

**Leader:** Claudio Tuniz

**Coordinator:** Sandro Scandolo

**Participants:** Federico Bernardini (2015-2017)

**Place of Work & Collaborations:**

*Abdus Salam International Centre for Theoretical Physics*

Elettra Sincrotrone Trieste

University of Trieste, Roma, Chieti, Torino, Siena, Bologna

INFN: Firenze, Trieste, LNGS, LANDIS-LNS

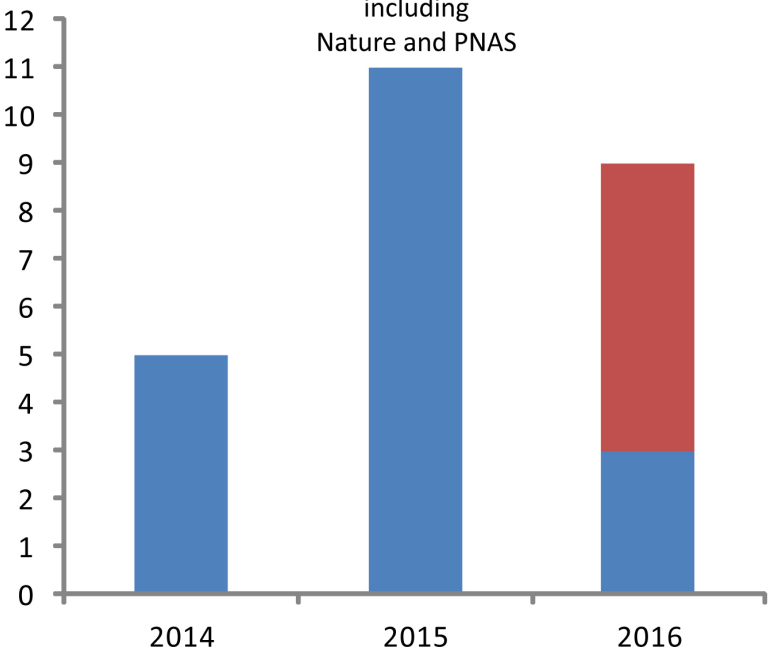
University of California, Irvine, USA

Institute for Human Origins, Arizona, USA

Centre for Archaeological Science, University of Wollongong, Australia

Institut Català de Paleontologia Miquel Crusafont, Barcellona

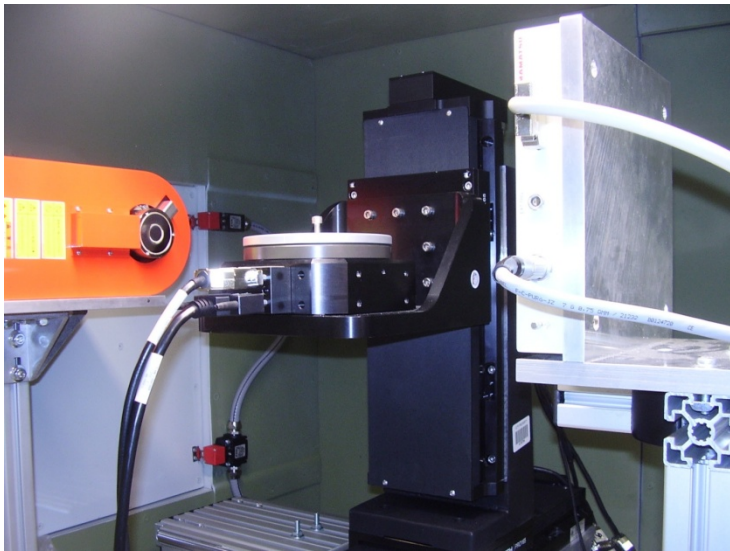
Museums: Trieste, Udine, Trento, Pigorini, San Daniele del Po



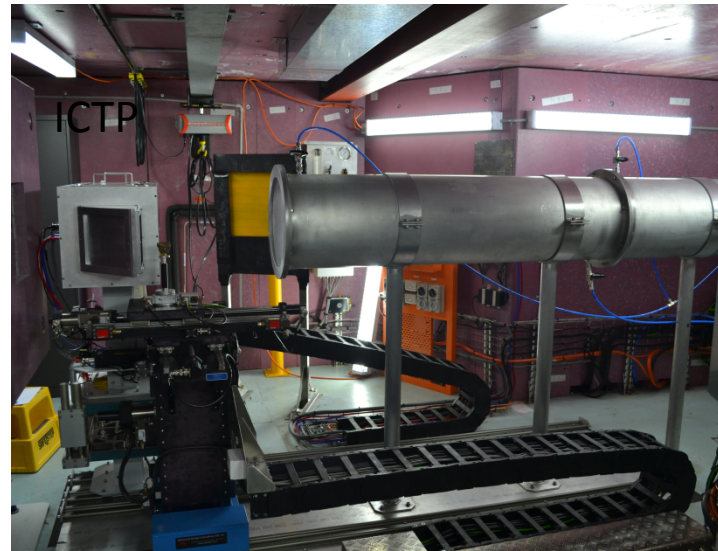
Papers in Journals

## Project main goal and results so far achieved

Contribute to the development and application of advanced physical methods (including 3D neutron and x-ray imaging, remote sensing and dating) in archaeological and palaeoanthropological studies.



x-ray microCT ICTP



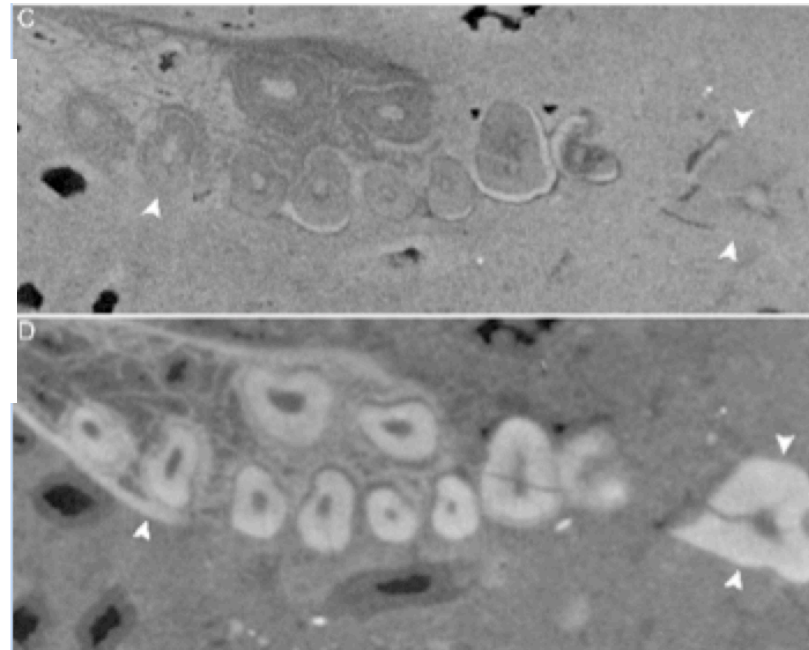
neutron microCT ANSTO/Australia

## Neutron micron CT

First application of neutron microtomography (n-microCT) to paleoanthropological cases where X-rays have previously failed to deliver sufficient contrast between different dental tissues of fossilized specimen.



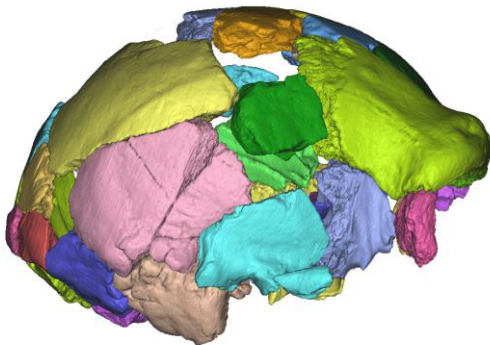
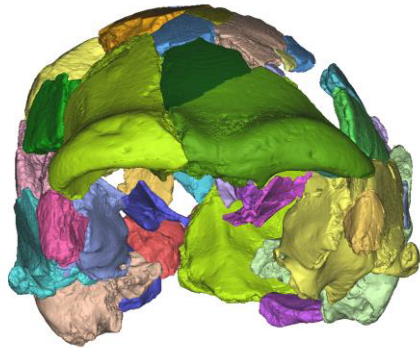
South African cercopithecoid  
maxilla embedded in hard  
breccia rock



x-ray mCT  
ICTP

neutron mCT  
ANTARES

## Reconstruction of Ceprano skull (400,000 years BP)



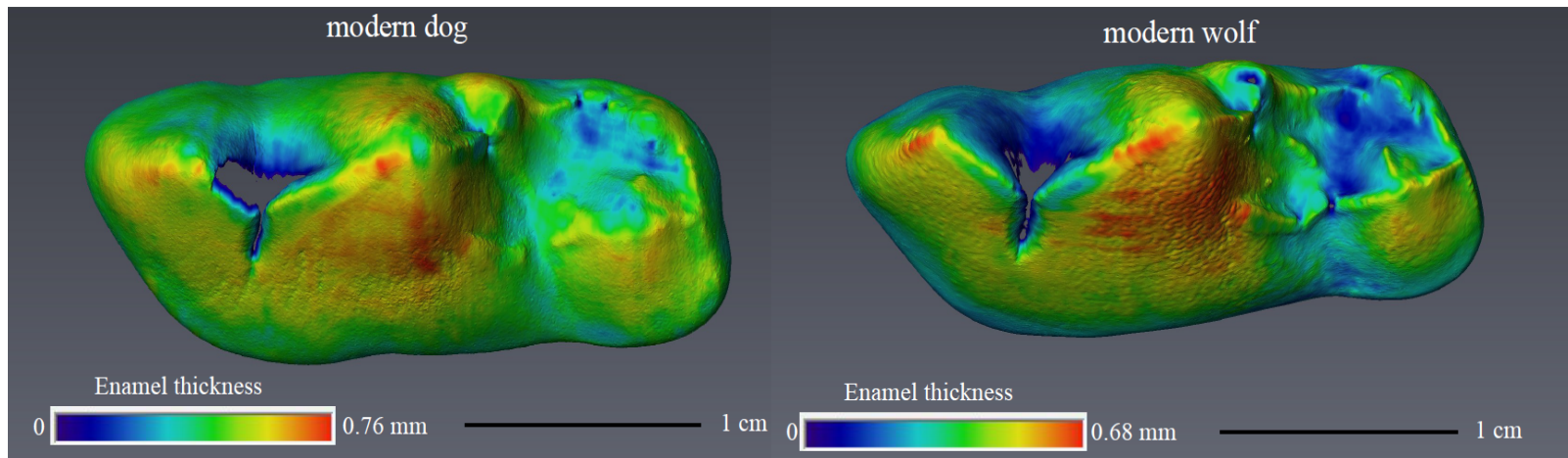
**Objective:** define its phylogenetic and taxonomic position

**Procedure:** correct the deformation that affected the specimen by a computer-assisted procedure based on geometric morphometrics and Finite Element Analysis

Being submitted to international journal

## New microCT-based method to discriminate between dog and wolf and early dog domestication study

In collaboration with U. of Siena, determination and study of dog remains from Grotta Paglicci through endostructural 3D morphology and morphometric analyses. The investigated samples are among the most ancient dog remains so far known. Being submitted to high impact journal.

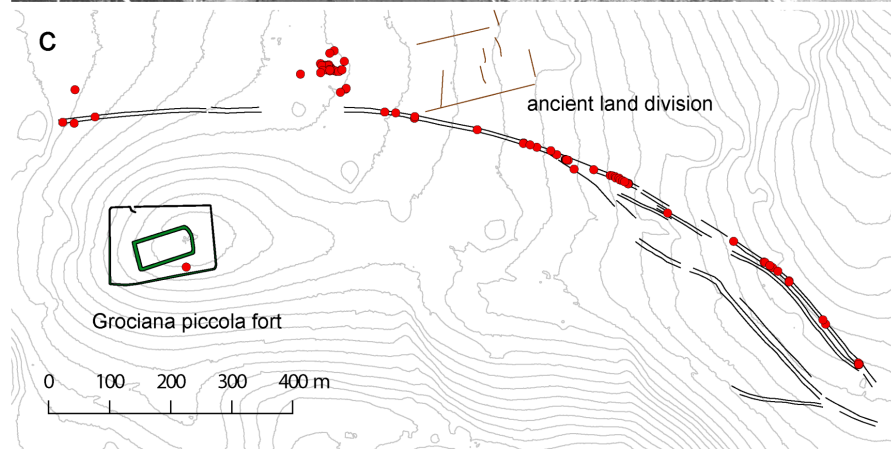
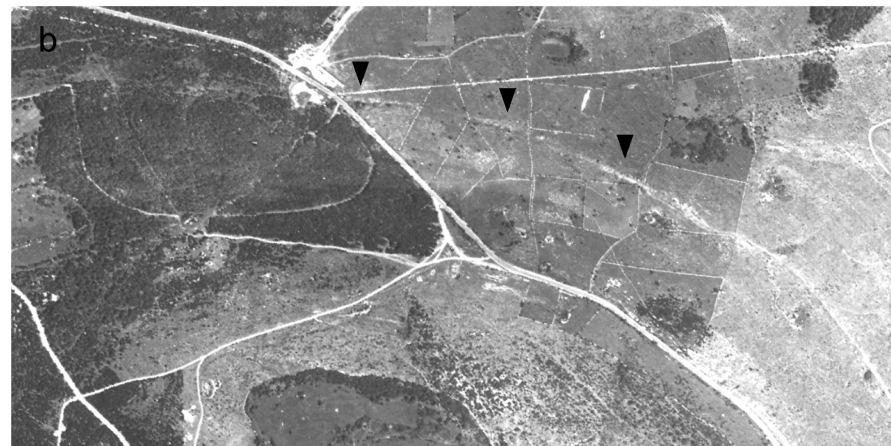
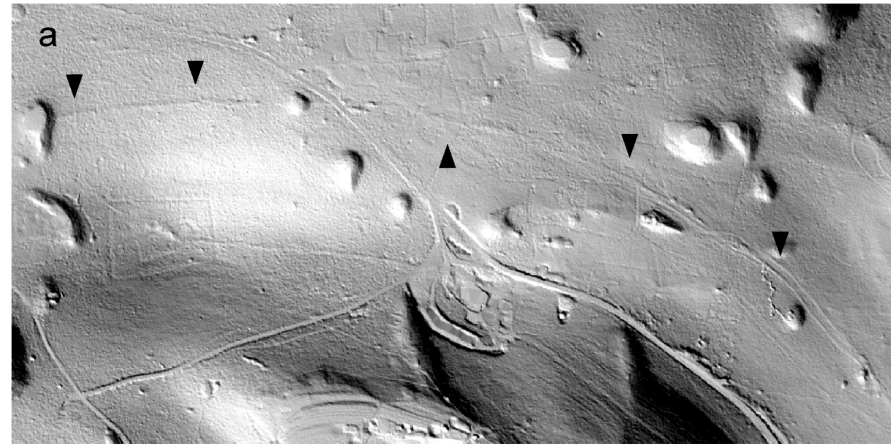


## Study of ancient landscape through geophysical and remote sensing techniques

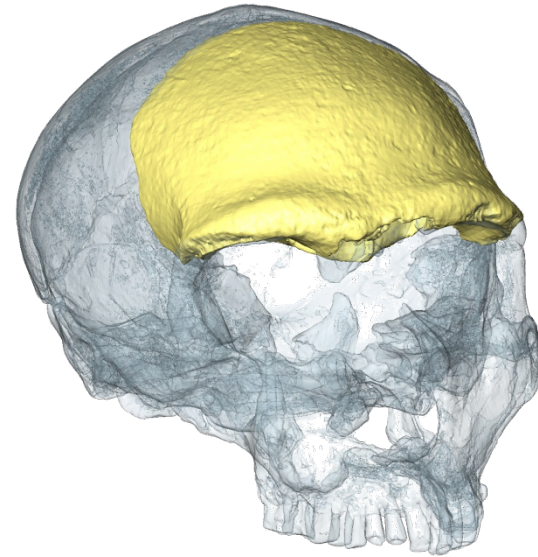
- Identification and study of early Roman military fortifications in the Trieste area (Bernardini et al 2015 PNAS).



- Identification and study of a Roman main road disrupted by sinkholes (being submitted to Scientific Reports)



## Plan of activities 2017 - 2019



Paus

### Dating methods

- i) U-Th dating at the Gran Sasso INFN Laboratories (coll. M. Laubenstein, LNGS) and at the University of Wollongong (coll. R. Roberts)
- ii) Dating Visogliano (Ts) (*H. eidelbergensis*) with OSL (Coll. Li Bo, U. Wollongong, Australia). Publication results.
- iii) Dating Roman/Neolithic sites (Ts) (coll. F. Terrasi, 2<sup>nd</sup> U. Naples, M. Martini, U. Milano Bic., V. Levchenko, ANSTO). Publication results.



## Plan of activity 2017 – 2019:

### Microtomography and other analytical methods

- i) Reconstructing prehistoric (Neolithic to Bronze Age) lifestyles on the territory of Croatia – a multidisciplinary approach (Croatian Science Foundation)
- ii) Neanderthals of Saccopastore and Altamura (coll. with G. Manzi et al, U. La Sapienza)
- iii) Paleoneurology of Italian Neanderthals (coll. with F. Macciardi et al., U.of Cal. Irvine, USA)
- iv) Diet in the Palaeolithic (coll. Stefano Benazzi et al., U. Bologna)
- v) Homo floresiensis, teeth (coll. R. Roberts, U. of Wollongong, Australia)
- vi) Neanderthal, sapiens, ergaster, teeth (coll. L. Bondioli, Pigorini, A. Coppa, La Sapienza, R. Macchiarelli, U. Poitiers, C. Zanolli, CNRS)
- vii) First humans in Cuba (coll. R. Fernández, El Instituto Cubano de Antropología)
- viii) Archeozoology (coll. F. Boschini, U. Siena)
- viii) Archaeology: characterization of stone artefacts, prehistoric and Roman pottery, etc. (coll. U. of Trieste, Soprintendenza Friuli Venezia Giulia, etc.)

## **Plan of activity 2017 – 2019 :**

### Study of ancient landscape through geophysical and remote sensing techniques

- i) Federico Bernardini will coordinate the "Accordo di collaborazione per lo sviluppo di tecnologie scientifiche avanzate per la conoscenza, la tutela e la valorizzazione delle evidenze archeologiche e del paesaggio antico della regione Friuli Venezia Giulia" signed by ICTP, U. of Trieste and Soprintendenza del Friuli Venezia Giulia (2016-2018).
- ii) Study of new Roman military camps identified in the Trieste area and Slovenia (coll. U. of Trieste, Soprintendenza BA FVG, Institute of Archaeology of Academy of Sciences and Arts, Slovenia).

## **Expected funding in the 3-year period:**

### **- Request of funding by Centro Fermi**

*Grant : number and period requested One assegno di studio (3 years)*

*Consumables/inventory per year 16,000 euro/ 10,000 euro*

### **- Potential external funding**

Croatian Science Foundation

Australian Research Council

CENTRAL EUROPE European Union programme

ALPINE SPACE European Union programme

Other European calls

National Geographic Wenner–Gren Foundation USA

KEK Foundation, USA

NIH and NSF, USA

VolksWagen Foundation, G