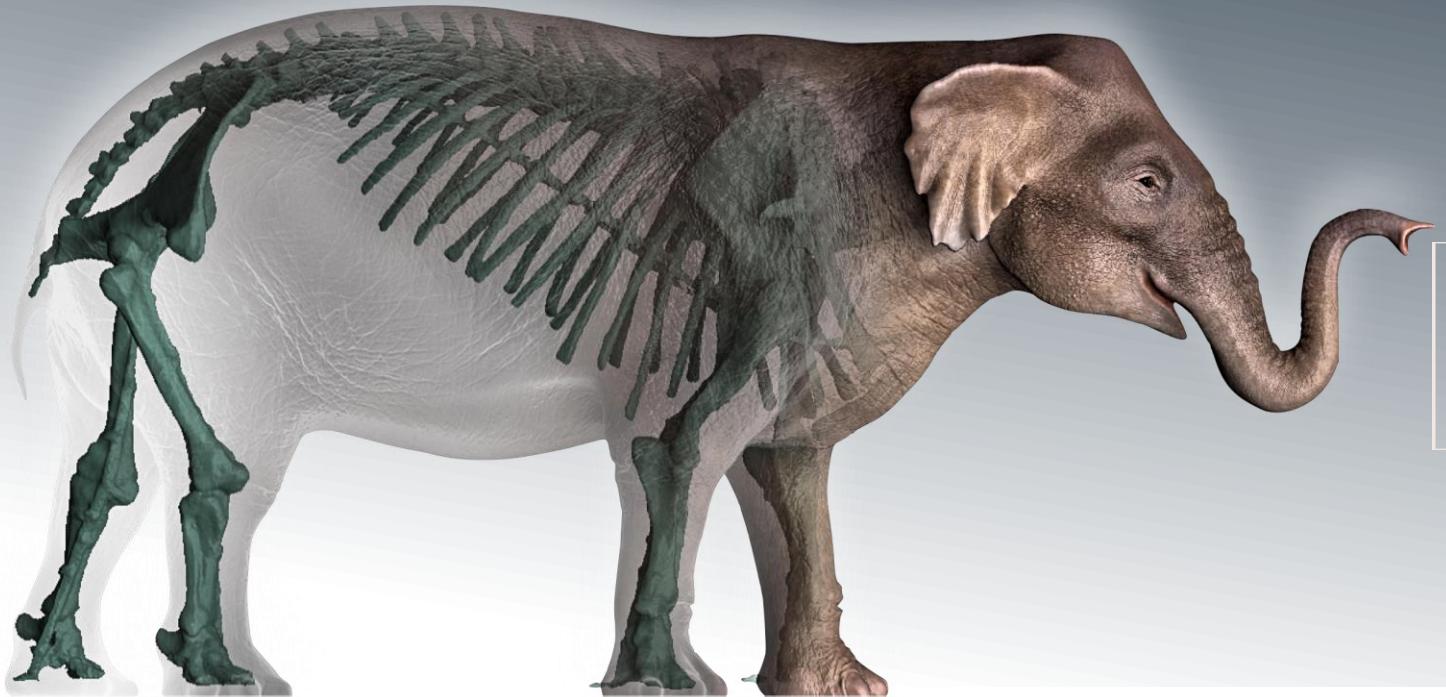


## IL MONDO VIRTUALE DELLA PALEONTOLOGIA

Applicazioni digitali per lo studio e la valorizzazione dei fossili



DAWID ADAM IURINO

[dawid.iurino@unimi.it](mailto:dawid.iurino@unimi.it)



UNIVERSITÀ DEGLI STUDI  
DI MILANO  
DIPARTIMENTO DI SCIENZE  
DELLA TERRA "ARDITO DESIO"

## PALEONTOLOGIA VIRTUALE

Branca della Paleontologia il cui obiettivo è lo studio dei reperti fossili attraverso l'acquisizione, l'elaborazione e l'analisi di immagini digitali.

FOTOGRAMMETRIA

TOMOGRAFIA (TAC)



# FOTOGRAMMETRIA



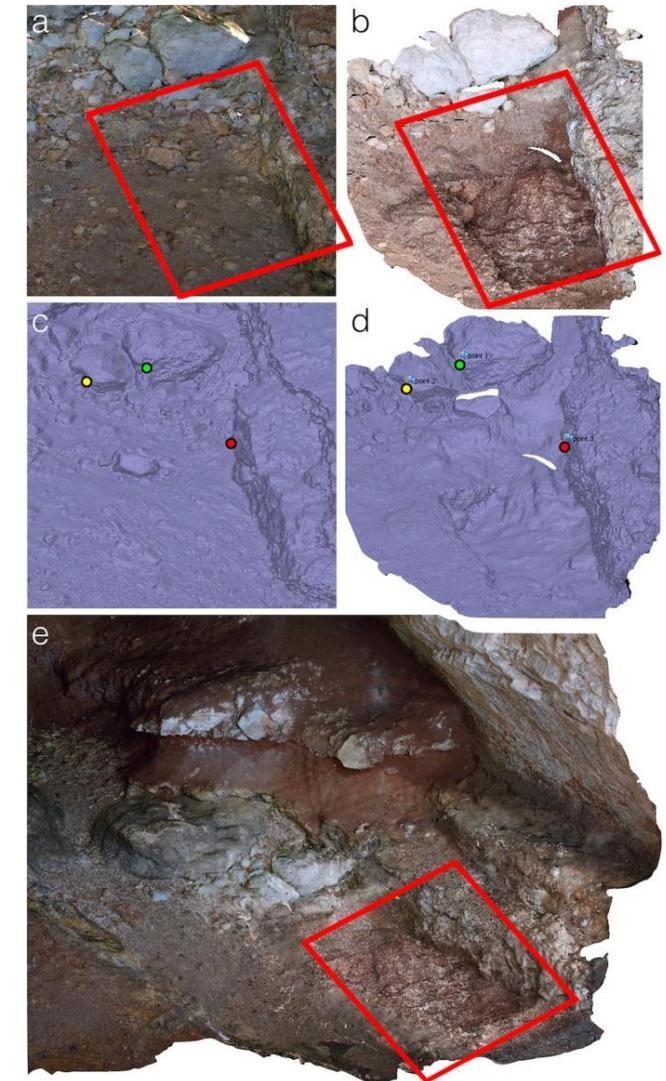
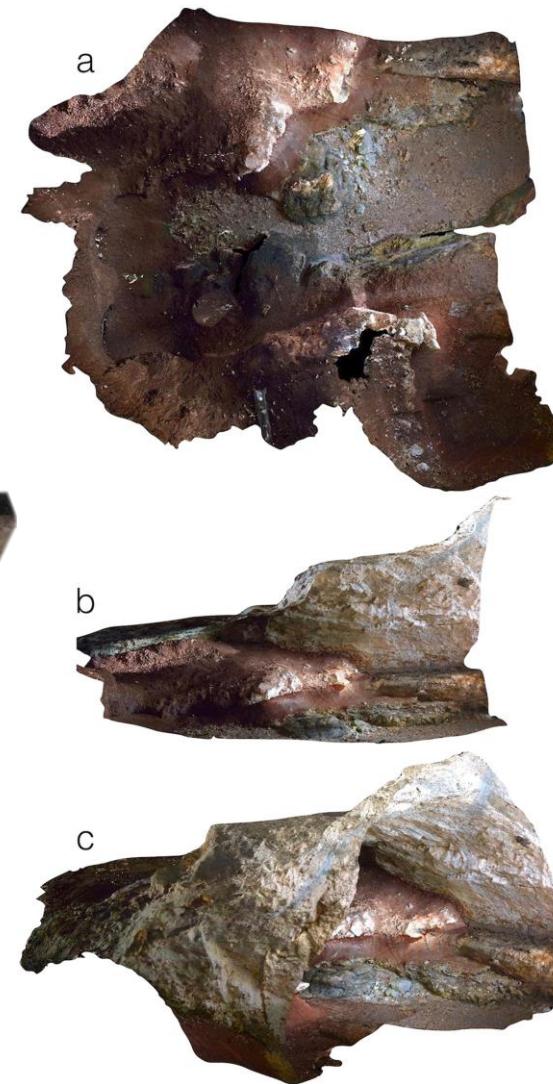
# FOTOGRAMMETRIA



- Portable
- Economica
- Texture

# APPLICAZIONI

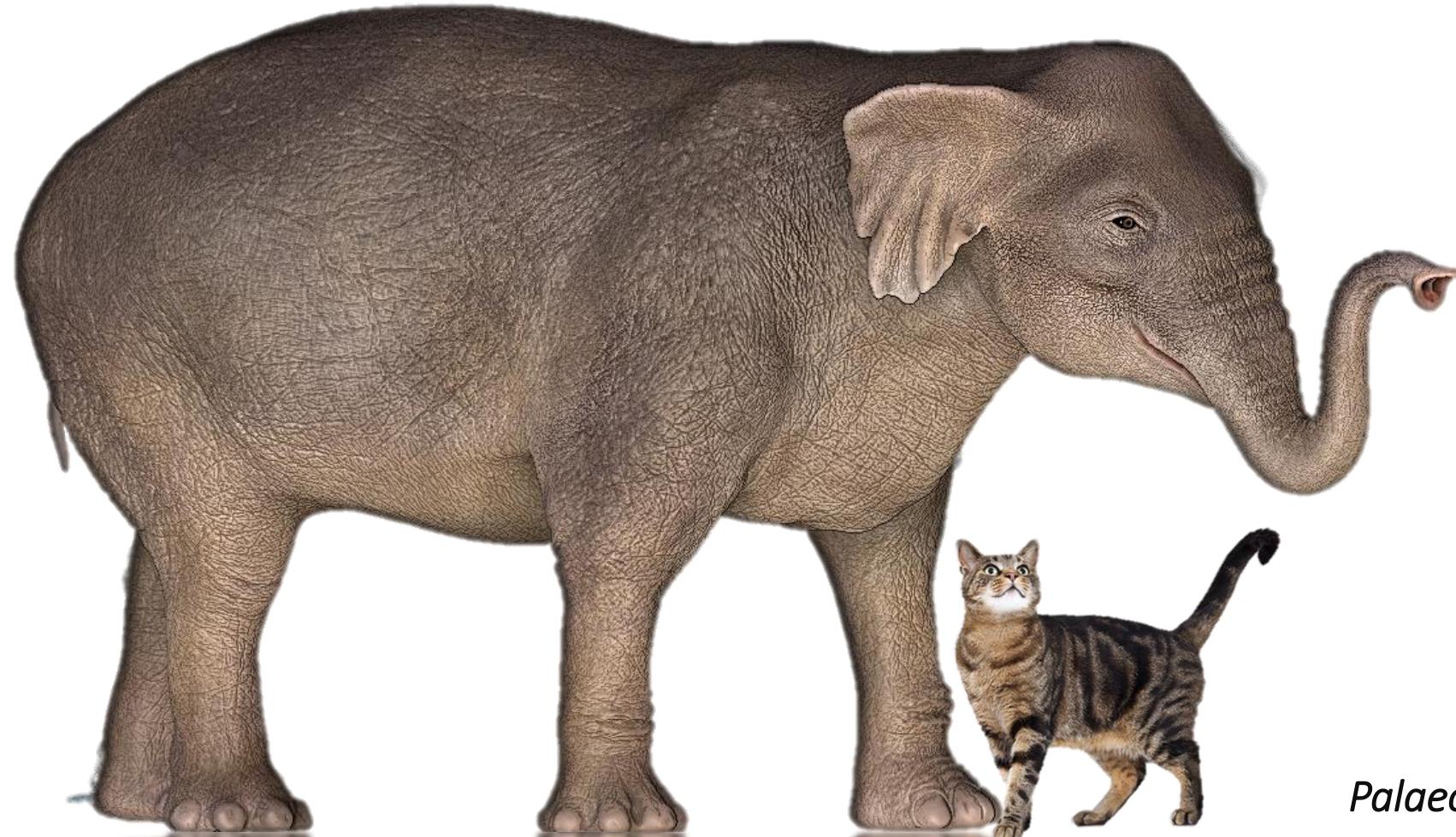
- Modelli 3D delle superfici di scavo
- Archivio digitale degli scavi



# RICOSTRUZIONI



# RICOSTRUZIONI



*Palaeoloxodon falconeri*

© Dawid A. Iurino



REALTÀ AUMENTATA



PALEOARTE

DAWID ADAM IURINO

DAWID ADAM IURINO

DAWID ADAM IURINO



# LAETOLI

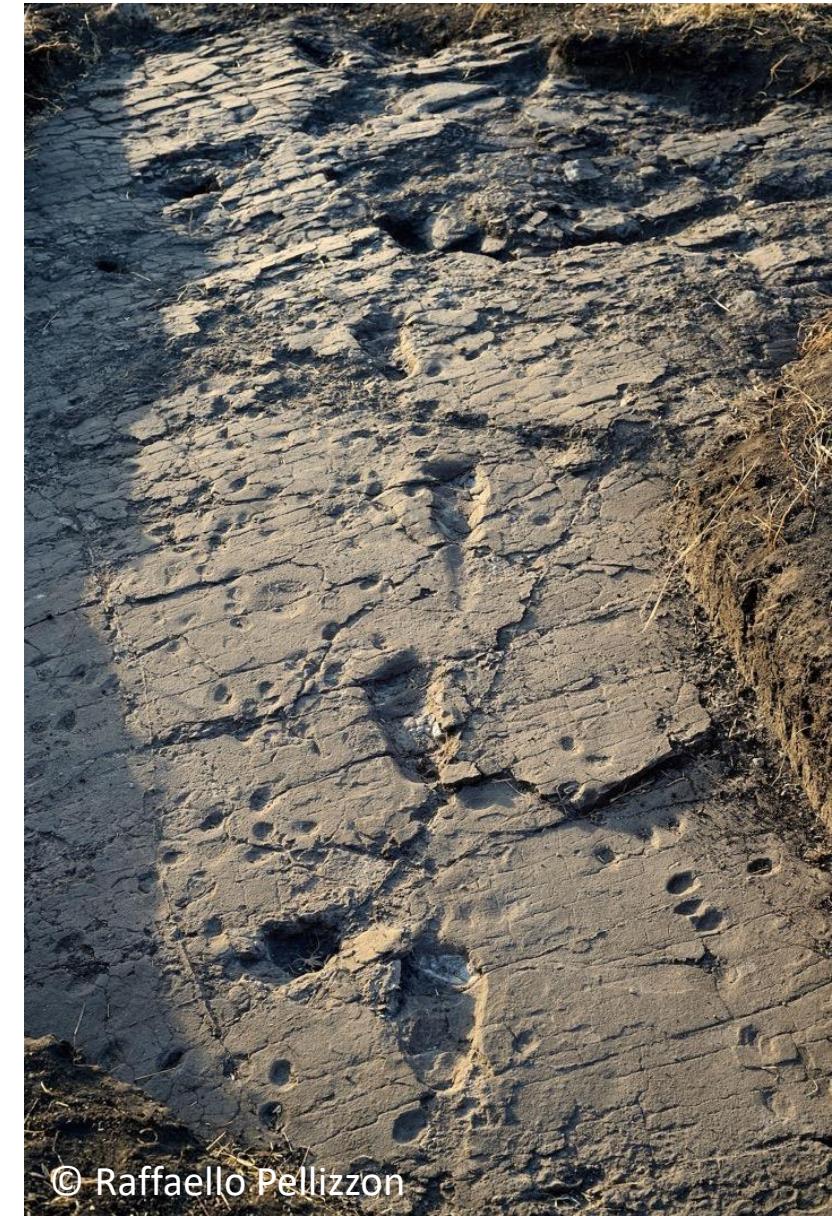
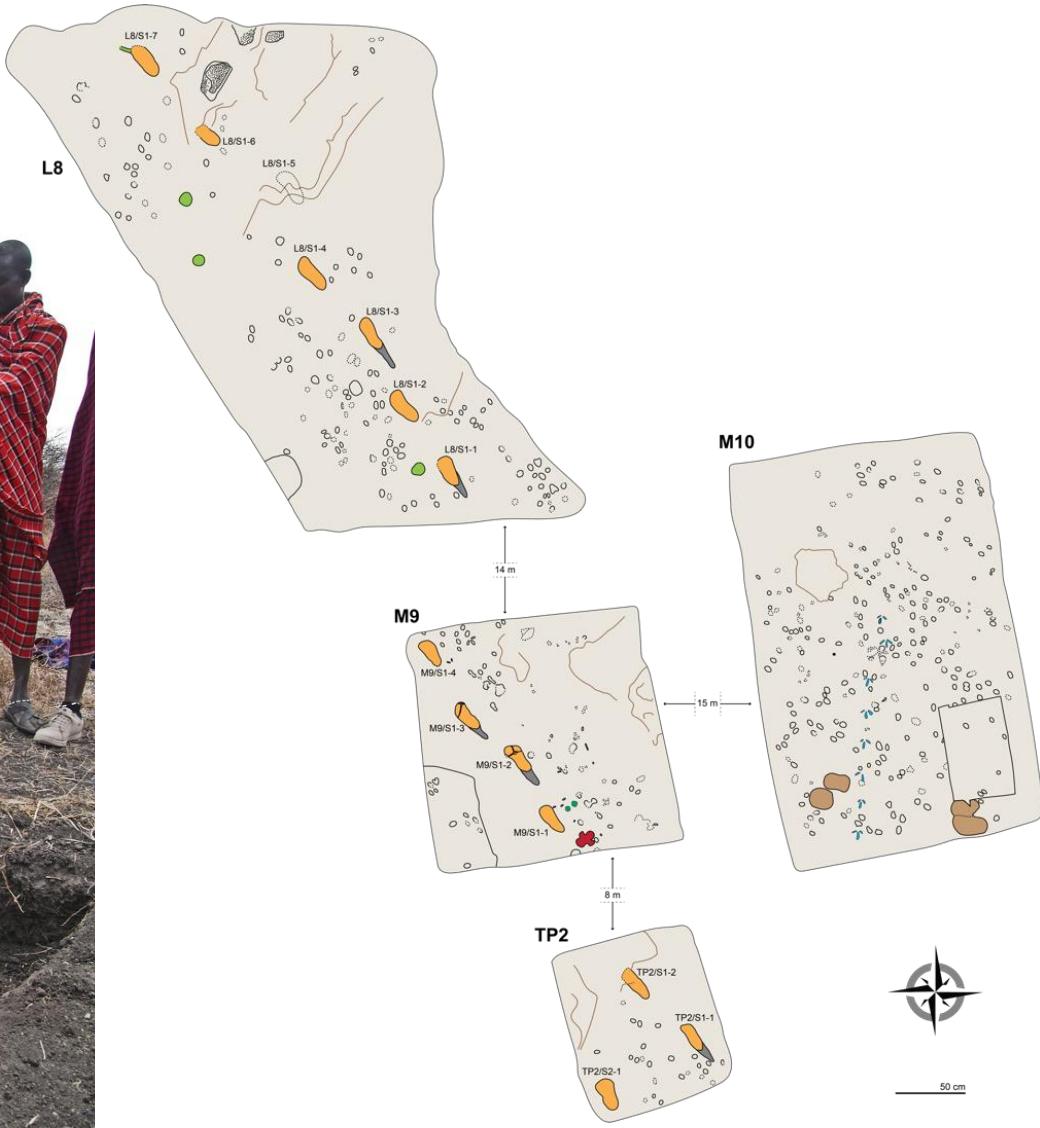


© Raffaello Pellizzon

# RICOSTRUZIONI



© Raffaello Pellizzon



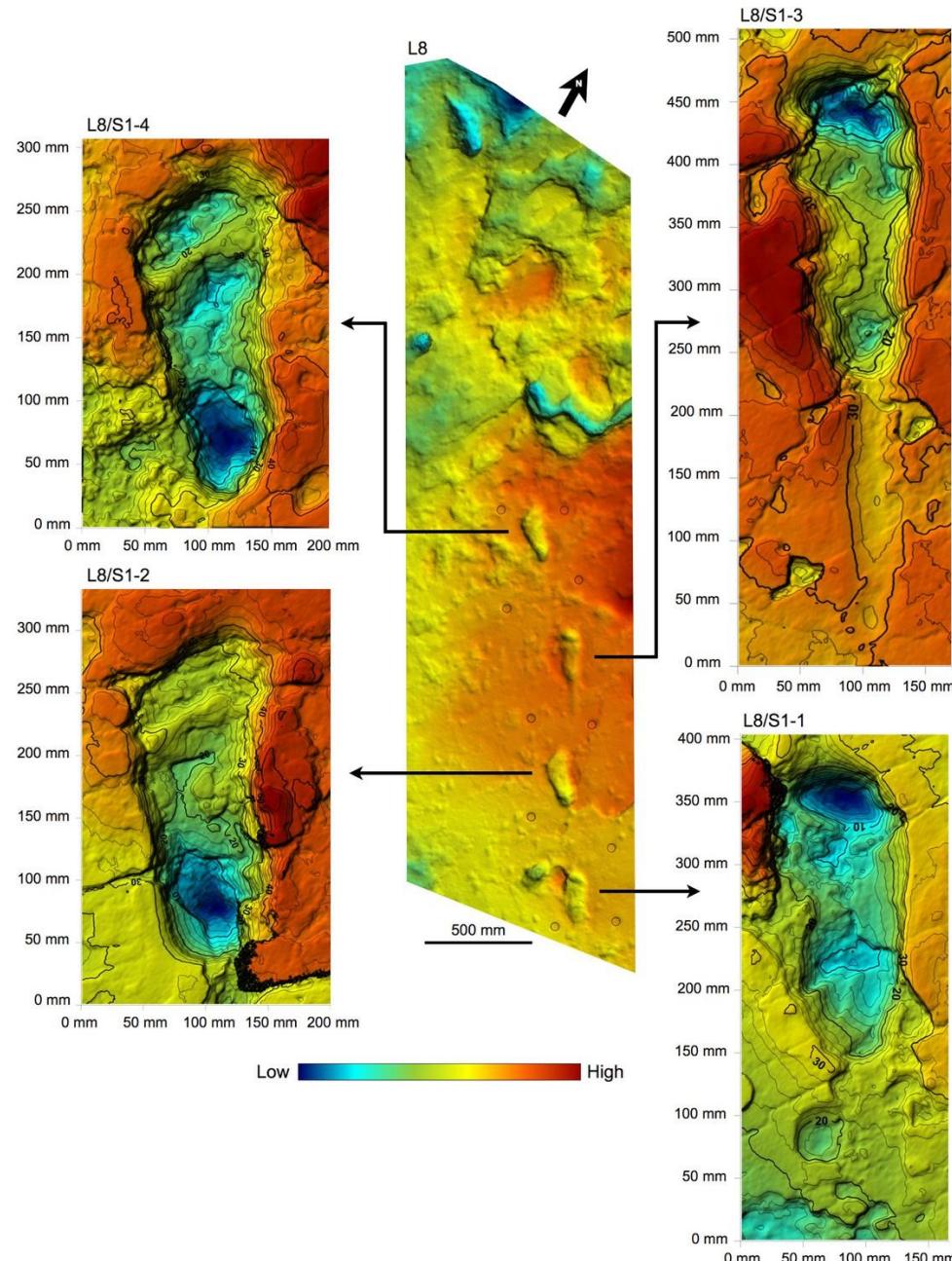
© Raffaello Pellizzon

# RICOSTRUZIONI



TEST-PIT L8

# RICOSTRUZIONI



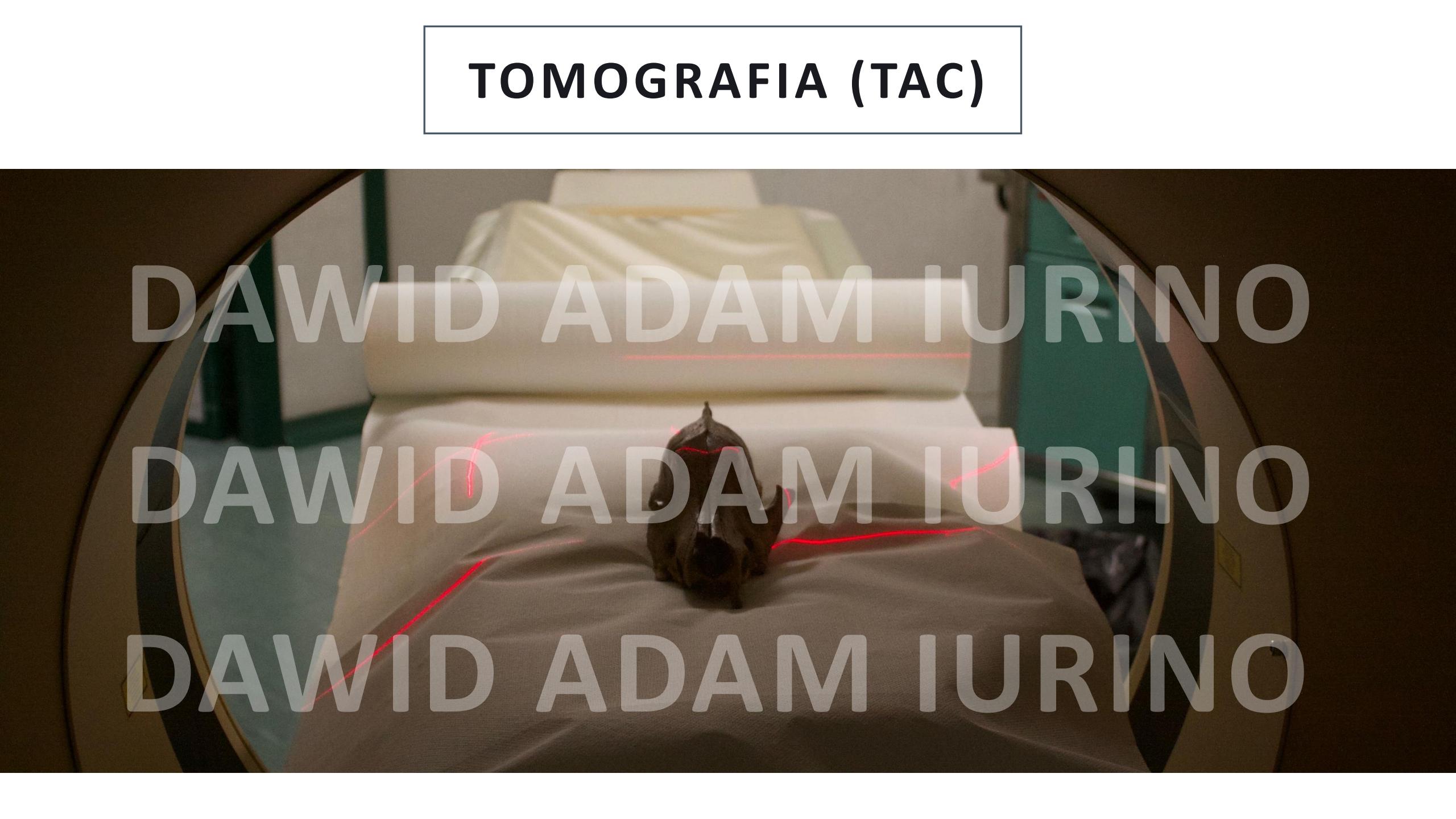
Trackway	S1	S2	G1	G2	G3
Number of measurable footprints	11	1	9	2	8
Average footprint length (mm)	261	231	180	225	209
Average footprint max width (mm)	104	120*	79	117	85
Average foot index (%)	40.0	51.9*	43.8	48.0	41.5
Average step length (mm)	568	-	416	453	433
Average stride length (mm)	1139	-	829	880	876
Estimated stature (cm)	<i>H. sapiens</i>	163-186	144-165	113-129	141-161
	<i>H. sapiens</i>	$171.6 \pm 5.4$	$160 \pm 5.4$	$141.4 \pm 5.4$	$158.2 \pm 5.4$
	<i>A. afarensis</i>	161-168	142-149	111-116	139-145
Estimated body mass (kg)	<i>H. sapiens</i>	$53.6 \pm 3.7$	$46.7 \pm 3.8$	$39.3 \pm 3.7$	$52.6 \pm 3.7$
	<i>A. afarensis</i>	41.3-48.1	36.5-42.4	28.5-33.1	35.6-41.4
Walking speed (m/s)	0.47-0.55	-	0.43-0.50	0.36-0.42	0.39-0.46
Relative speed ( $s^{-1}$ )	0.25-0.34	-	0.33-0.44	0.23-0.30	0.26-0.35

(Masao et al., 2016)

# PALEOARTE



# TOMOGRAFIA (TAC)



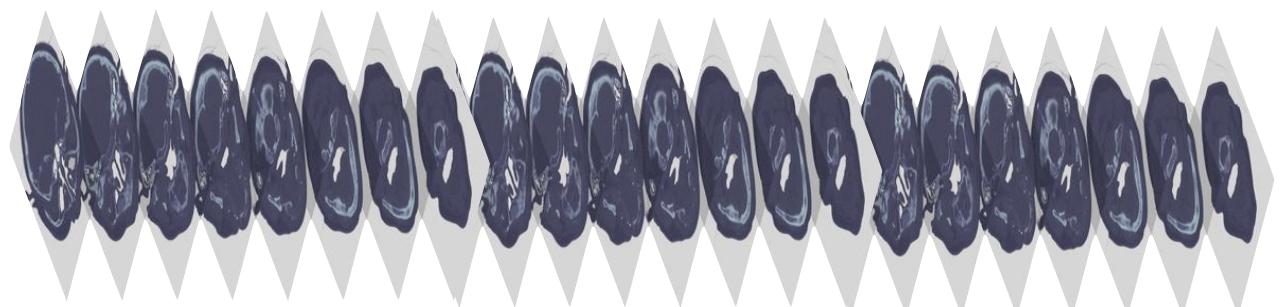
DAWID ADAM IURINO

DAWID ADAM IURINO

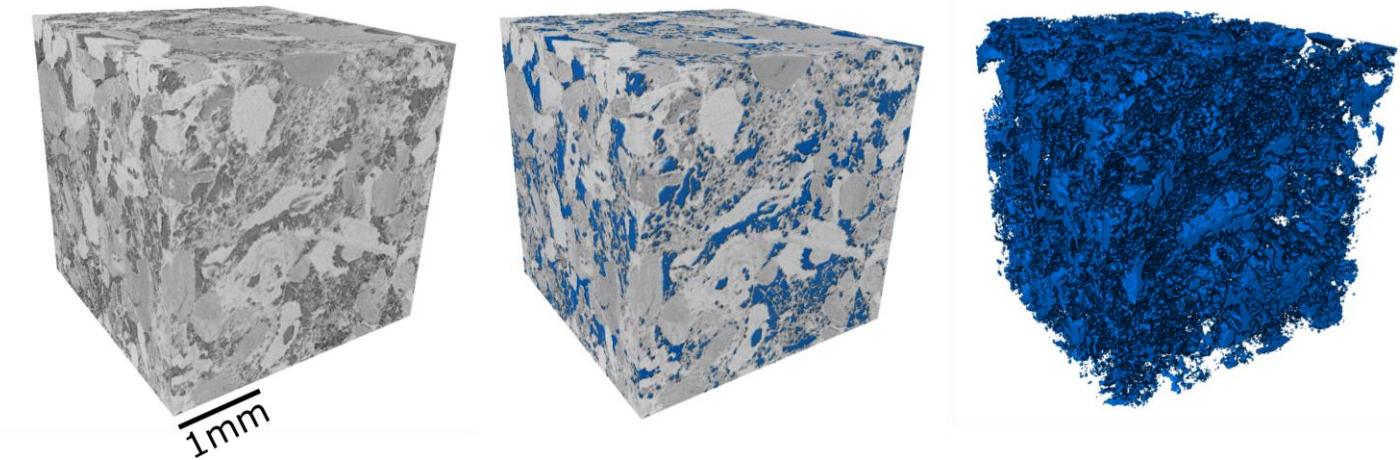
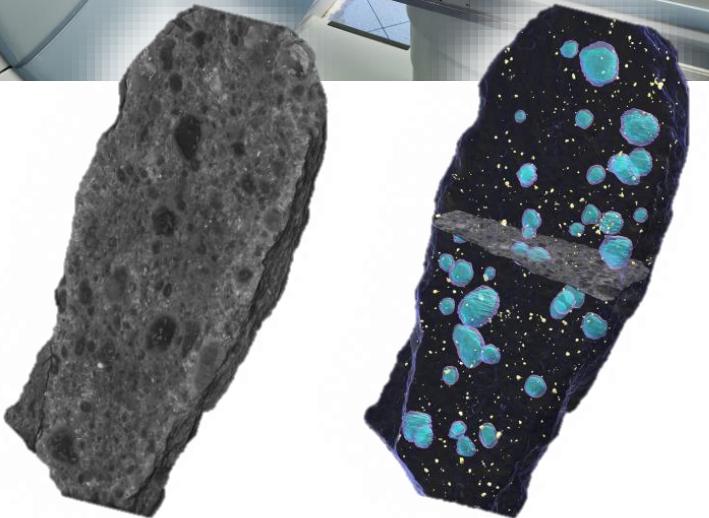
DAWID ADAM IURINO

# TOMOGRAFIA (TAC)

- Ambiente controllato
- Costi elevati
- Interno degli oggetti

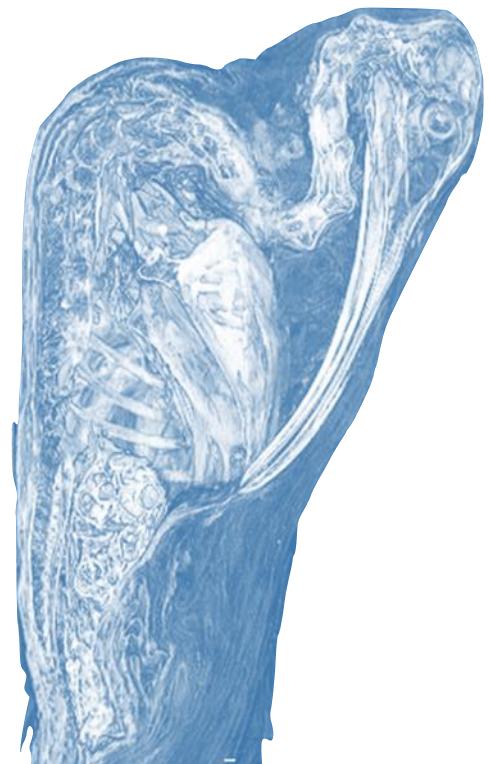


# APPLICAZIONI

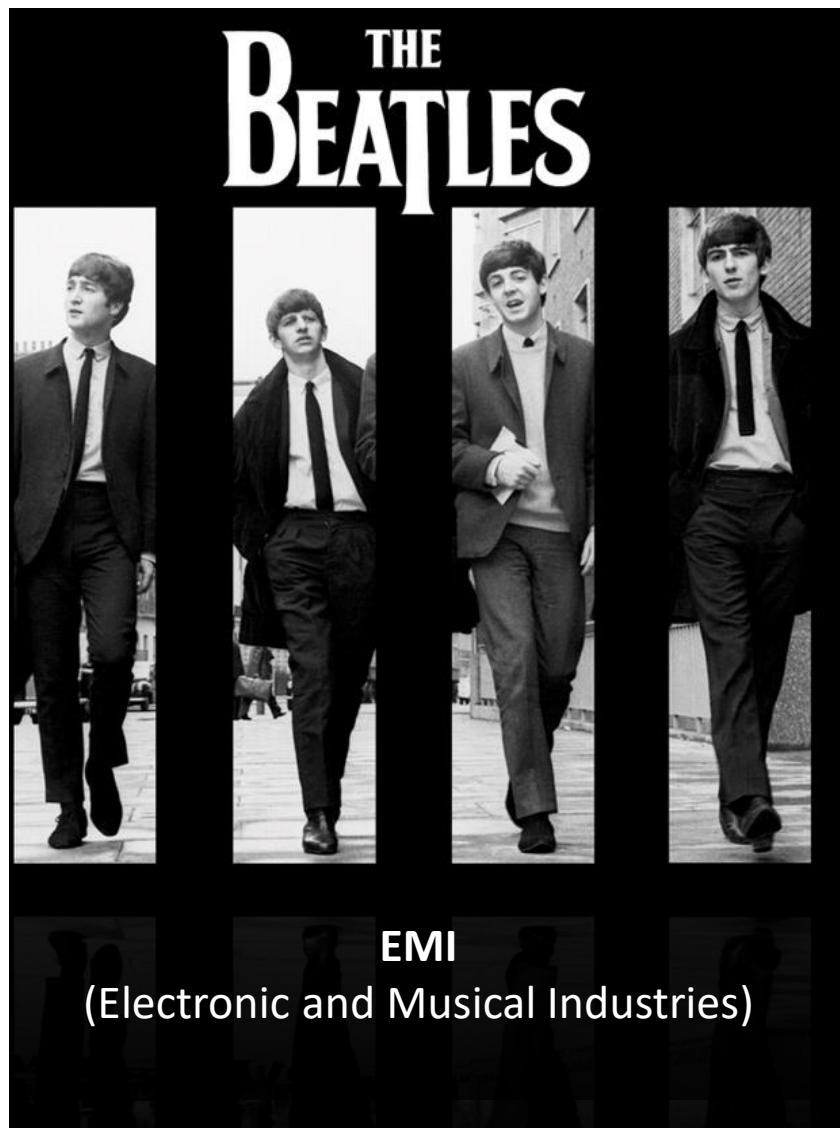


# FOSSILI E RAGGI X

Author	Year	Study subject	Site
Koenig	1896	Human and cat mummies	Frankfurt, Germany
Holland	1896	Bird mummy	Liverpool, UK
Dedekind	1896/97	Egyptian mummies	Vienna, Austria
Londe	1897	Egyptian mummies Fake mummy	Paris, France
Leonard	1898	Peruvian mummies	Philadelphia, USA
Petrie	1898	Egyptian mummies	London, UK
Gorjanovic-Kramberger	1901	Hominid fossil	Vienna, Austria
Gardiner	1904	Egyptian mummies	London, UK
Albers-Schoenberg	1905	Egyptian mummies	Hamburg, Germany
Elliot Smith	1912	Egyptian mummies	Cairo, Egypt
Salomon	1921	Peruvian mummy	Berlin, Germany



# HELP!



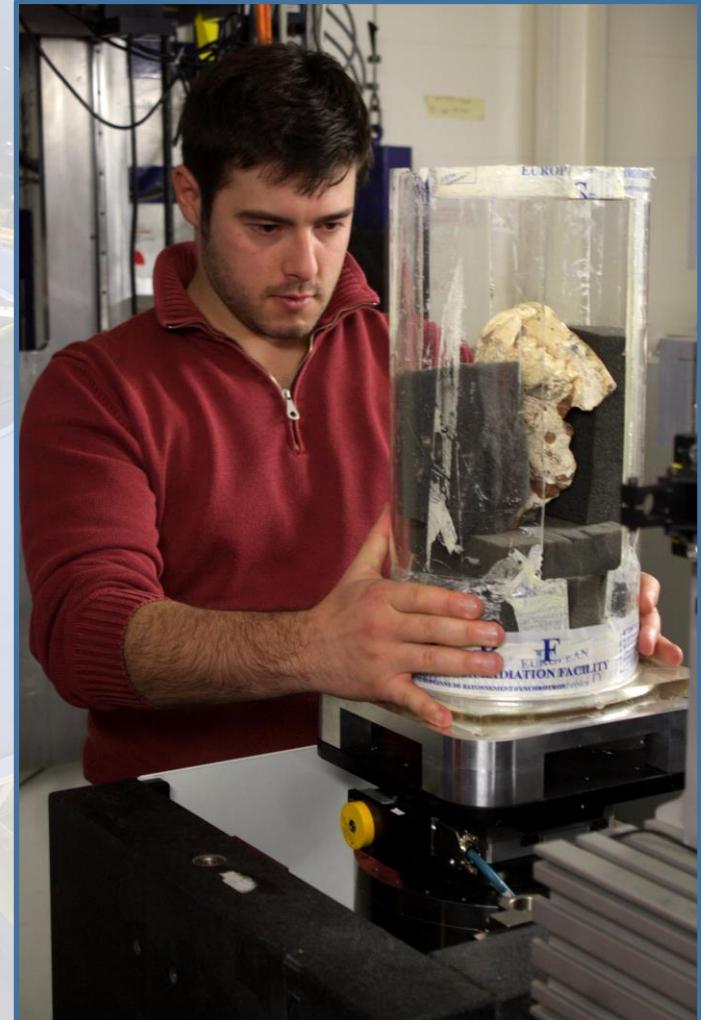
J Comput Assist Tomogr. 2012 Mar-Apr;36(2):161-4. doi: 10.1097/RCT.0b013e318249416f.

**Do we really need to thank the Beatles for the financing of the development of the computed tomography scanner?**

Maizlin ZV<sup>1</sup>, Vos PM.

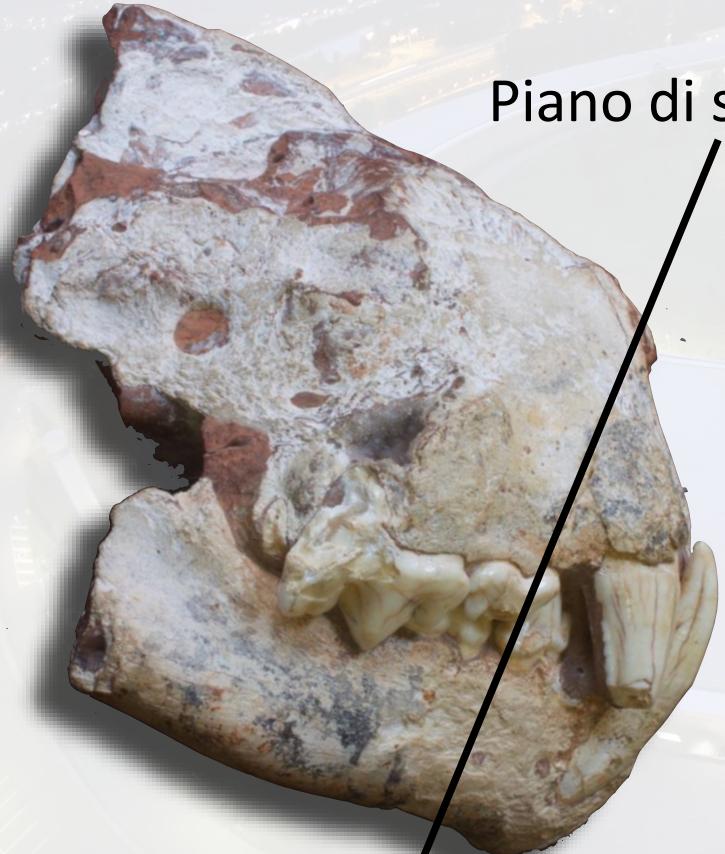


# SINCROTRONE

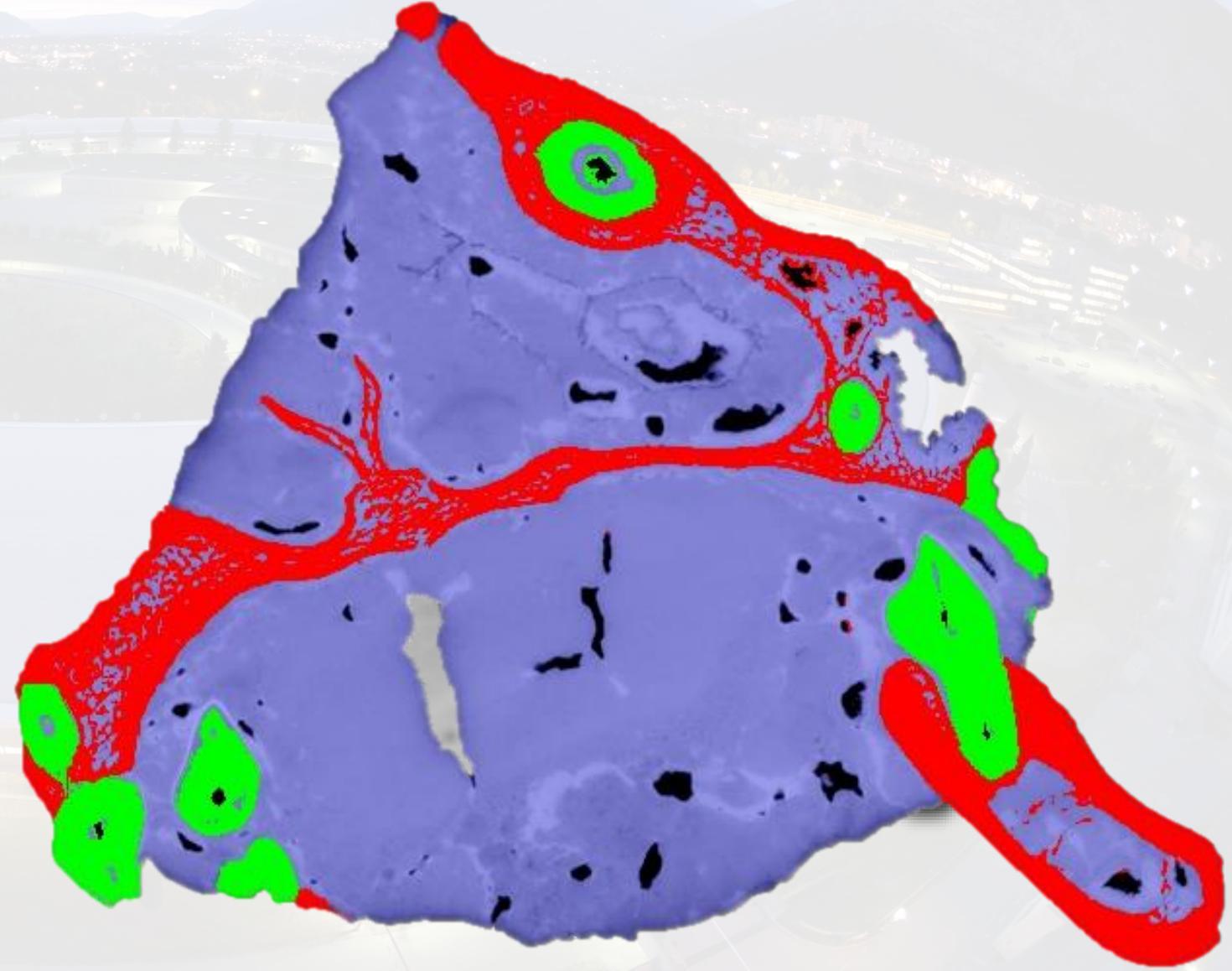




# SINCROTRONE

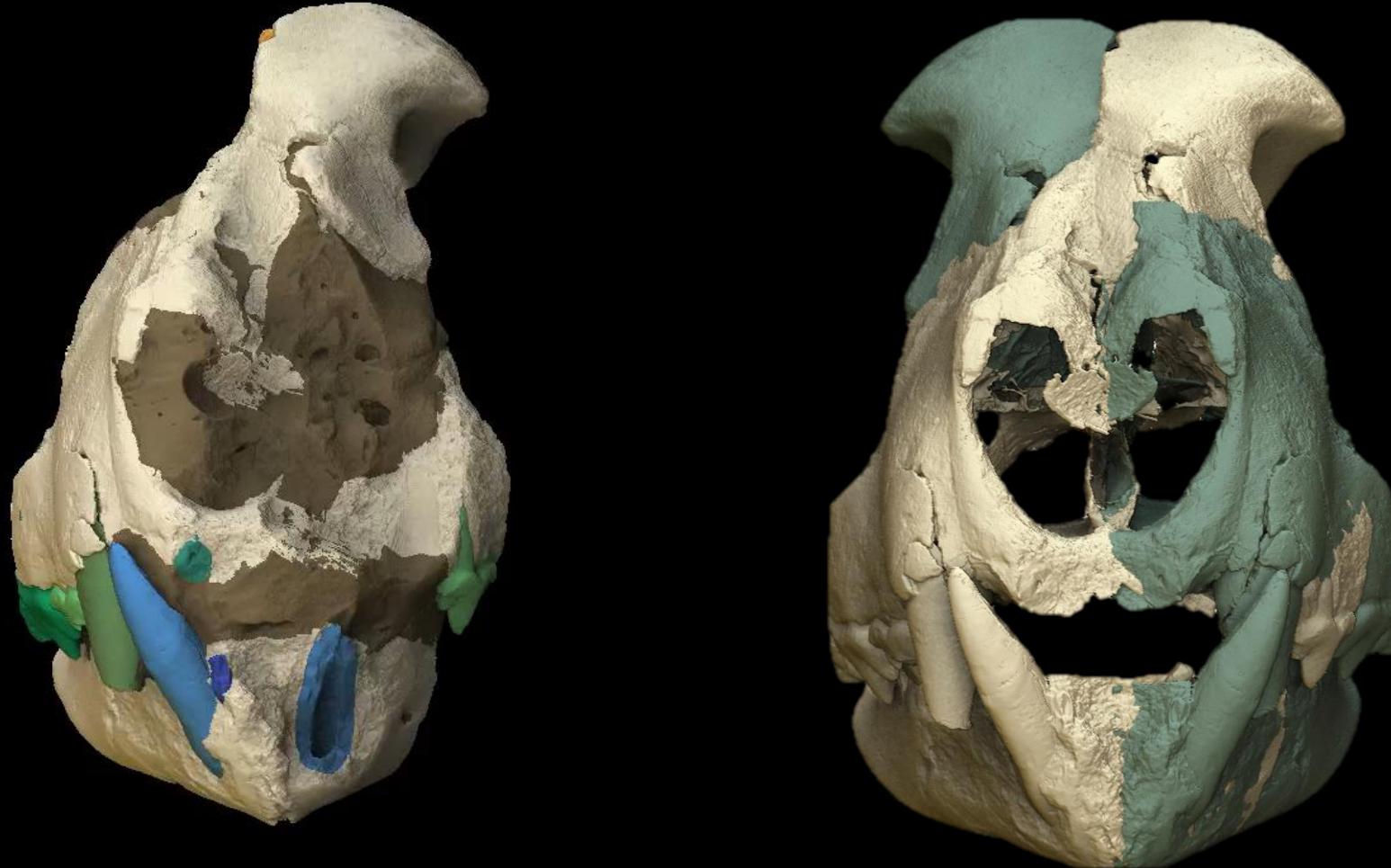


Piano di sezione



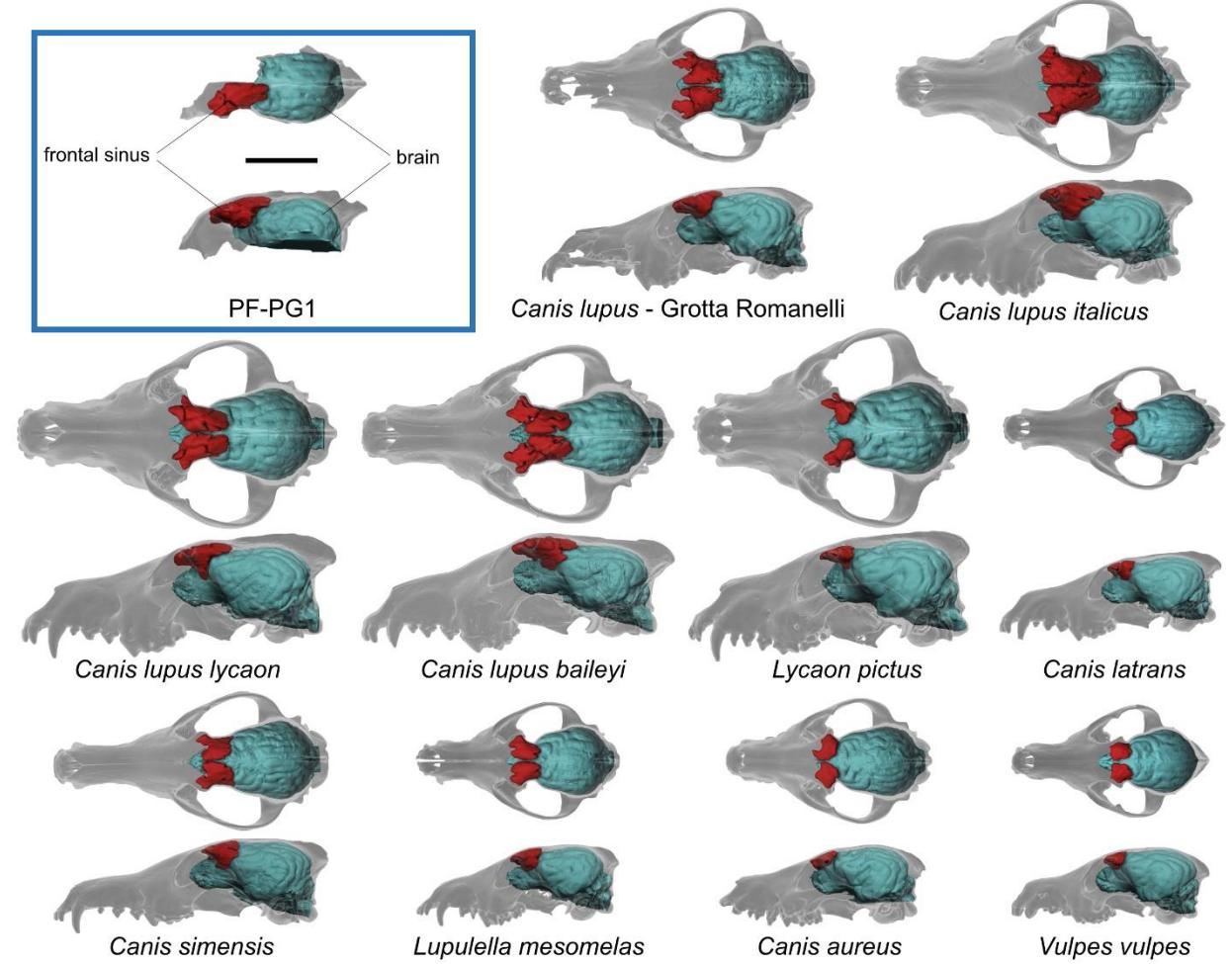
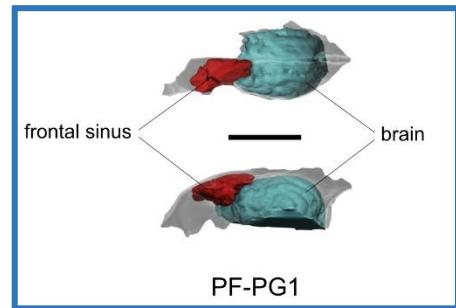
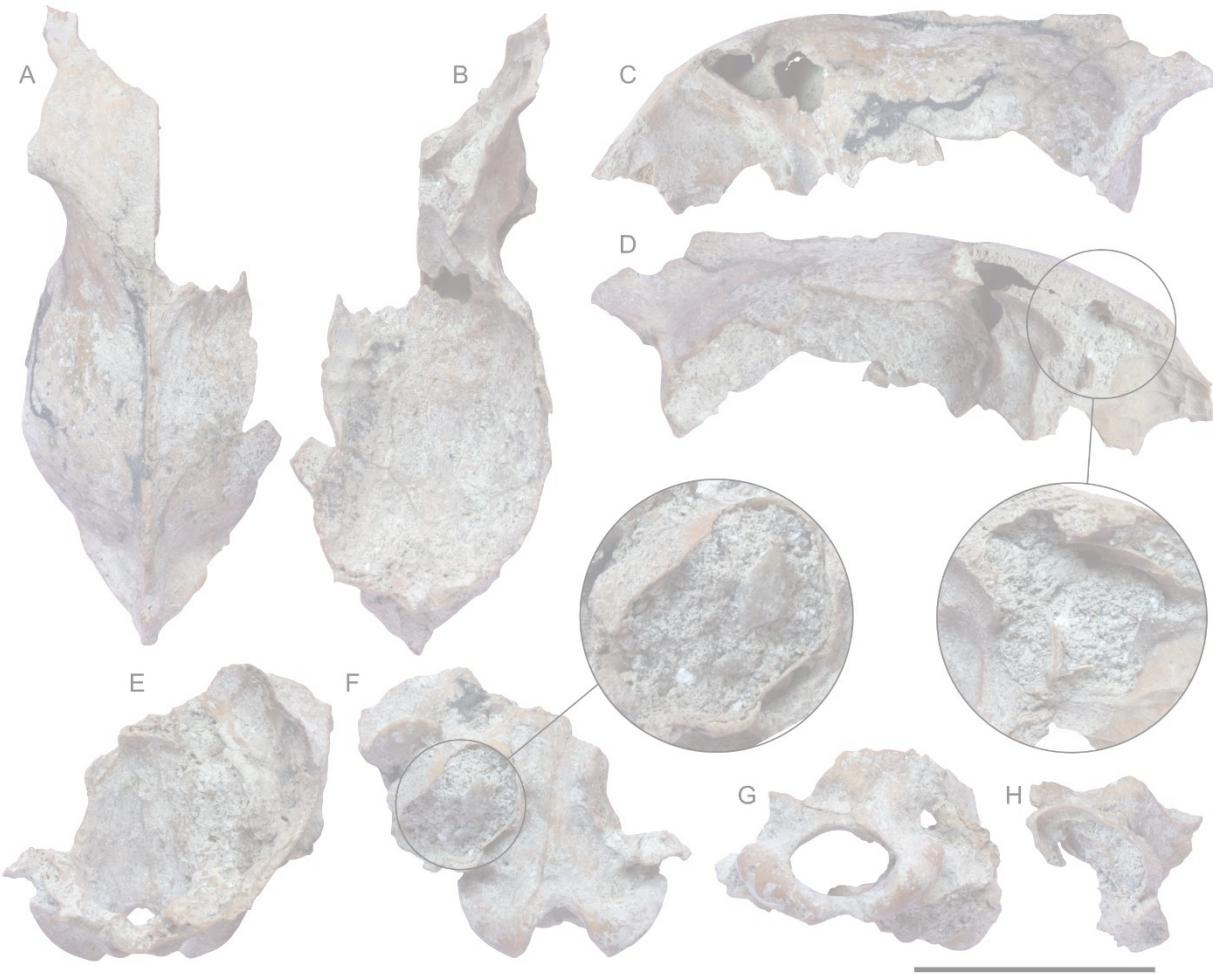
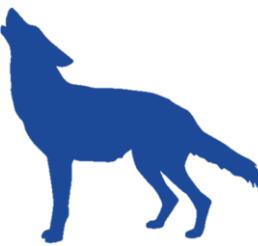


*Acinonyx pardinensis*



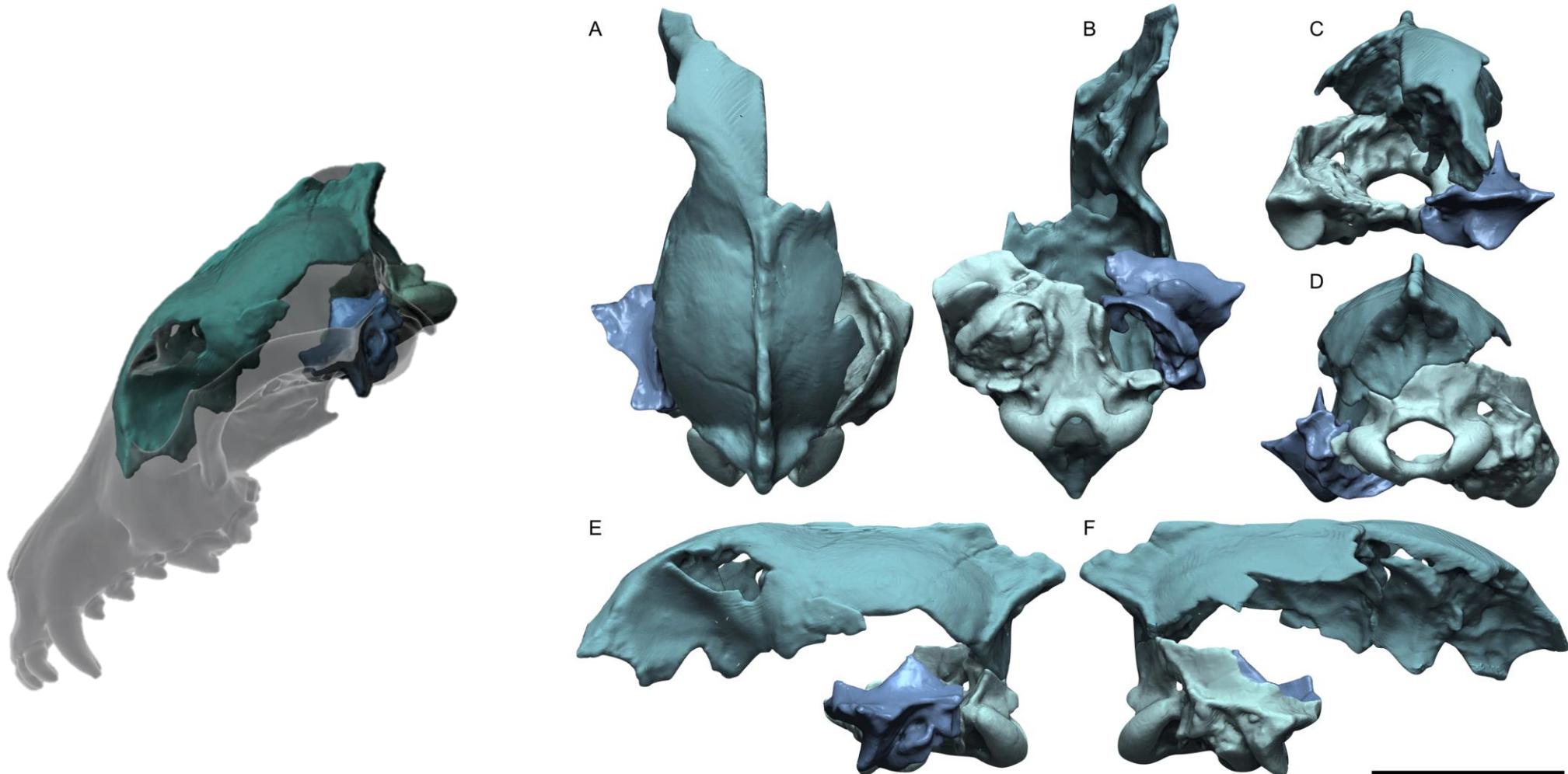
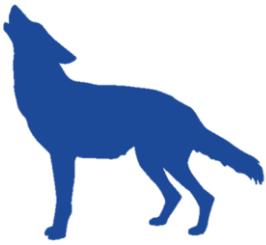
(Cherin et al., 2018)

# IL PRIMO LUPO D'EUROPA



(Iurino et al., 2022)

# IL PRIMO LUPO D'EUROPA



(Iurino et al., 2022)

# IL PRIMO LUPO D'EUROPA



Daniel Alonso Iurino 2021

(Iurino et al., 2022)

79 A.D.

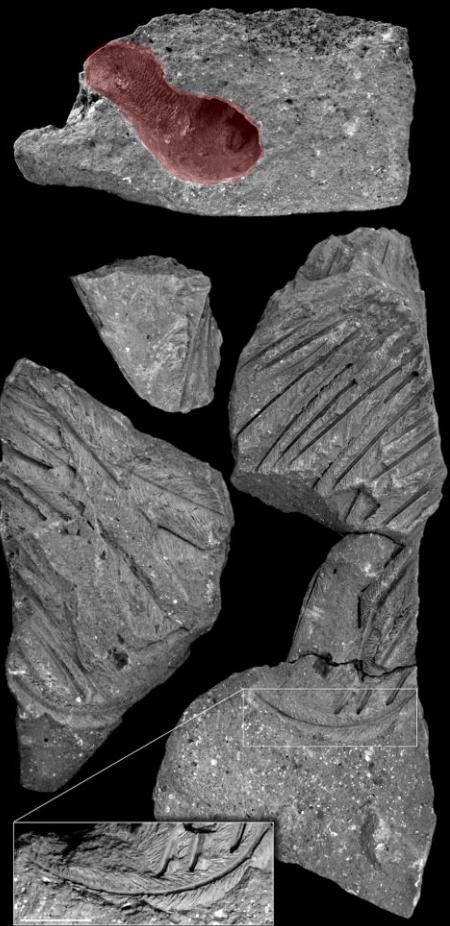


La distruzione di Pompei ed Ercolano  
John Martin (1822)

An aerial photograph of Lake Albano, a deep blue lake nestled in a valley surrounded by green hills. In the foreground, a dense cluster of buildings, mostly residential houses with red roofs, is built along the shore. A prominent white building with a dome, likely the Villa d'Este, sits atop a hill overlooking the lake. The background shows more hills and a clear sky.

# ROMA COME POMPEI

Colli Albani (1889)



Peperino di Albano

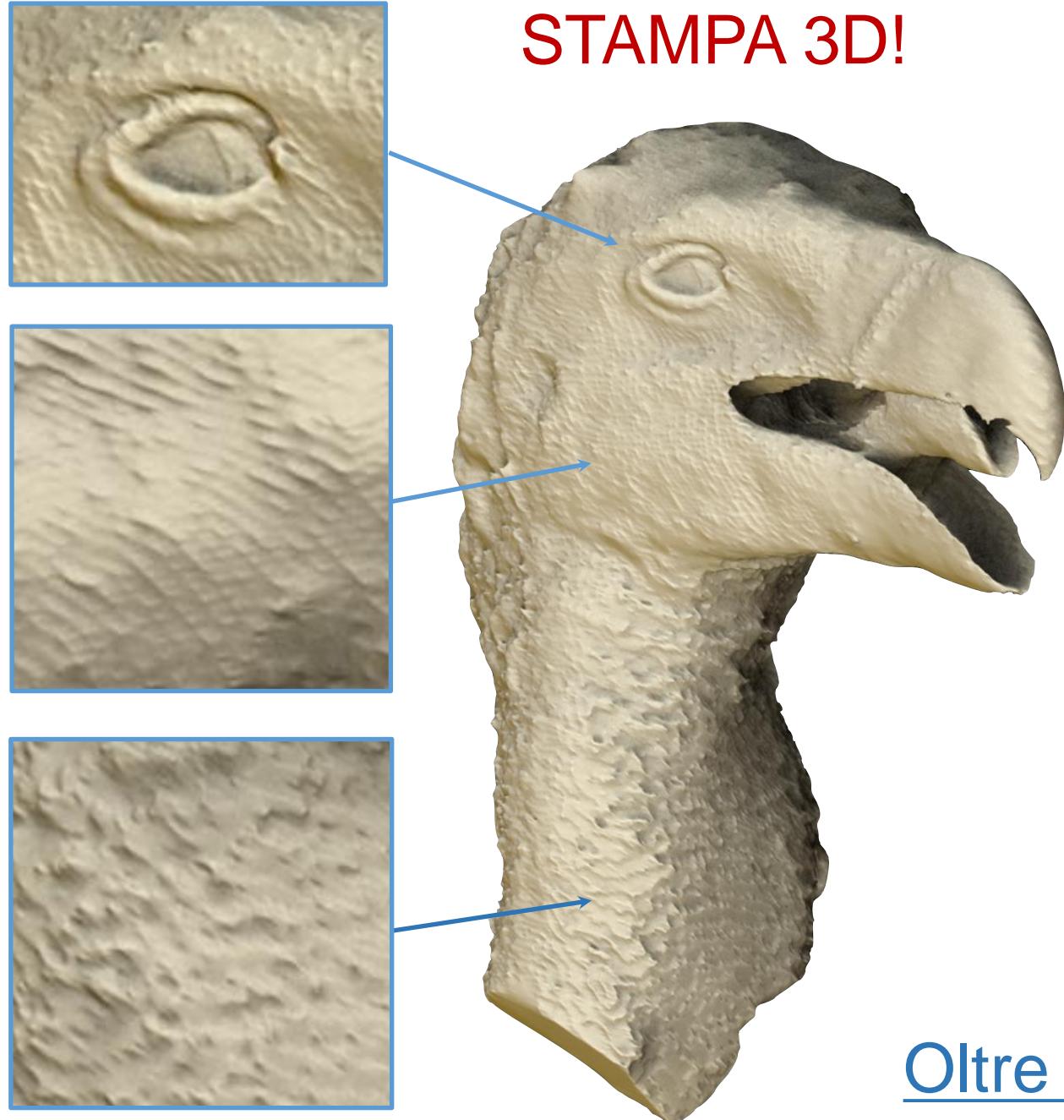


5 cm

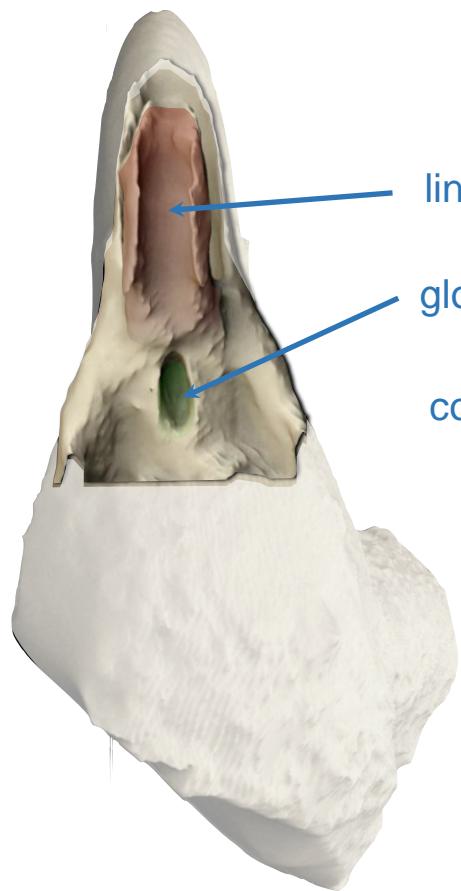
*Gyps fulvus*



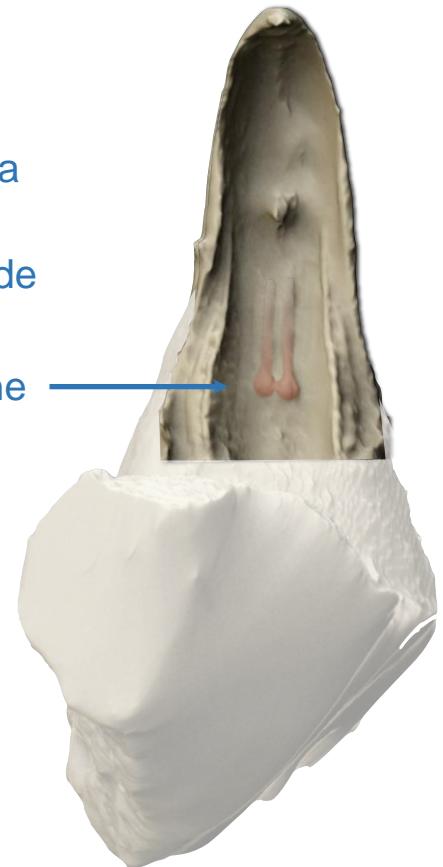
**STAMPA 3D!**



Vista dorsale



Vista ventrale



Oltre 30.000 anni

(Iurino et al., 2014)

# ARCHIVIAZIONE E CONDIVISIONE DATI

**DIGITAL MORPHOLOGY**  
A National Science Foundation Digital Library at the University of Texas at Austin

**DigiMorph**

- Home
- About DigiMorph
- DigiMorph Help
- Sponsors
- Links
- Recent Publications
- DigiMorph People

**Browse the Library by:**

- Scientific Names
- Common Names
- What's New?
- What's Popular?

**Learn More**

- X-ray CT
- 3-D Printing

**Overview Pages**

- Dinosaurs
- Tapirs
- Horned Lizards \*
- Endocasts

**A Production of**

- UTCT
- UT Geosciences
- TMM
- DigiMorph Contributors

\* Expert annotation

**Duchesnean Primate, *Rooneuya viejaensis***  
The Digital Morphology library is a dynamic archive of information on digital morphology and high-resolution X-ray computed tomography of biological specimens. Browse through the site and see spectacular imagery and animations and details on the morphology of many representatives of the Earth's biota. Recent additions or updates to the site include:

**Acrotholus audeti, Pachycephalosaur** 2013-05-07 08:46:14  
In the most recent issue of Nature Communications, Evans and coauthors describe a new taxon of pachycephalosaurs, *Acrotholus audeti*, from the Santonian of Alberta, Canada. They argue that the diversity of small-bodied ornithischian dinosaurs is underestimated, and that taphonomic biases obfuscate the paleoecology and diversity of vertebrate taxa throughout the Mesozoic. Learn more about this new pachycephalosaur -- whose name means 'highest dome' -- by seeing CT imagery of the holotype specimen and reading the DigiMorph account. [more...]

**A Nose by Any Other Name...** 2013-03-16 07:40:40  
A recent paper by Giannini and coauthors examines the internal nasal skeleton of *Pteropus lylei*, Lyle's flying fox, and compares it to that of other well-known mammals. Detailed study of such delicate, three-dimensionally complex structures was not possible prior to the advent of high-resolution X-ray computed tomography. These researchers found that homologies between these bones -- called turbinals -- are relatively easy to establish across taxa, and thus may be useful employed in phylogenetic analyses. [more...]

**Razorbill Auk, *Alca torda*** 2012-10-05 16:09:35  
Charadriiformes is a species-rich, morphologically diverse, and ecologically variable clade of birds, so one might expect that the sensory systems of these birds would be highly variable also. A recent paper by N.A. Smith and J. Clarke examined their endocranial cavity and inner ear morphology and found that the relatively conserved morphology of charadriiform inner ear labyrinths is in stark contrast to the highly variable morphology of their brains. Additionally, this new CT-based research represents the most dense taxon sampling for a comparative endocranial study within Aves to date, and the first attempt at phylogenetically contextualizing potential endocranial apomorphies of an avian subclade. [more...]

**Jurassic Chinese Turtles** 2012-10-16 09:40:06  
In a new book chapter, Brinkman and coauthors describe the turtle fauna of the Jurassic Shishugou Formation of the Junggar Basin, northwestern China. Of the five species occurring there, two can be found on DigiMorph: *Xinjiangchelys radiplicatoides* and *Anemys* sp.. These species document early stages in the evolution of the euryopidre basiscanular region, and the diversity of turtles in the Shishugou Formation suggests an unusual paleoecology. [more...]

**Eusphyra blochii, Winghead Shark** 2012-09-24 10:03:05  
OK, so we missed Shark Week, but a bunch of hammerhead sharks are making their way to DigiMorph! The first to arrive is the weirdest of all -- the winghead shark, *Eusphyra blochii* -- whose head is as wide as half its body length! Why would such a bizarre morphology evolve? Learn about the different theories by reading the expert commentary by Kyle Mara of Temple University. [more...]

**MORPHO SOURCE**

**ABOUT** **BROWSE** **DASHBOARD** **LOGIN/REGISTER**

## Welcome

MorphoSource is a project-based data archive that allows researchers to store and organize, share, and distribute their own 3d data. Furthermore any registered user can immediately search for and download 3d morphological data sets that have been made accessible through the consent of data authors.

The goal of MorphoSource is to provide rapid access to as many researchers as possible, large numbers of raw microCT data and surface meshes representing vouchered specimens.

File formats include tiff, dicom, stl, and ply. The website is designed to be self explanatory and to assist you through the process of uploading media and associating it with meta data. If you are interested in using the site for your own data but have questions about security or anything else contact the site administrator. Otherwise please download whatever data you need and check back frequently to see what's new.

foot of *Daubentonina madagascariensis* scanned at 38micron resolution at Duke Evolutionary Anthropology department's new high resolution microCT facility. Click here if you are interested in details on the facility.



# GUERRE E CALAMITÀ NATURALI



Londra



Monaco

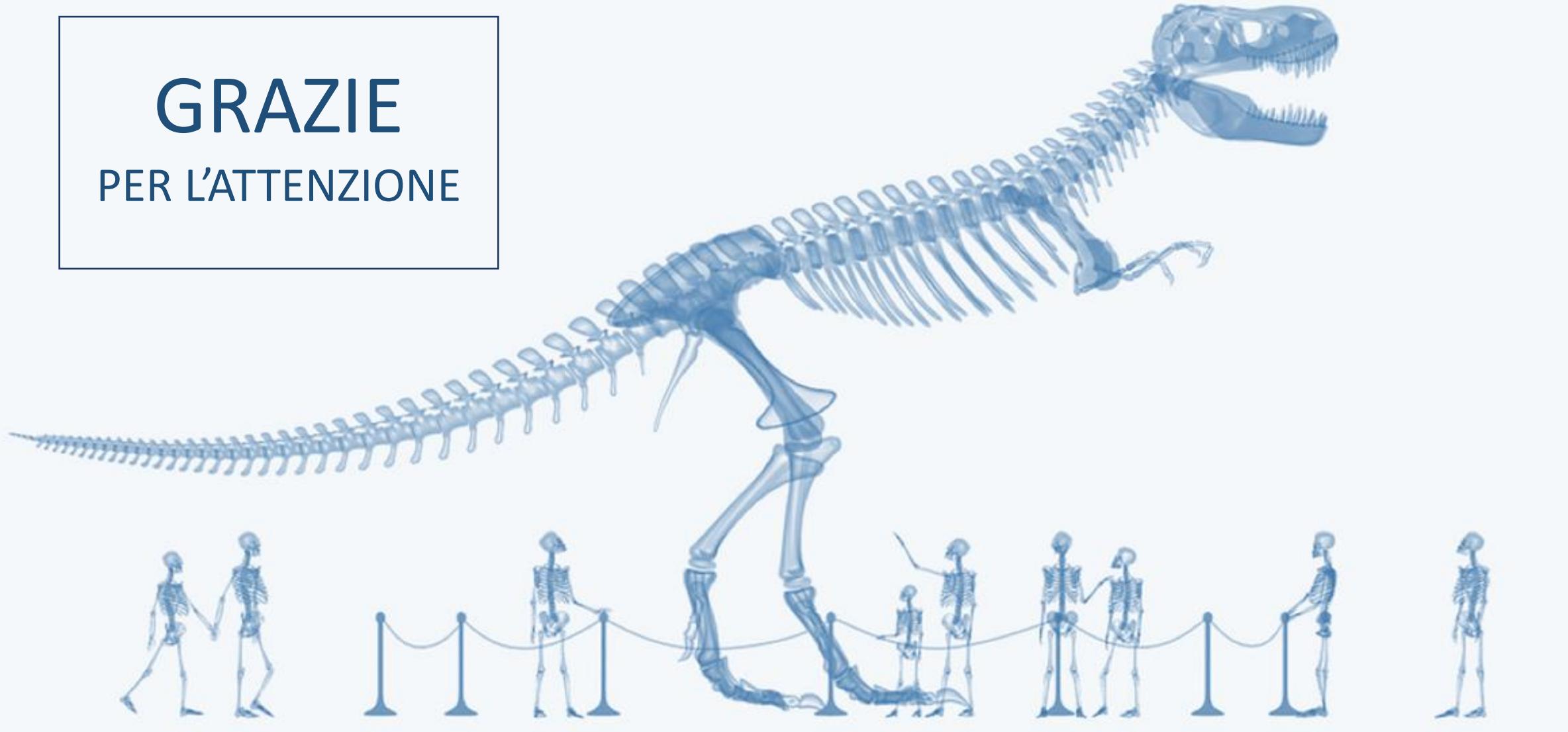


Rio de Janeiro



Milano

**GRAZIE**  
PER L'ATTENZIONE



[dawid.iurino@unimi.it](mailto:dawid.iurino@unimi.it)



UNIVERSITÀ DEGLI STUDI  
DI MILANO  
DIPARTIMENTO DI SCIENZE  
DELLA TERRA "ARDITO DESIO"