

Leader: Claudio Tuniz

Coordinator: Sandro Scandolo

Participants: Federico Bernardini (2018-2020)

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 (MUSE), Pigorini, San Daniele del Po

Papers

Journals

- Baucon A. ... **Bernardini, F., Tuniz, C.** et al., "Organism-substrate interactions and astrobiology: Potential, models and methods", *Earth-Science Reviews*, 171 (2017), 141–180. doi.org/10.1016/j.earscirev.2017.05.009.
- **Bernardini F. ... Tuniz, C.** et al., "Evidence of open-air late prehistoric occupation in the Trieste area (North-eastern Italy): dating, 3D clay plaster characterization and obsidian provenancing", *Archaeological and Anthropological Science* (2017) doi: 10.1007/s12520-017-0504-7.
- Bernardini F. ... Tuniz, C.** et al., "Polished stone axes from Varna/Nössingbühel and Castelrotto/Grondlboden, Alto Adige (Italy)", *Archaeological and Anthropological Sciences* (2017).
- Di Vincenzo F. ...**Bernardini, F., Tuniz, C.** et al., "Digital reconstruction of the Ceprano calvarium (Italy), and implications for its interpretation", *Scientific Reports*, 7 (2017), doi:10.1038/s41598-017-14437-2.
- Nava A....**Bernardini, F., Tuniz, C.** et al., "Virtual histological assessment of the prenatal life history and age at death of the Upper Paleolithic fetus from Ostuni (Italy)", *Scientific Reports*, 7 (2017), doi:10.1038/s41598-017-09773-2.
- Vinci G., **Bernardini F.**, "Reconstructing the protohistoric landscape of Trieste Karst (north-eastern Italy) through airborne LiDAR remote sensing", *Journal of Archaeological Science: Reports*, 12 (2017), 591-600. doi.org/10.1016/j.jasrep.2017.03.005.
- Diaz Araez J. L. ... **Bernardini, F.** et al., "New remains of *Diplocynodon* (*Crocodylia: Diplocynodontidae*) from the Early Miocene of the Iberian Peninsula", *Comptes Rendus Palevol* 16 (2017), 12-26. doi.org/10.1016/j.crpv.2015.11.003.
- Zanolli C., **Tuniz, C.** et al., "Exploring Hominin and Non-hominin Primate Dental Fossil Remains with Neutron Microtomography", *Physics Procedia* 88 (2017), 109-115. doi: 10.1016/j.phpro.2017.06.014.
- Zanolli C. ... **Tuniz, C.** et al., " Inner tooth morphology of *Homo erectus* from Zhoukoudian. New evidence from an old collection housed at Uppsala University, Sweden", *Journal of Human Evolution* 116 (2018) 1-13. doi.org/10.1016/j.jhevol.2017.11.002 0047-2.

In press

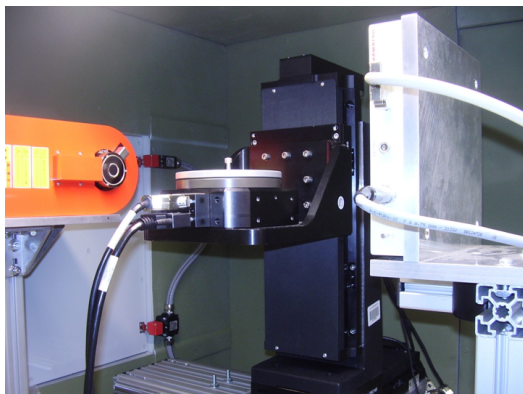
- Zanolli C. **Bernardini, F., Tuniz, C.** et al., "Comparative structural characterization of the Middle Pleistocene human dental remains from Fontana Ranuccio and Visogliano, Italy", *PLOS One*.
- Fernández-Coll M., Arbez T., **Bernardini F.**, Fortuny J., "Cranial anatomy of the Early Triassic Trematosaurine *Angusaurus* (Temnospondyli: Stereospondyli): 3D endocranial insights and phylogenetic implications", *Journal of Iberian Geology*.
- **Bernardini F., Tuniz, C.** Et al. "Polished stone axes in the Caput Adriae from Neolithic to Copper Age". *Journal of World Prehistory*.
- **Bernardini F. Tuniz, C.** et al., "Discovery of ancient Roman "highway" reveals geomorphic changes in karst environments during historic times", *PLOS One*,
- Nannini, N. ... **Bernardini, F., Tuniz, C.** et al, "Archaeological bone injuries by lithic backed projectiles: new evidence from the Late Epigravettian site of Cornafessa rock shelter (Italy), *Antiquity*.

Books or Book chapters

- **Bernardini F., Tuniz C.**, Zanini F., X-ray computed micro-tomography for paleoanthropology, archaeology and cultural heritage, in "Nanotechnologies and Nanomaterials for Diagnostic, Conservation and Restoration of Cultural Heritage", Elsevier.
- **Bernardini F.**, Fortificazioni militari romane di età repubblicana nell'area di Trieste, in "Campamentos, guarniciones y asedios durante la Segunda Guerra Púnica y la conquista romana (siglos III-I a.C.): perspectivas arqueológicas".
- **Tuniz, C.**, Tiberi Vipraio P. 2018, *La Scimmia Vestita. Dalle tribù di primati all'intelligenza artificiale*. Carocci, Roma.

Project main goals and results achieved in 2017

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 trieste



SR microCT – ELETTRA Trieste



AMS dating – CIRCE Caserta

SCIENTIFIC REPORTS

OPEN

Digital reconstruction of the Ceprano calvarium (Italy), and implications for its interpretation

Fabio Di Vincenzo^{1,2}, Antonio Profico^{1,2}, Federico Bernardini^{3,4}, Vittorio Cerroni⁵, Diego Drossi⁶, Stefan Schlager⁷, Paola Zaiò⁵, Stefano Benazzi^{8,9}, Italo Biddittu², Mauro Rubini^{2,5,10}, Claudio Tuniz^{4,3,11} & Giorgio Manzi^{1,2}

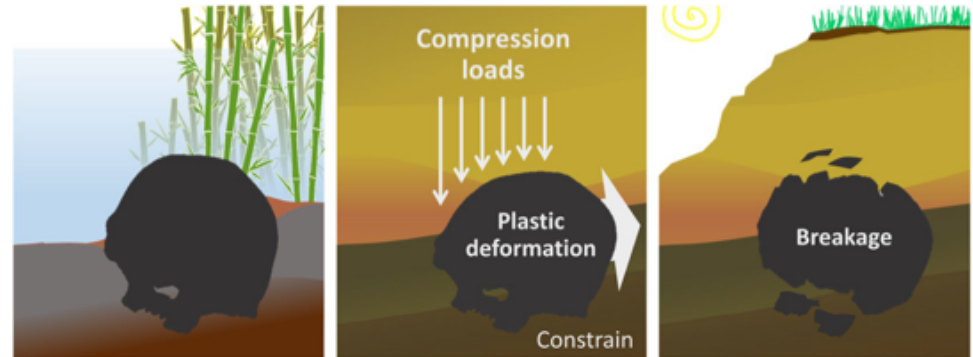
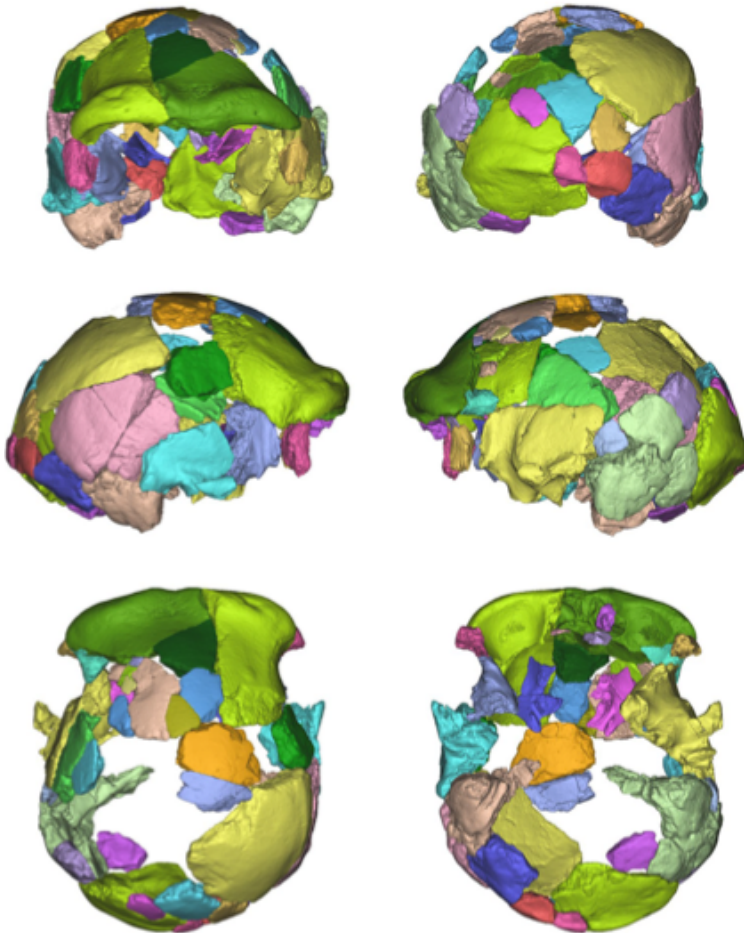
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Digital reconstruction of the Ceprano calvarium (430 – 385.000 years BP)




Di Vincenzo F. ... **Bernardini. F., Tuniz. C.** et al., "Digital reconstruction of the Ceprano calvarium (Italy), and implications for its interpretation", Nature Scientific Reports, 7 (2017), doi:10.1038/s41598-017-14437-2.

SCIENTIFIC REPORTS

OPEN

Virtual histological assessment of the prenatal life history and age at death of the Upper Paleolithic fetus from Ostuni (Italy)

Alessia Nava ^{1,2}, Alfredo Coppa¹, Donato Coppola^{3,4}, Lucia Mancini⁵, Diego Dreossi⁵, Franco Zanini⁵, Federico Bernardini^{6,7}, Claudio Tuniz^{6,7,8} & Luca Bondioli²

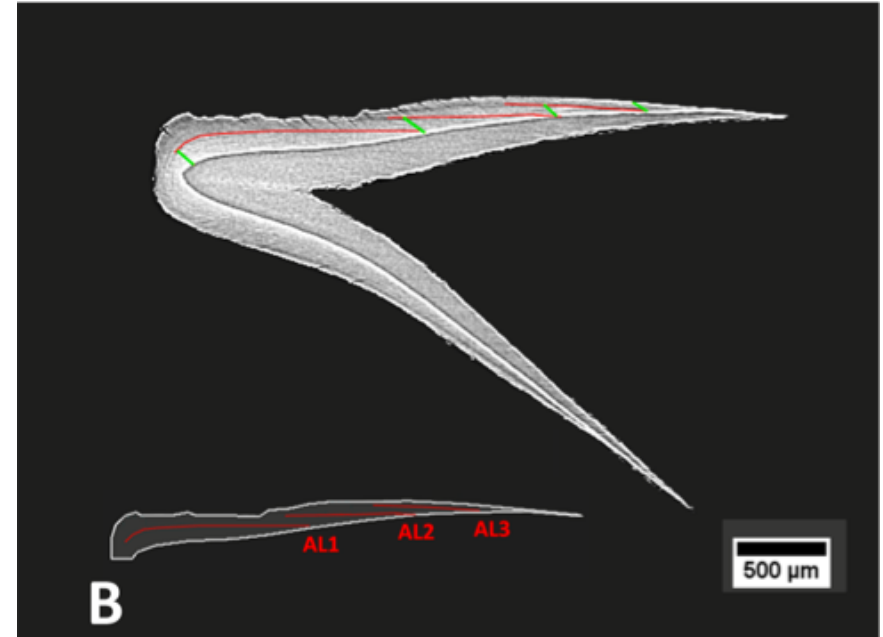
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Paleolithic fetus from Ostuni 27.000 years BP





SIF PRIMA PAGINA



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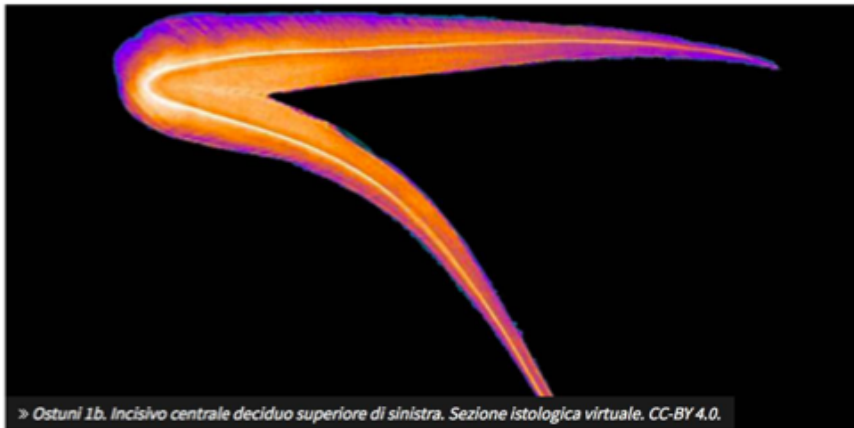
120 ANNI E OLTRE



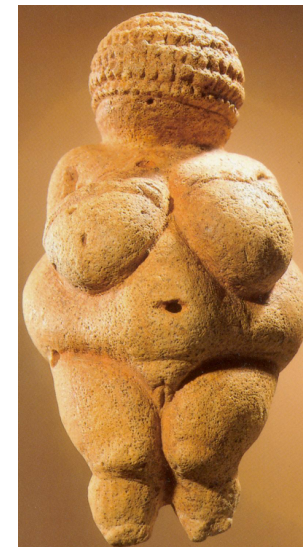
FISICA Physics

Luce (di sincrotrone) su un feto del Paleolitico

C. TUNIZ 29-09-2017 LEGGI IN PDF



» Ostuni 1b. Incisivo centrale deciduo superiore di sinistra. Sezione istologica virtuale. CC-BY 4.0.

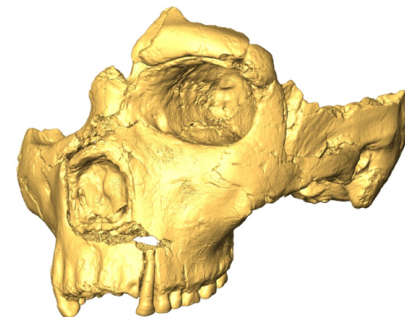


La giovane donna era stata seppellita con tutti gli onori, in una grotta. Indossava un copricapo fatto di conchiglie perforate, che erano state impastate con oca rossa, e alcuni bracciali, anch'essi fatti di conchiglie. Il suo corpo era rannicchiato sul lato sinistro come se stesse dormendo, con la mano destra appoggiata

Milestones 2018

- Publication first results from international project on reconstruction Paleolithic life stile (with M. Novak et al., Institute for Anthropological Research, Zagreb, Croatia)
- Publication paper on Roman military 'highway' on the Trieste Karst.
- Publication paper on *H. heidelbergensis* (Visogliano and Fontana Ranuccio)
- Publication paper on dog domestication in Italy during Upper Palaeolithic.

Plan of activities 2018 - 2020



Paleoantropology

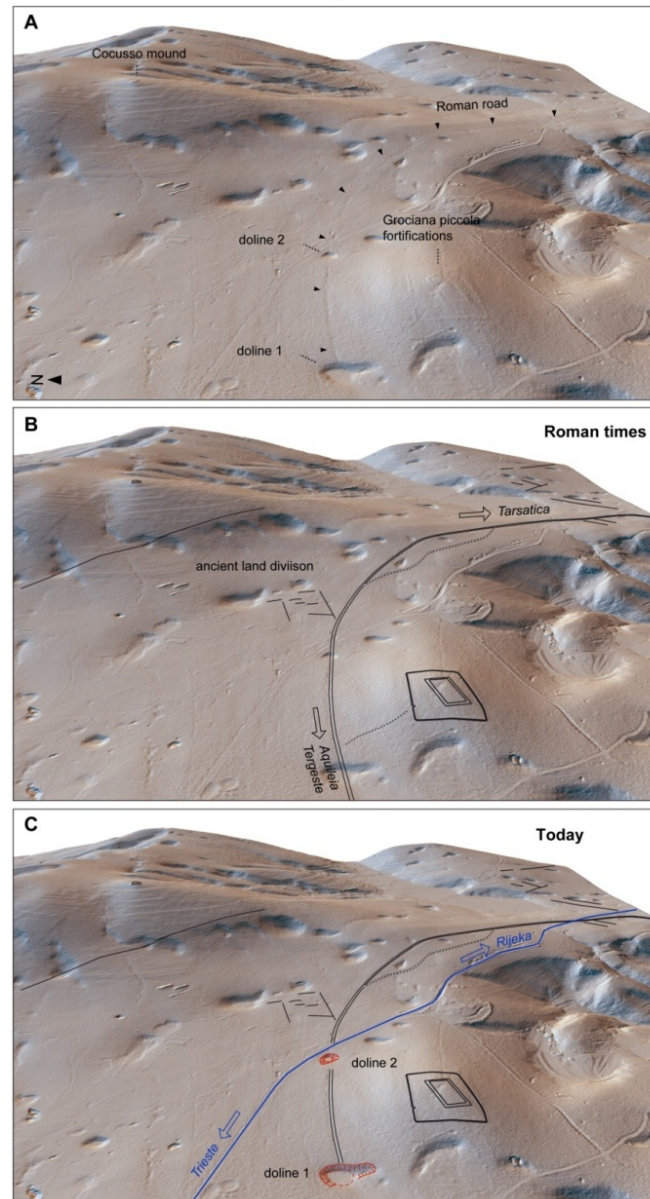
- Uranium-thorium dating and morphometric analysis of Saccopastore and Paus Neanderthals (with U. La Sapienza, U. of Wollongong, Australia and other institutions));
- Non-destructive analysis of pigments used in upper Palaeolithic rock art in Puglia (with U. of Siena) and in Kimberley (Kimberley Foundation e University of Western Australia), in collaboration with CNR and INFN, Catania;
- Identification of sulphur traces in stalactite sections from South Africa (with U. of Arizona) to identify the environmental impact of the Toba eruption (74 ka) and the implication on Homo sapiens evolution; -
- Diet, health and migrations during the Upper Palaeolithic and Neolithic using genetic/isotopic analysis and 3D imaging of fossilized teeth (with Institute for Anthropological Research, Croatia, U. di Bologna, Pennsylvania State U., U. College di Dublino.-
- Use of advanced morphometric and palaeogenetic methods to study modern humans from the Upper palaeolithic (Romito), in collaboration with U. California Irvine
- Palaeomedical study of the Ceprano skull, with M. Rubini (Soprintendenza Beni ambientali e Archeologici del Lazio), F. Macchiardi (U. California Irvine).

Plan of activities 2018 - 2020

Study of ancient landscape and characterization of archaeological manufacts

Study Roman military fortifications and roads in in the Trieste area using LiDAR; geophysical investigations using Electrical Resistivity Tomography, Ground Penetrating Radar and other advanced methods in collaboration with the University of Trieste, Soprintendenza Archeologia, belle arti e paesaggio del Friuli Venezia Giulia, the Archaeology Institute of Lubljana

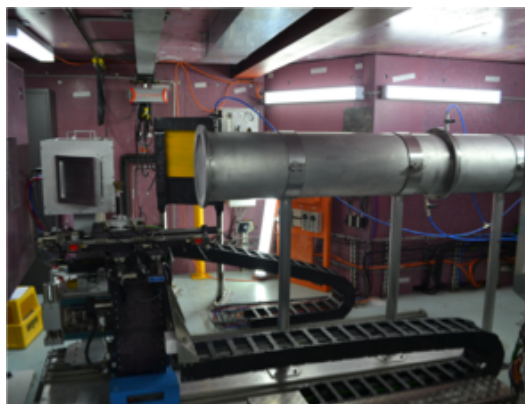
Characterisation of archaeological artifacts from north eastern Italy, Slovenia and Croatia (in collaboration with University of Trieste, Soprintendenza Archeologia, belle arti e paesaggio del Friuli Venezia Giulia, the Archaeology Institute of Lubljana



Plan of activities 2018 - 2020

Development and application of advanced methodologies in archaeology, palaeontology, anthropology and cultural heritage

X-ray and neutron microCT (Elettra/Trieste, ANTARES/Germany and ANSTO/Australia), XRF imaging (LNS/INFN), uranio/torium dating (LA-ICPMS, Griffith University, Australia).



Expected funding in the 3-year period:

- Request of funding by Centro Fermi

One Assegno di Ricerca grant, 3 years

Specific Consumables/Inventory per year Euro 16.000/Euro10.000

- Potential external funding

Croatian Science Foundation

Kimberley foundation, Australia

CENTRAL EUROPE European Union programme

ALPINE SPACE European Union programme

Other European calls

National Geographic Wenner–Gren Foundation USA

KEK Foundation, USA

Claudio Tuniz | Patrizia Tiberi Vipraio

*Dalle tribù di primati
all'intelligenza artificiale*

LA SCIMMIA VESTITA



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