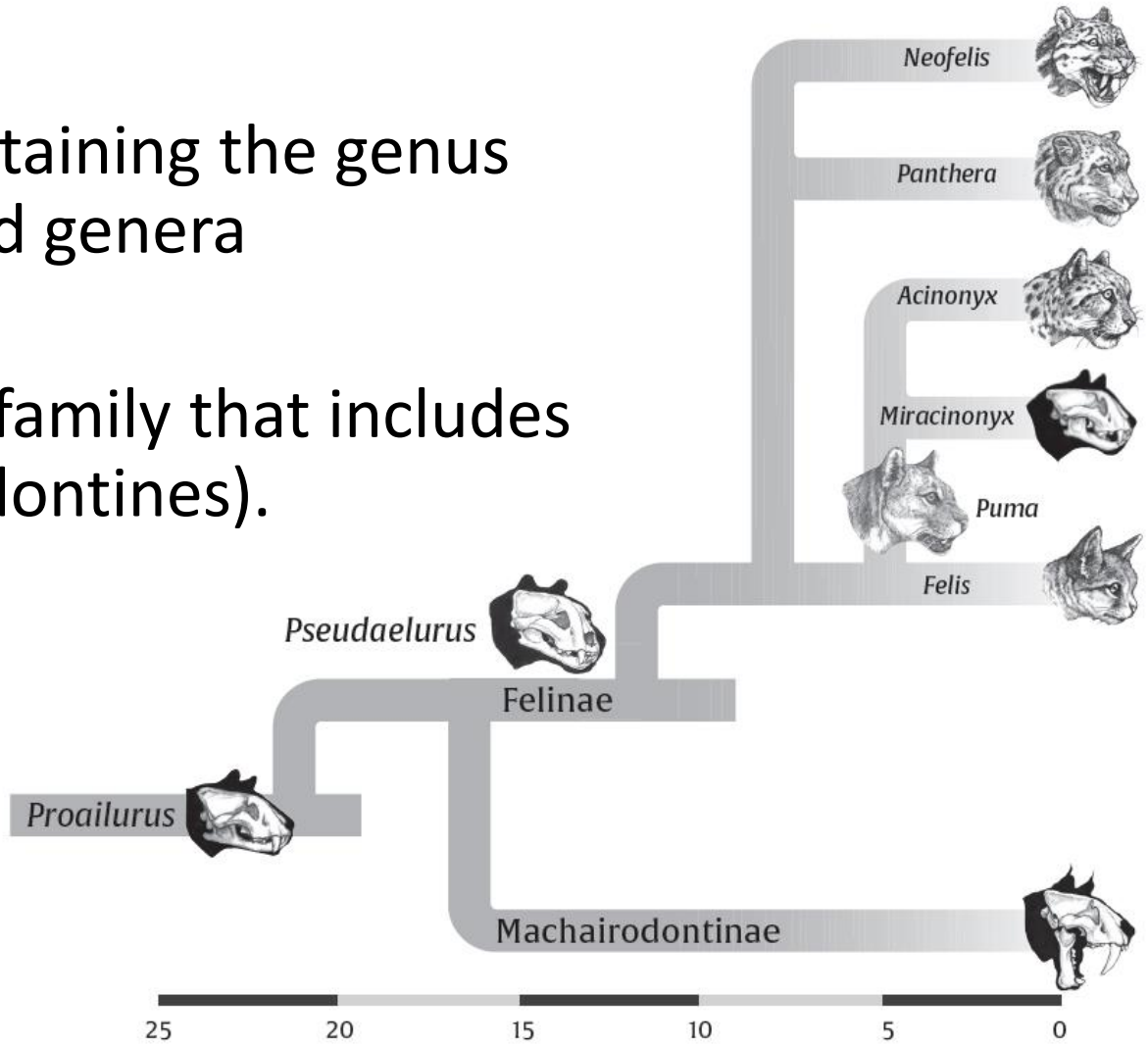
On the identity of the elusive pantherine from the Algar da Manga Larga, Portugal: a computed tomographic study of inner cranial cavities.

D. Estraviz-López, Q. Jiangzuo, J. Madurell-Malapeira, J.L. Cardoso, M. Rios & A. Grandal-d'Anglade

Introduction to pantherines.

- **Pantherinae**: subfamily containing the genus *Panthera* and closely related genera (pantherines).
- **Machairodontinae**: cat subfamily that includes the sabertooths (machairodontines).



Credit: Mark Hallet, 2022 *"On the prowl"*

Late Pleistocene pantherines in Iberian Peninsula

- They appear in at least 12 localities just within Portugal (15% of Iberian Peninsula).
- Two species of pantherines are known so far in the Late Pleistocene of Iberian Peninsula: The cave lion (*Panthera spelaea*) and the leopard (*Panthera pardus spelaea*).

Credit: Wikipedia user HTO

Credit: Wikipedia user Menah the Great

The leopard of Algar da Manga Larga

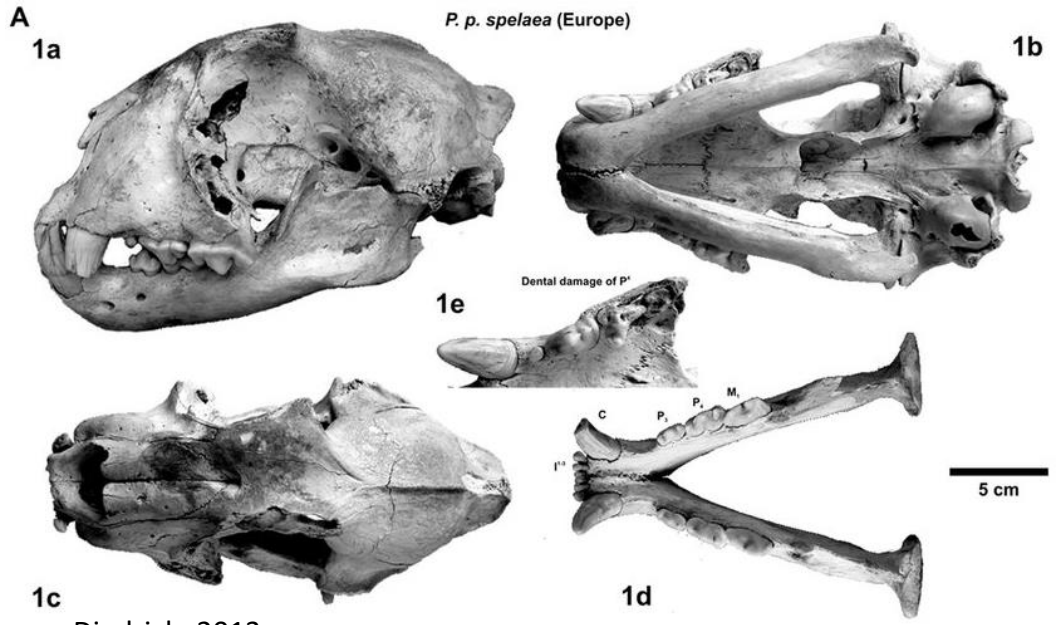
- Discovered in 2003 at the Algar da Manga Larga, Porto de Mós Municipality, Leiria, Portugal.
- Lacked stratigraphic context, with the bones deposited over flowstones, after likely have been transported from other areas of the cave.
- Deposited at the Geological Museum of Lisbon with the number catalog number MG1355.0001-9 and published in 2006.

Credit: Google maps

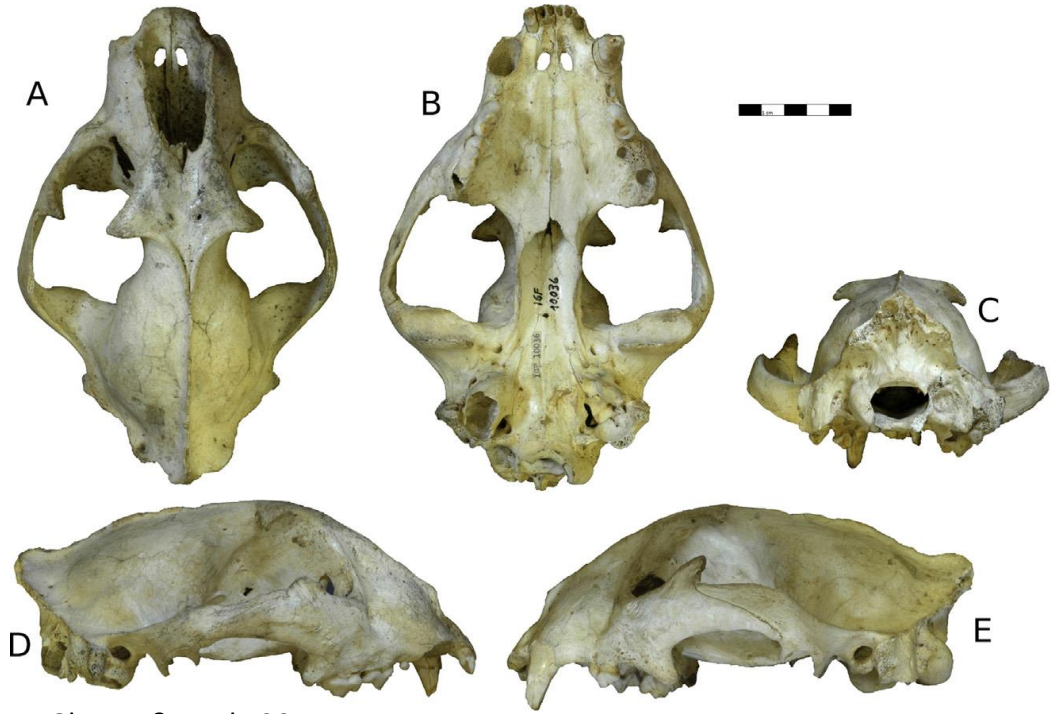
Cardoso & Regala, 2006

The leopard of Algar da Manga Larga today

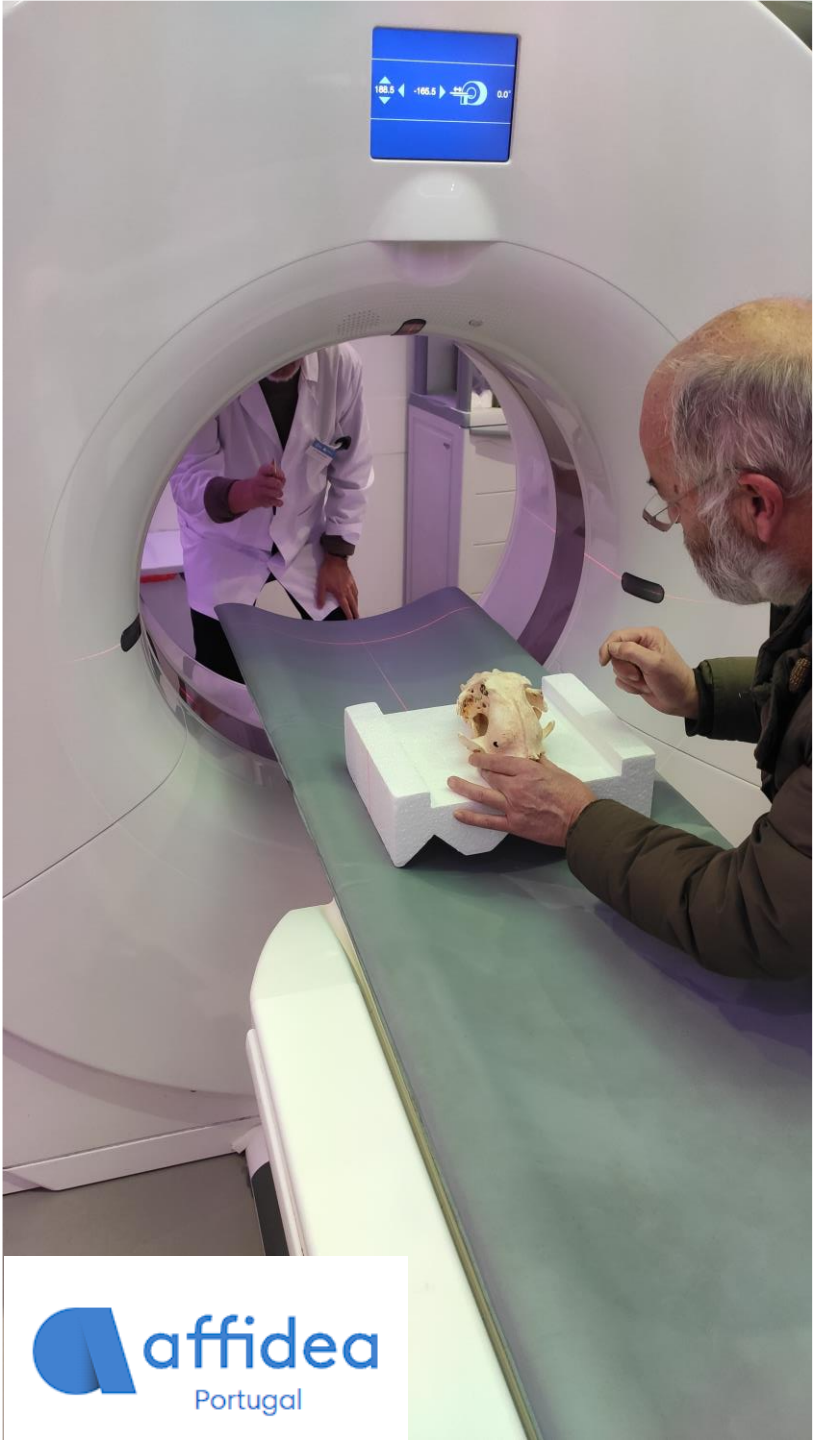
A peculiar skull…



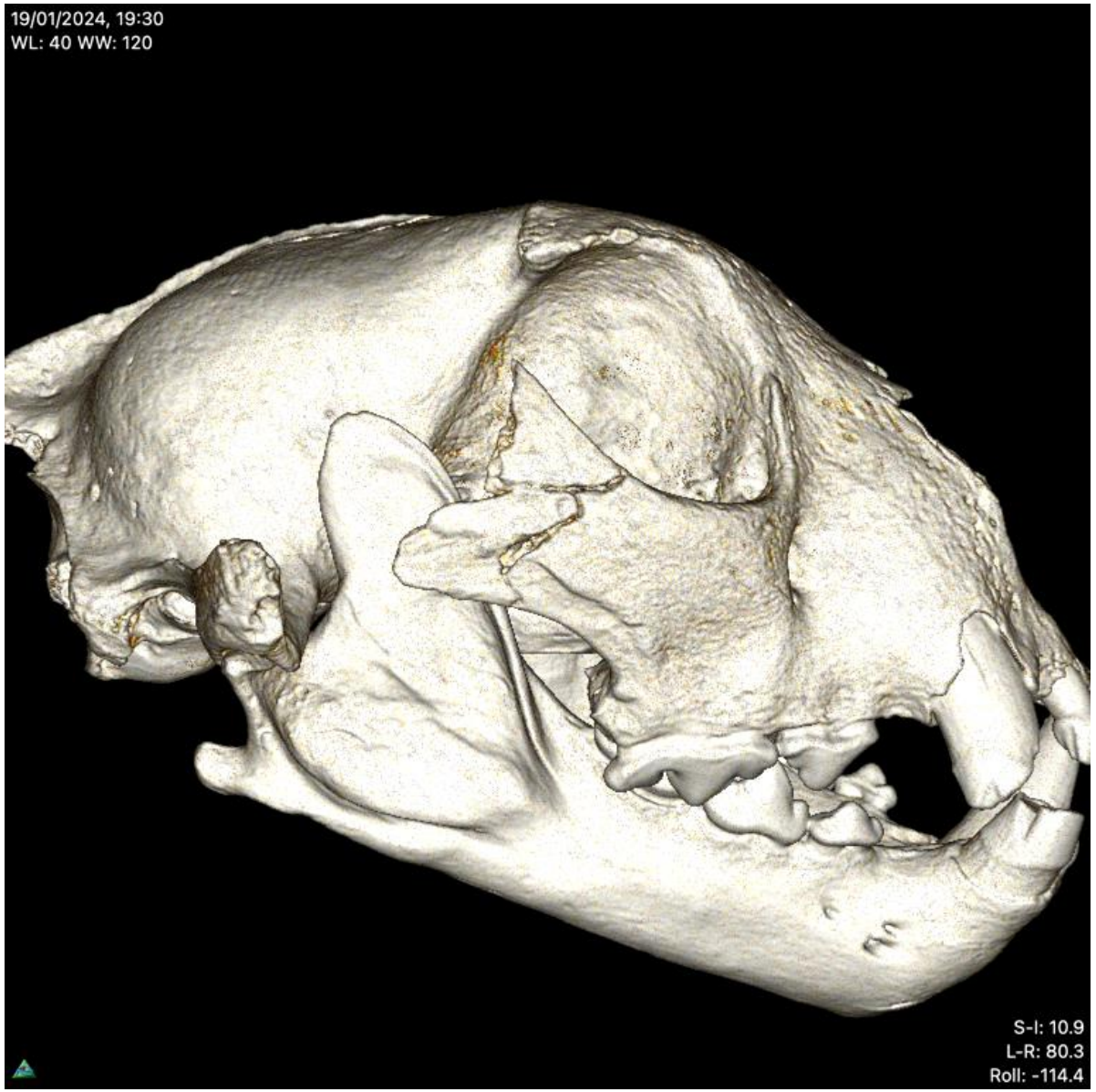
Diedrich, 2013



Ghezzo & Rook, 2015

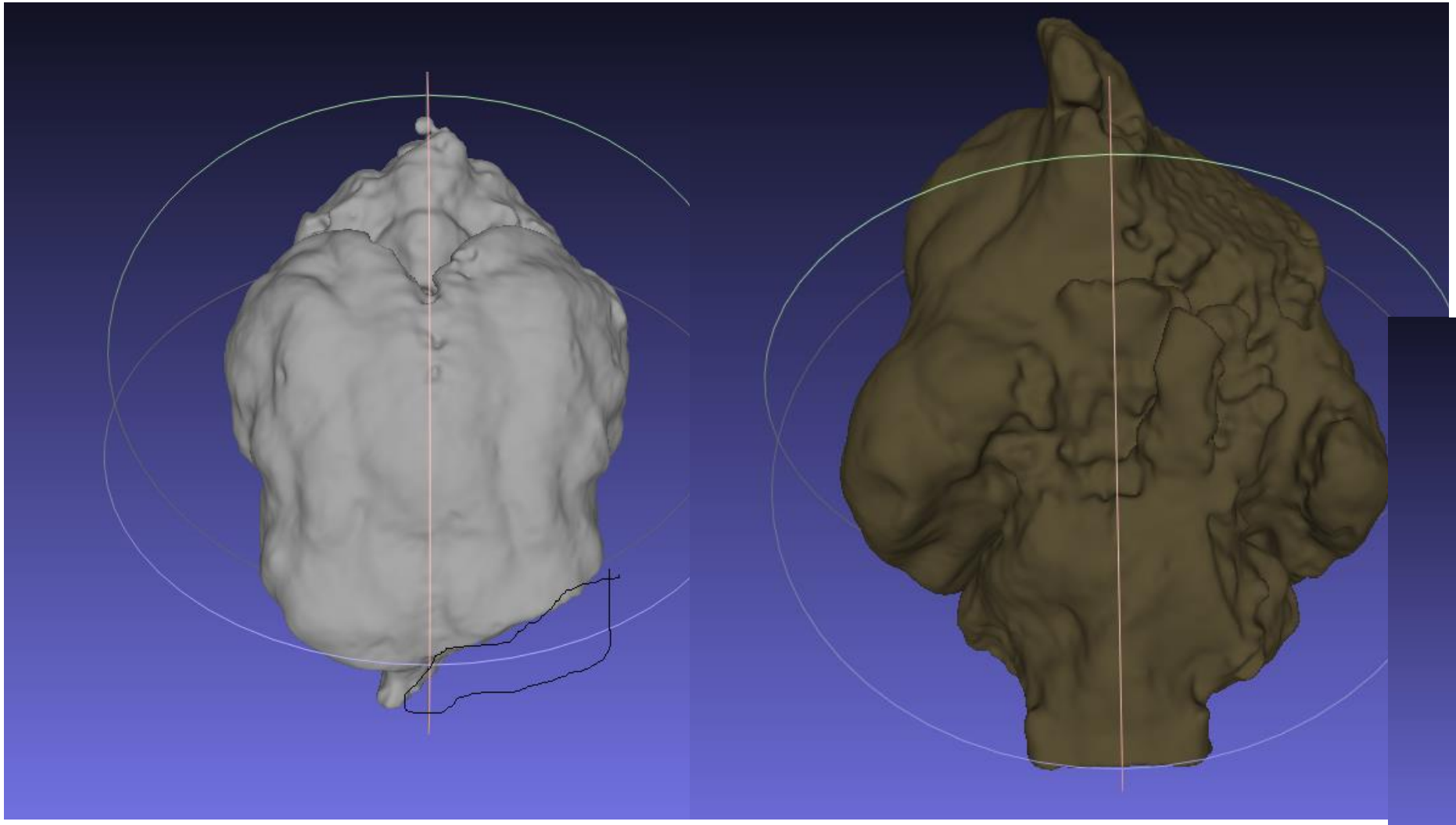


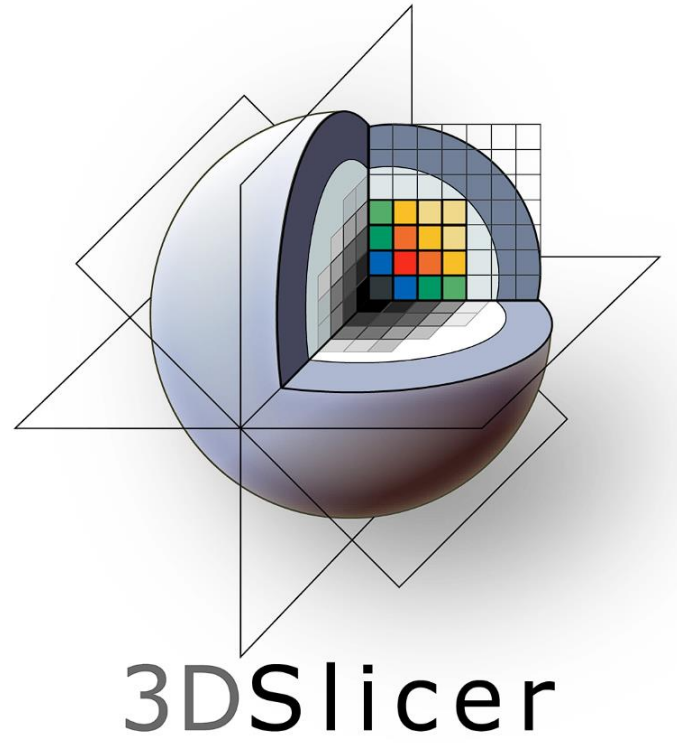
CT scanning…

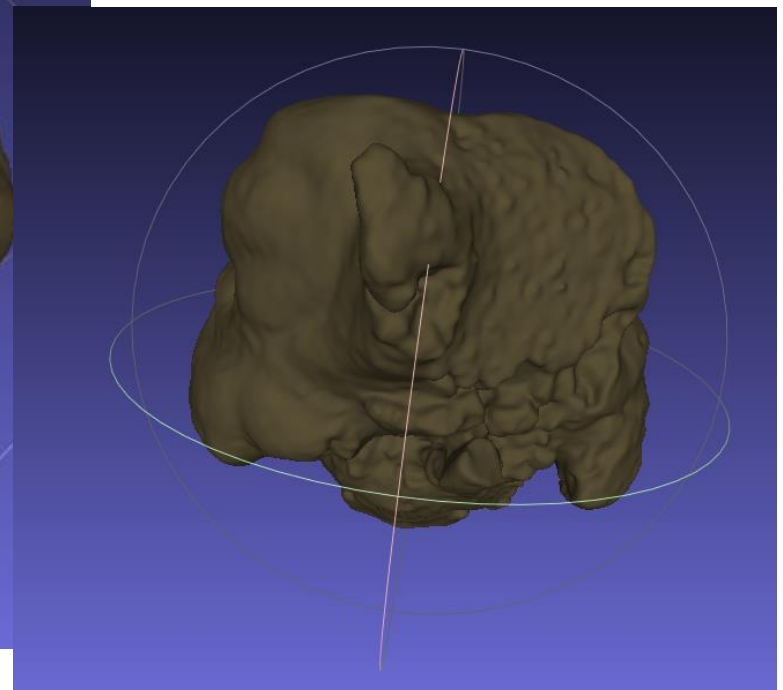


affidea
Portugal

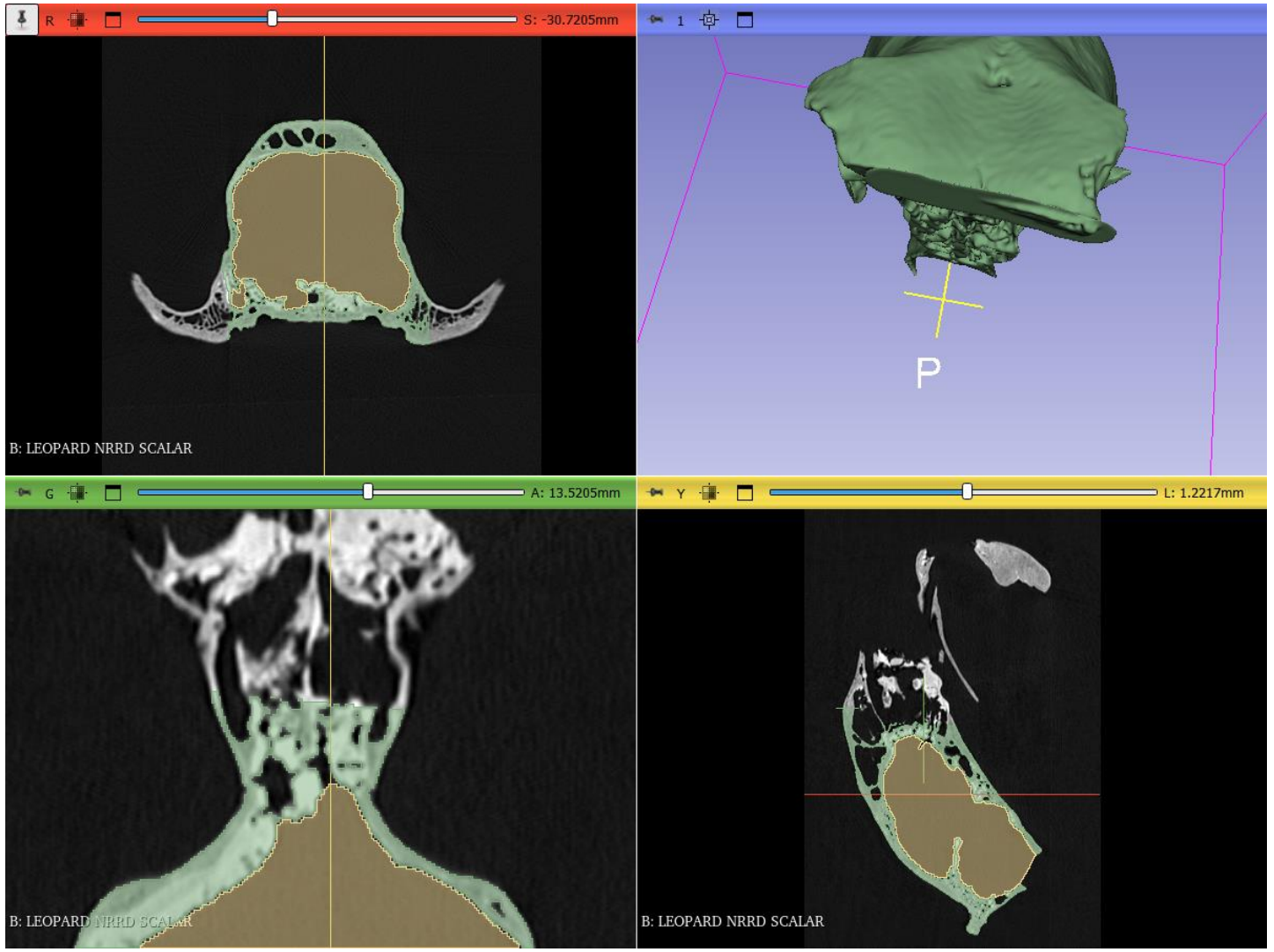
Extracting the endocast…





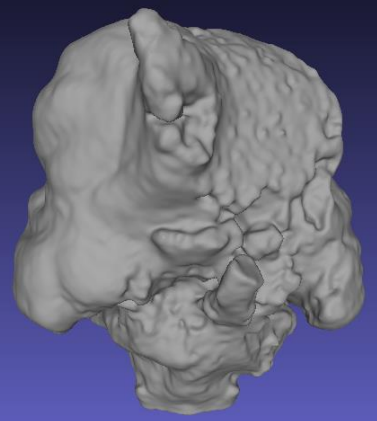


Hundreds of hours of 3D slicer later…



Anterior view

BEFORE



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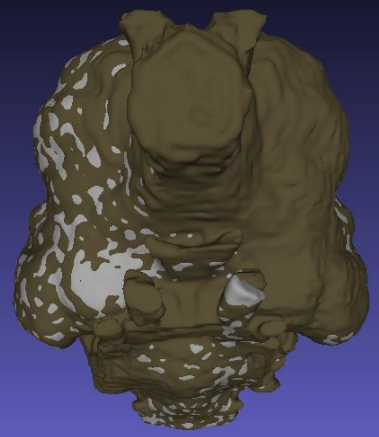
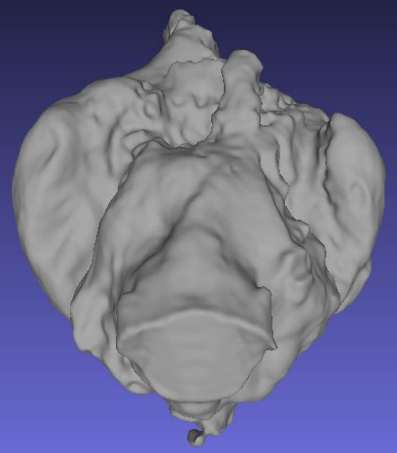


Ventral view

BEFORE



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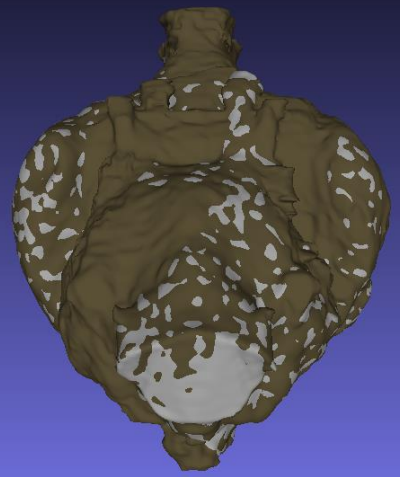


Posterior view

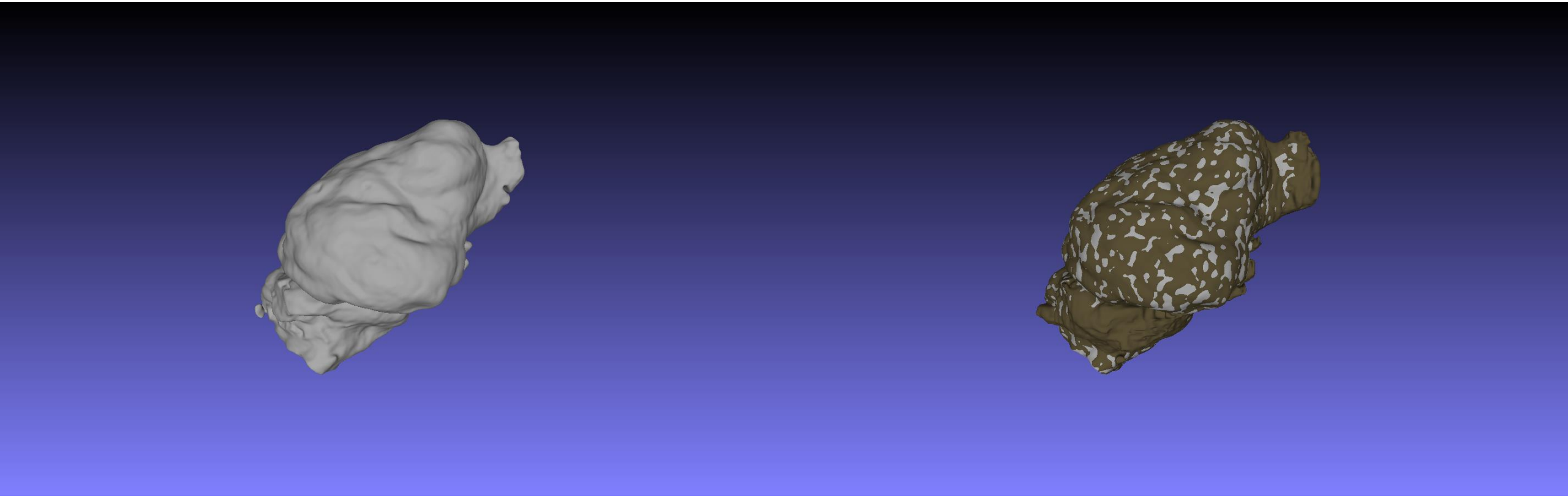
BEFORE

AFTER

Right lateral view

BEFORE

AFTER

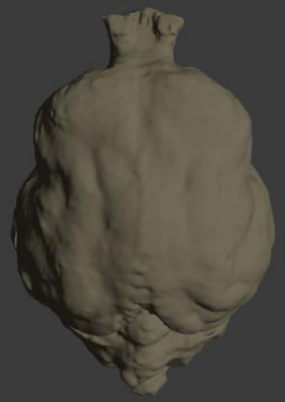


Left lateral view

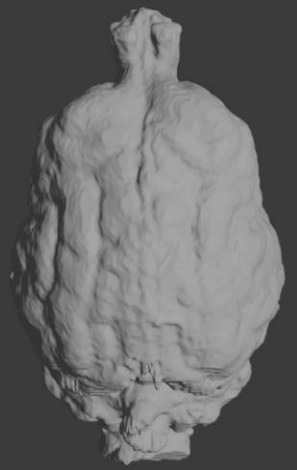
BEFORE

AFTER

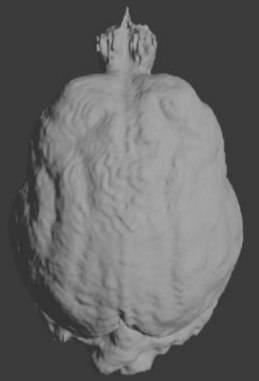
Comparison with pantherines



Manga Larga



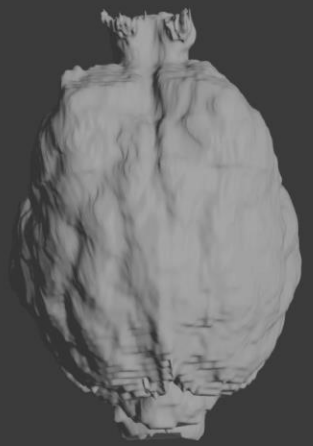
P. pardus



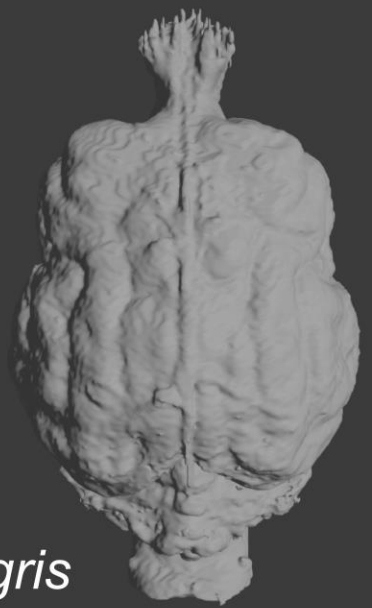
P. uncia

A. jubatus

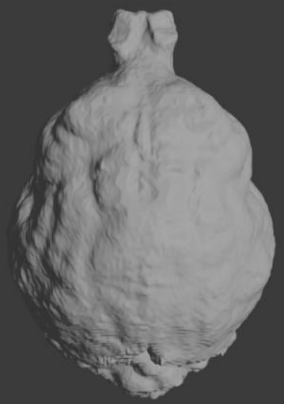
P. leo



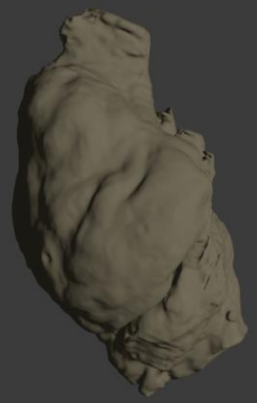
P. onca



P. tigris



P. concolor



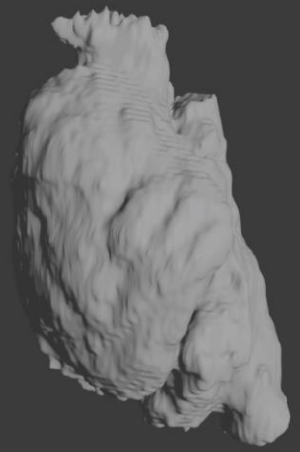
Manga Larga

P. pardus

P. uncia

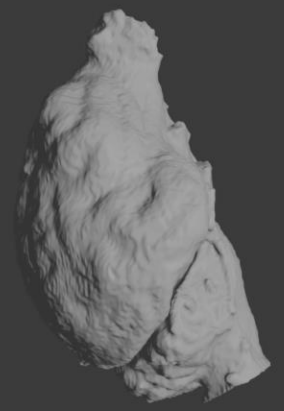
A. jubatus

P. leo



P. onca

P. tigris



P. concolor

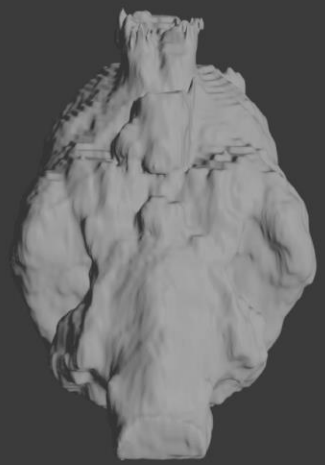
Manga Larga

P. pardus

P. uncia

A. jubatus

P. leo



P. onca

P. tigris

P. concolor

Conclusions

- The Manga Larga specimen presents a dorso-ventral torsion of the telencephalon relative to the brain stem, while the modern African leopard presents a more antero-posteriorly straight brain cavity, revealing also a relatively more ventral position of the foramen magnum in the specimen from Manga Larga.
- Further work on this specimen is necessary to clarify the implications of these differences, including….
  - The virtual reconstruction of the frontal sinuses
  - The study of the cranial and postcranial skeleton with both traditional and geometric morphometrics.
  - The use molecular techniques to clarify its age and details about its ecology.

U-Th dating and $\delta^{13}C$ / $\delta^{18}O$

… and a one work currently under revision!

Acknowledgements

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Many thanks for your attention!

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