

The study of the past as a tool for the future.

R+D+I at CENIEH

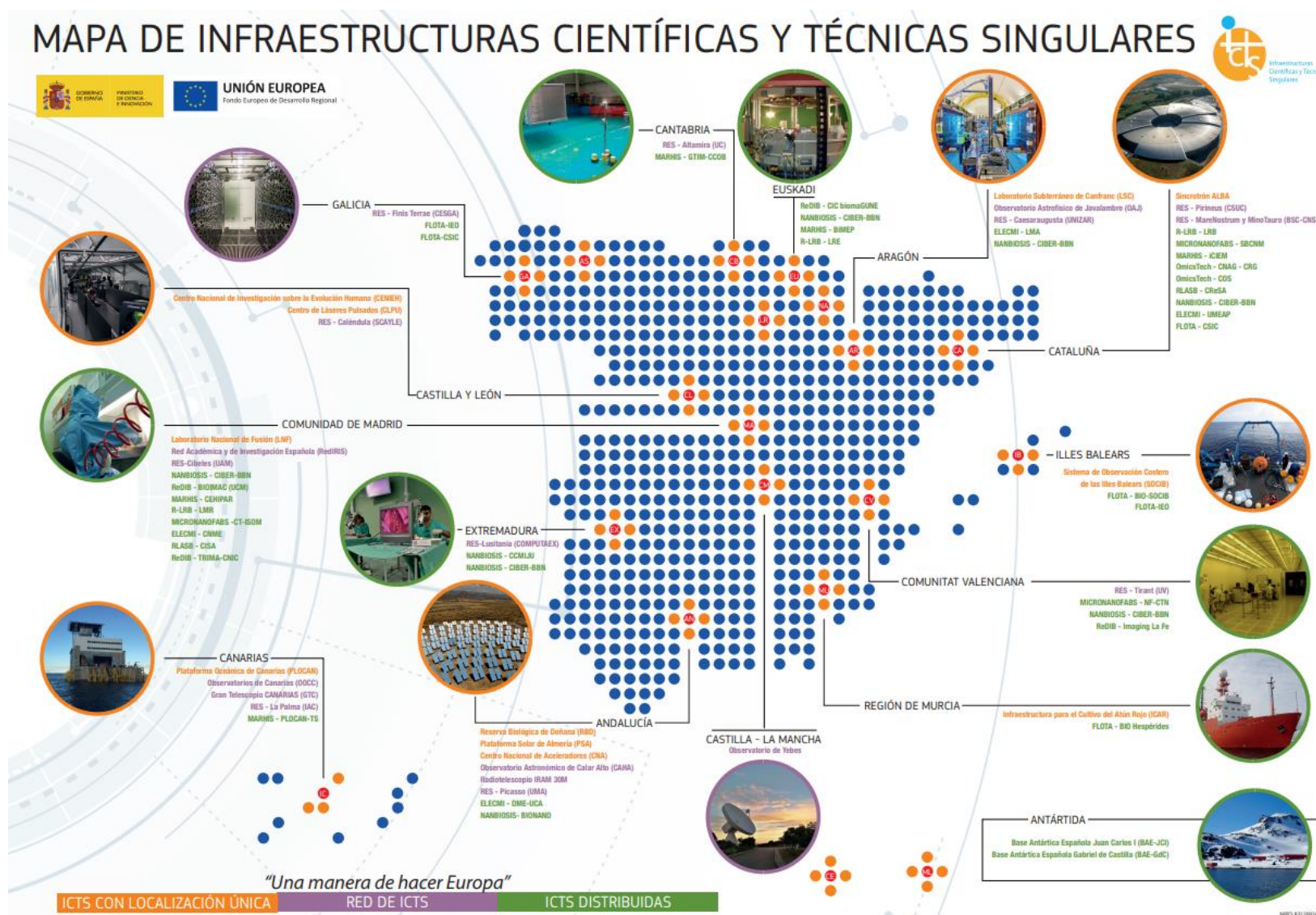


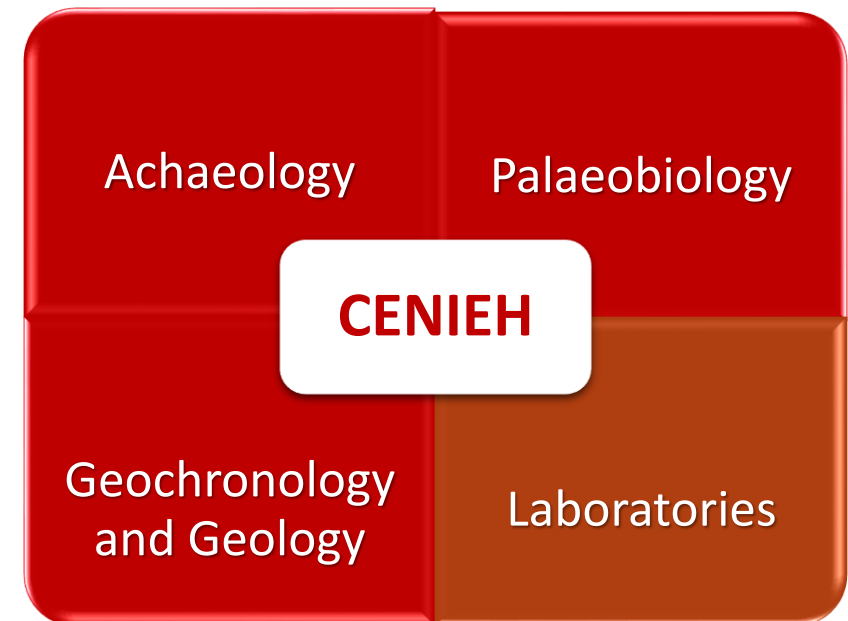
CENIEH
Centro Nacional de Investigación
sobre la Evolución Humana

María Martinón-Torres



Social Sciences and Humanities





- Biological and cultural evolution of human lineage
- Bidirectional impact of hominins and environmental interaction
- Climate and landscape change
- Conservation and heritage science (Atapuerca collections)
- Archaeological and paleontological excavations

Research

Dental anthropology

Palaeoneurobiology

Paleophysiology and palaeocology

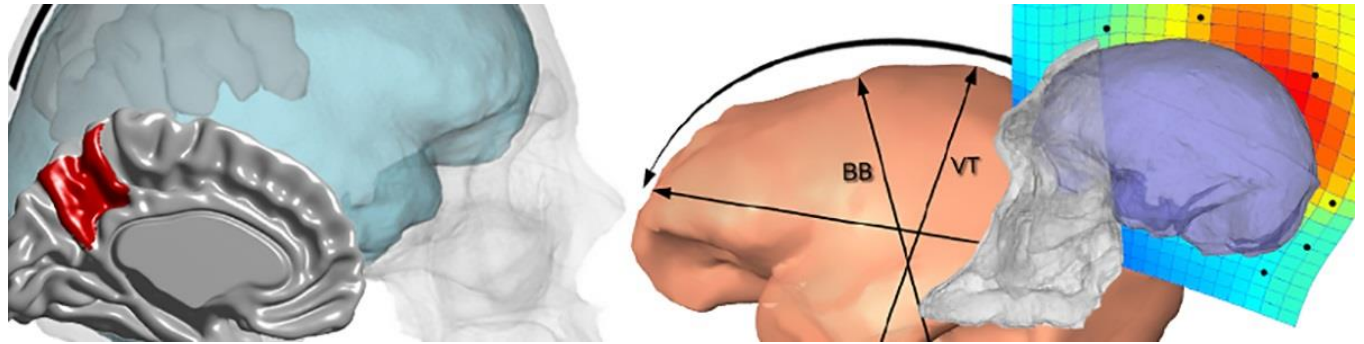
Quantitative genetics

Taphonomy

Palaeolithic and cognitive archaeology

Geochronology

Site formations, landscape evolution





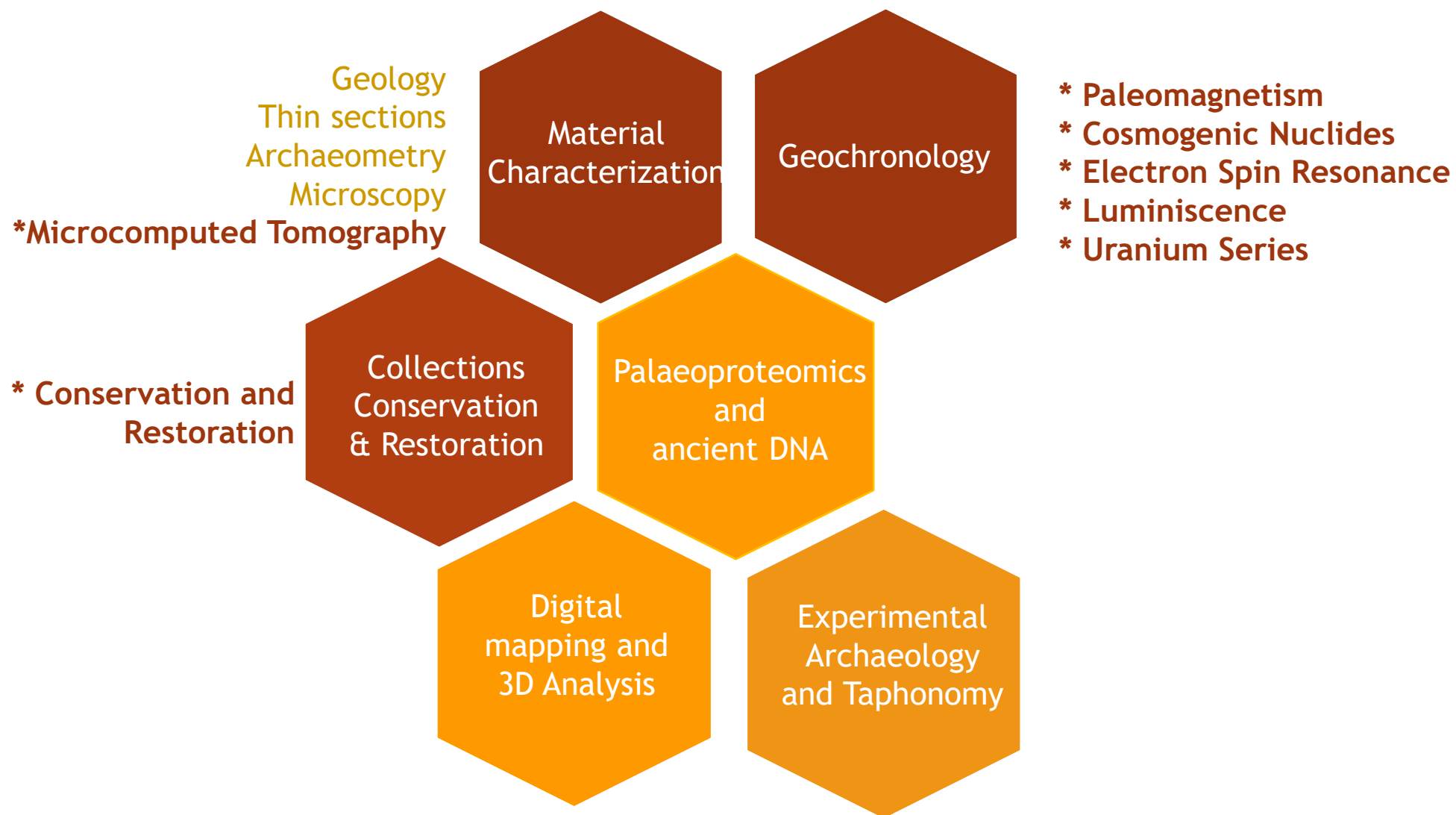


CENIEH

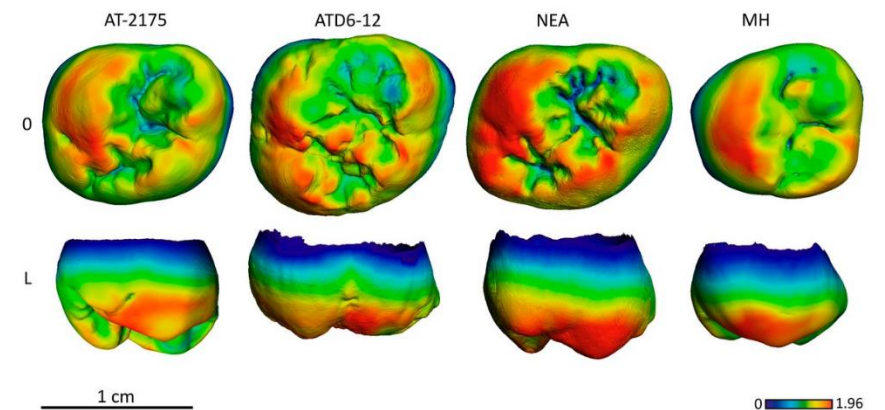
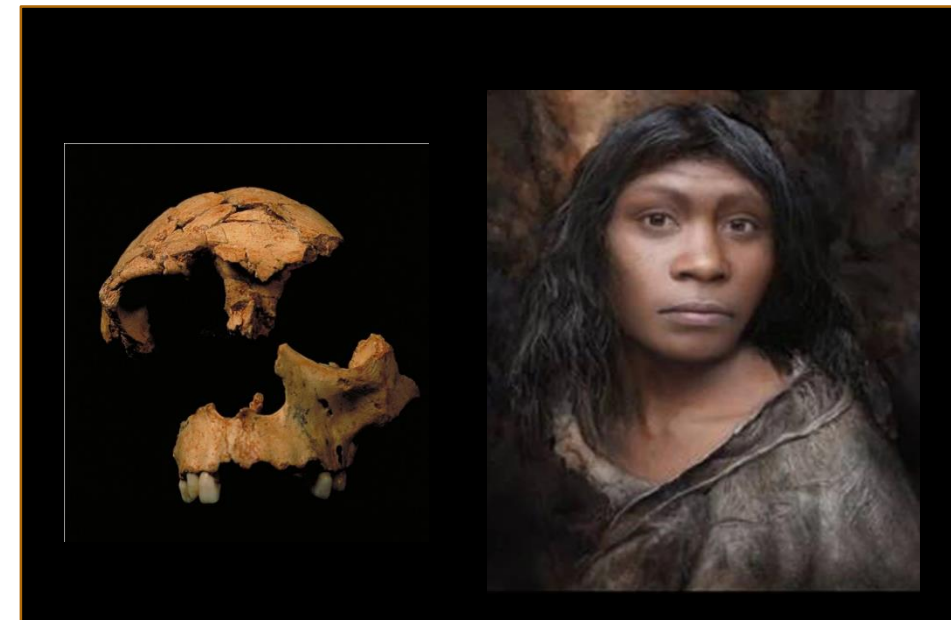
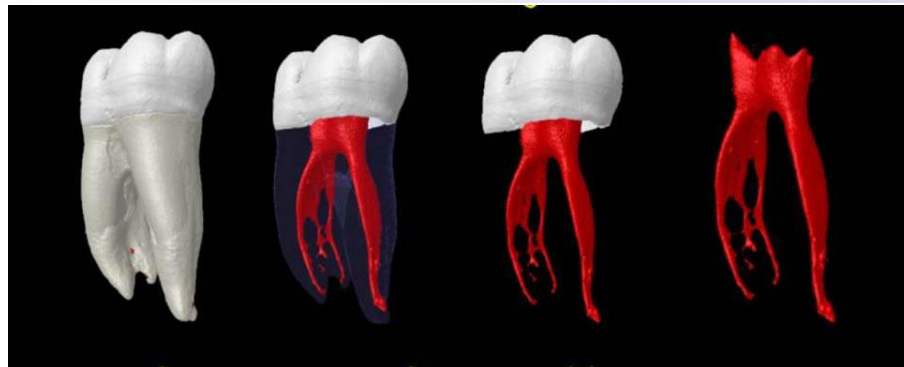
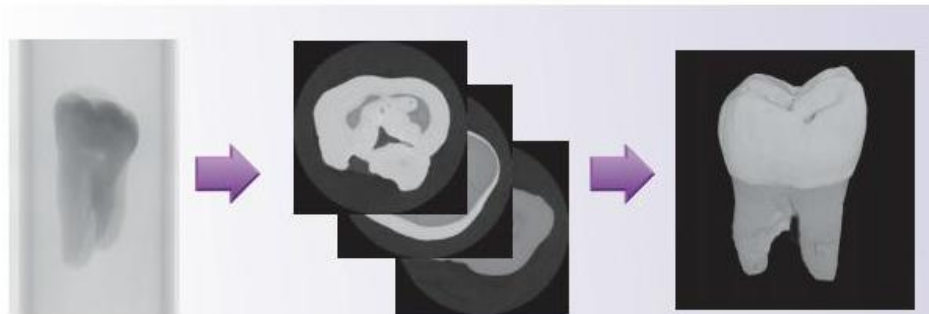
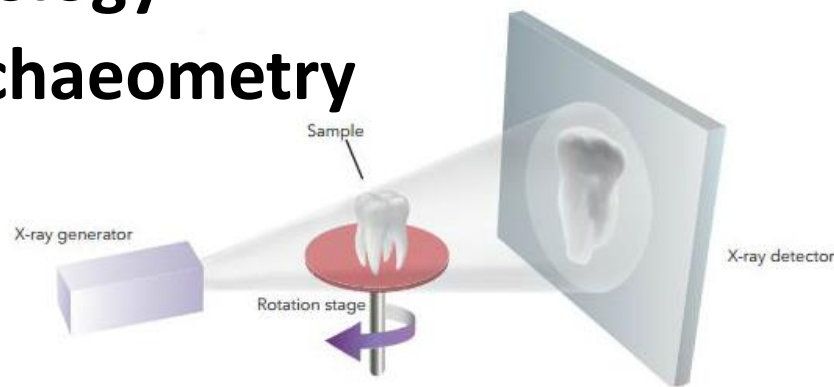
Centro Nacional de Investigación
sobre Evolución Humana



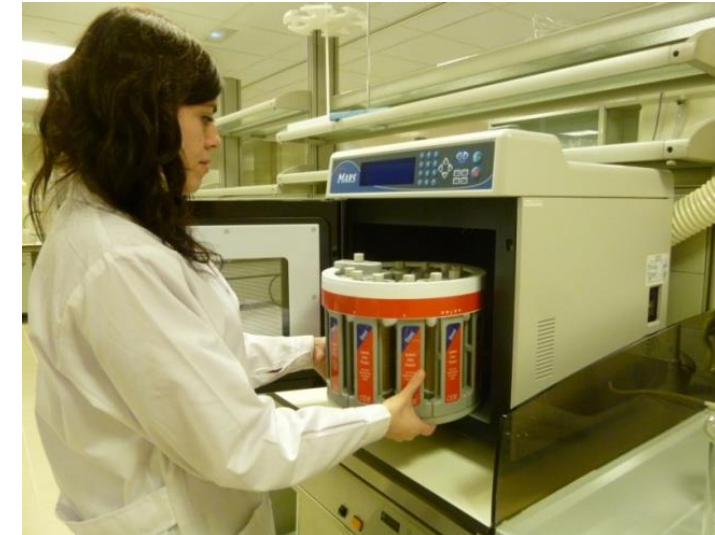
Infrastructure



- Microscopy and microcomputed tomography
- Geology
- Archaeometry



- **Microscopy and microcomputed tomography**
- **Geology**
- **Archaeometry**



Electron microscopy
Optical microscopy
RAMAN microscopy
Laser confocal microscopy
3D digital microscopy-Image analysis-
Multielemental analysis of samples and
crystallography (XRF, XRD, FTIR, TG/DSC)
Sediment analysis



- Applications in quality studies of materials in production processes and development of new materials:

- Pharmaceuticals
- Graphenes
- Plastics
- New materials
- Prosthetics
- Dentistry
- Engineering

Article
pubs.acs.org/JPCA

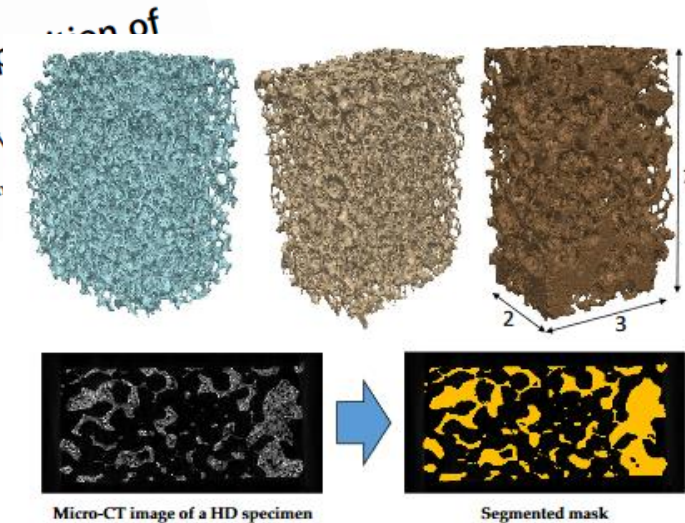
THE JOURNAL OF
PHYSICAL CHEMISTRY C

Evolution of the Raman Spectrum with the Chemical Composition of Graphene Oxide

David López-Díaz,[†] Marta López Holgado,[†] José L. García-Fierro,[‡] and M. Mercedes V.

[†]Departamento de Química Física, Facultad de Ciencias Químicas, Universidad de Salamanca, E37008 Salar

[‡]Instituto de Catálisis y Petroleoquímica, CSIC, 28049 Cantoblanco, Madrid Spain



Contents lists available at ScienceDirect

Materials Science & Engineering C

journal homepage: www.elsevier.com/locate/msec



Open cell polyurethane foam compression failure characterization and its relationship to morphometry

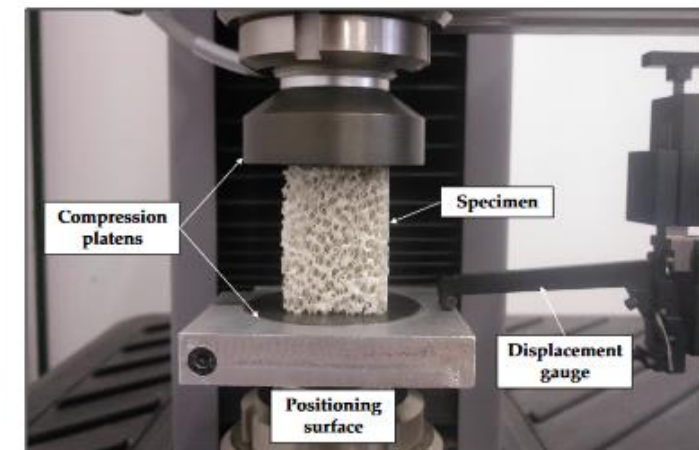
Ricardo Belda^{a,*}, Marta Palomar^a, Miguel Marco^b, Ana Vercher-Martínez^{c,d}, Eugenio Giner^{a,d}

^a Centre of Research in Mechanical Engineering - CIIM, Dept. of Mechanical Engineering and Materials, Universitat Politècnica de València, Camino de Vera, 46022 Valencia, Spain

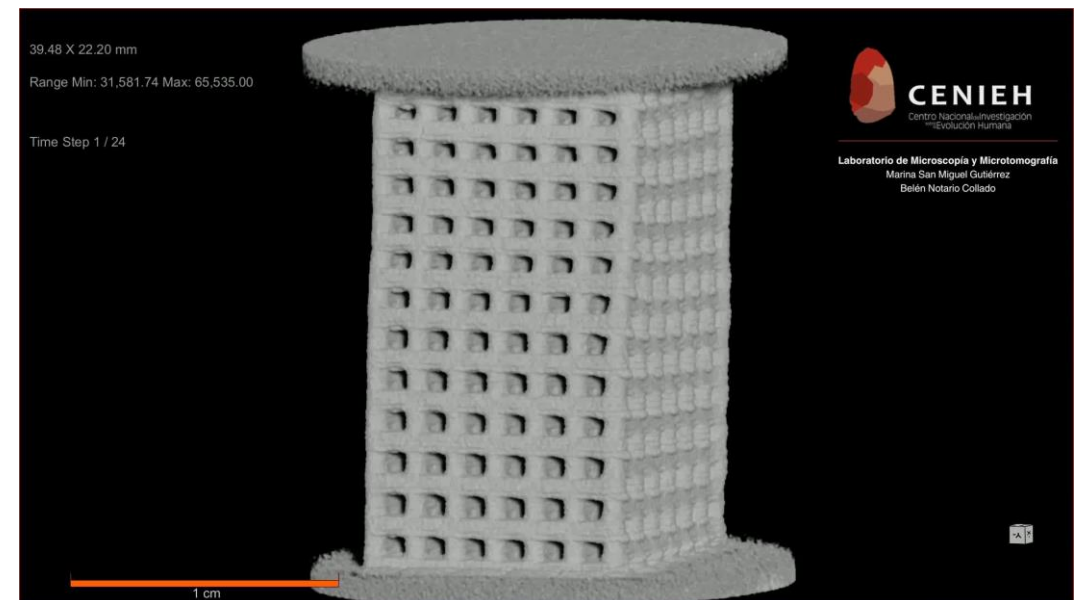
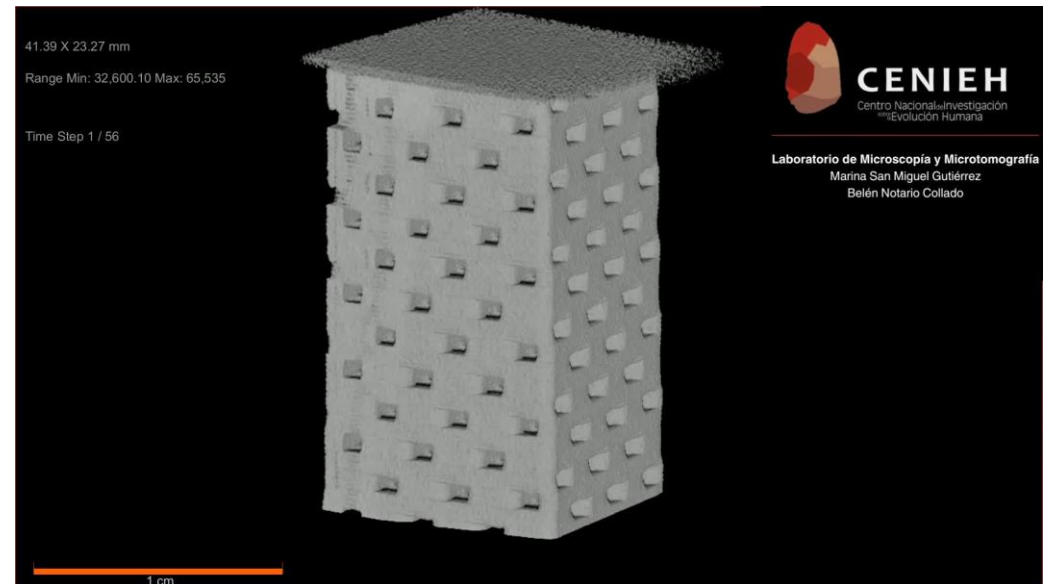
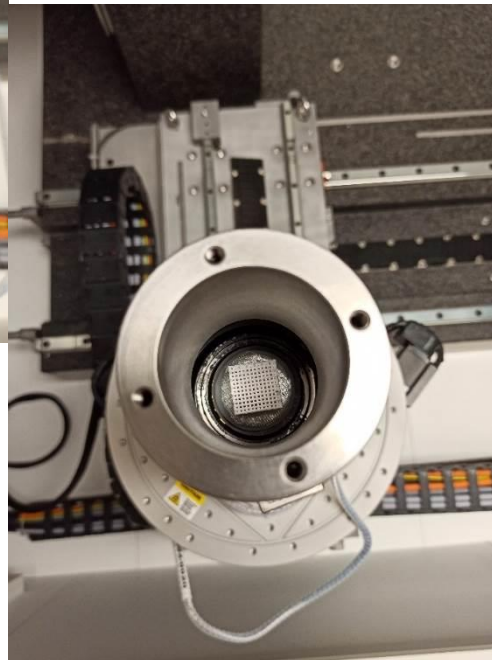
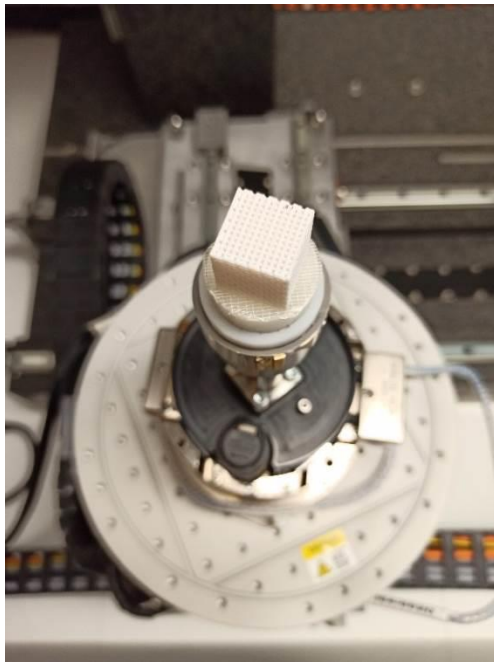
^b Department of Mechanical Engineering, Universidad Carlos III de Madrid, Avda. de la Universidad 30, 28911, Leganés, Madrid, Spain

^c Institute of Mechanical and Biomechanical Engineering - IZMB, Universitat Politècnica de València, Camino de Vera, 46022 Valencia, Spain

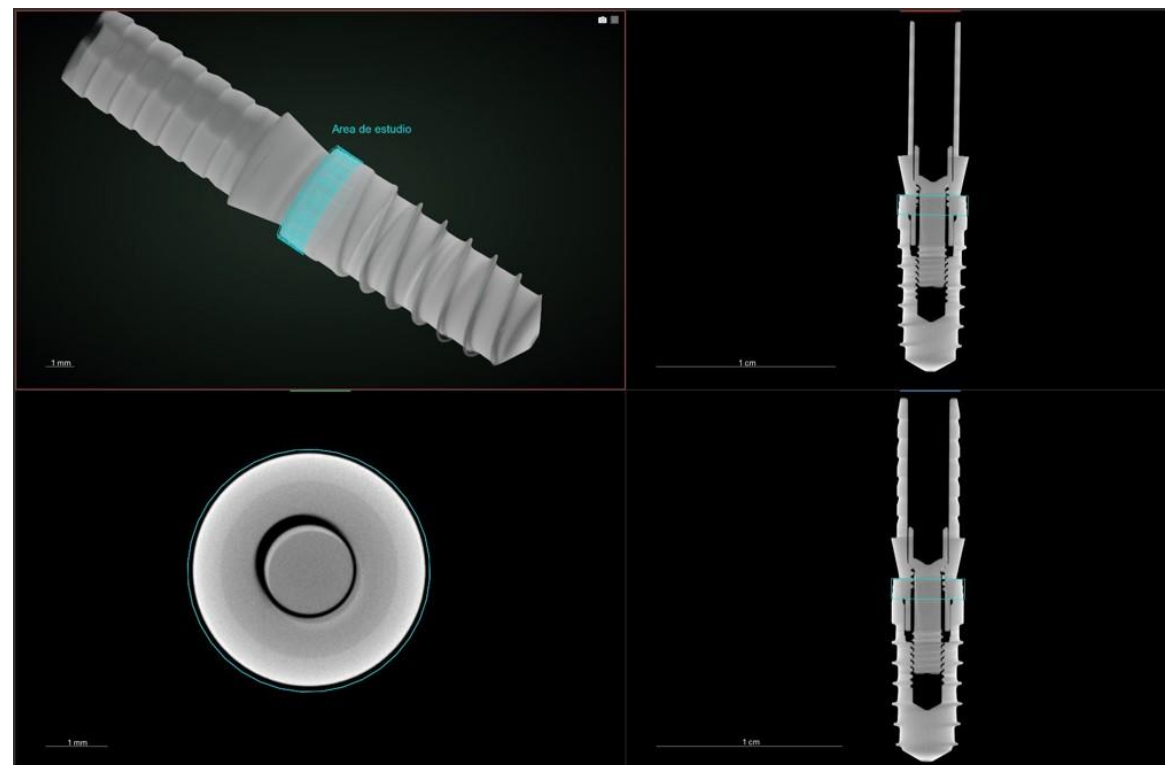
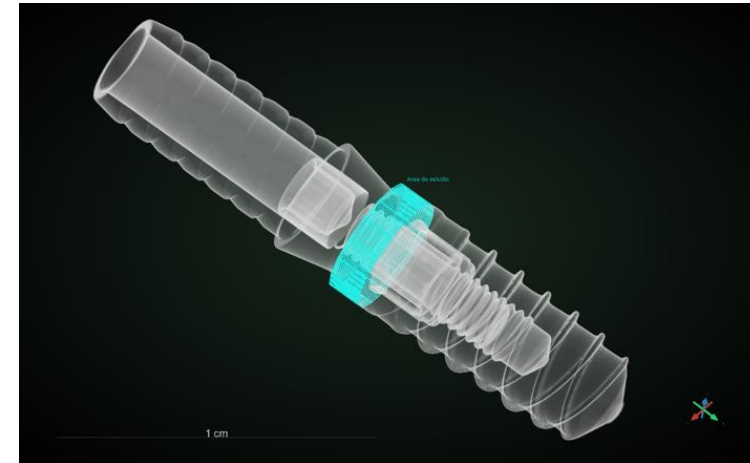
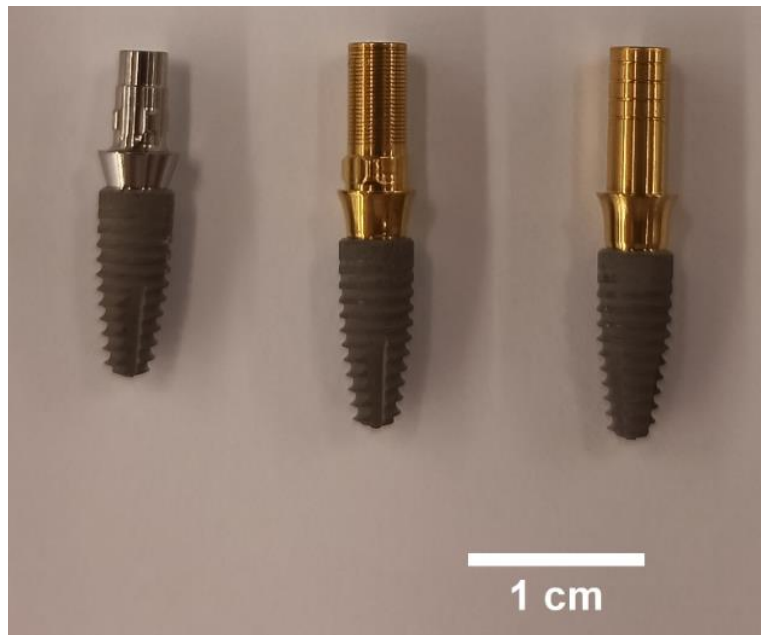
^d Biomedical Research Networking Centre in Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN), Universitat Politècnica de València, Camino de Vera, 46022 Valencia, Spain



Material science- Dynamic scans



Case study: Dental implants

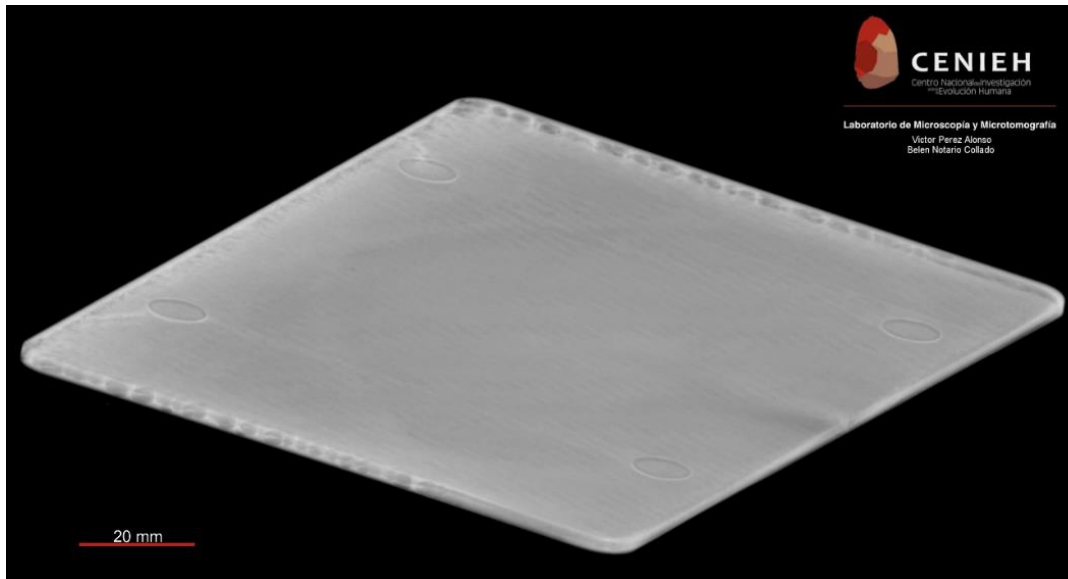




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Case study: Foamed plastic piece



Res. = 122,7 μm

Porosity = 7,54 %

Proyectos and collaboration networks with private companies

Colaboración con Empresas Contratos de Servicios



Redes de Colaboración



Proyectos Científicos de los que el laboratorio forma parte

Project: VAXAMA CDTI (IDI- 20230536)



Project: EURAD European Union's Horizon 2020 (No. 847593)



European Joint Programme on Radioactive Waste Management

Research and Science Spanish Ministry (PID2020-115347GB-I00)



Project: ROBUSTA Plan Propio Universidad Complutense de
Madrid (PR23/23 - 30817)





Users/collaborators



Fundación Cidaut	University of Lisboa
CellMat Technologies	University of Burgos
Grupo Antolín	IPHES (Institut Català de Paleoecologia Humana i Evolució Social)
Shell GSNL B.V.	University of Basque Country
Fundación Idonial	University of Cádiz
CLPU (Centro de Láseres Pulsados)	Institut Català de Paleontologia Miquel Crusafont
CIMNE (Centro Internacional de Métodos Numéricos en la Ingeniería)	Bordeaux University
Muséum National d'Histoire Naturelle	University of La Laguna
Natural Sciences Museum of Barcelona	University of Rey Juan Carlos
University of Valladolid	University of A Coruña
IGME(Instituto Geológico y Minero de España)	University of Alicante
CSIC	University of Valencia
University of Oviedo	University of La Rioja



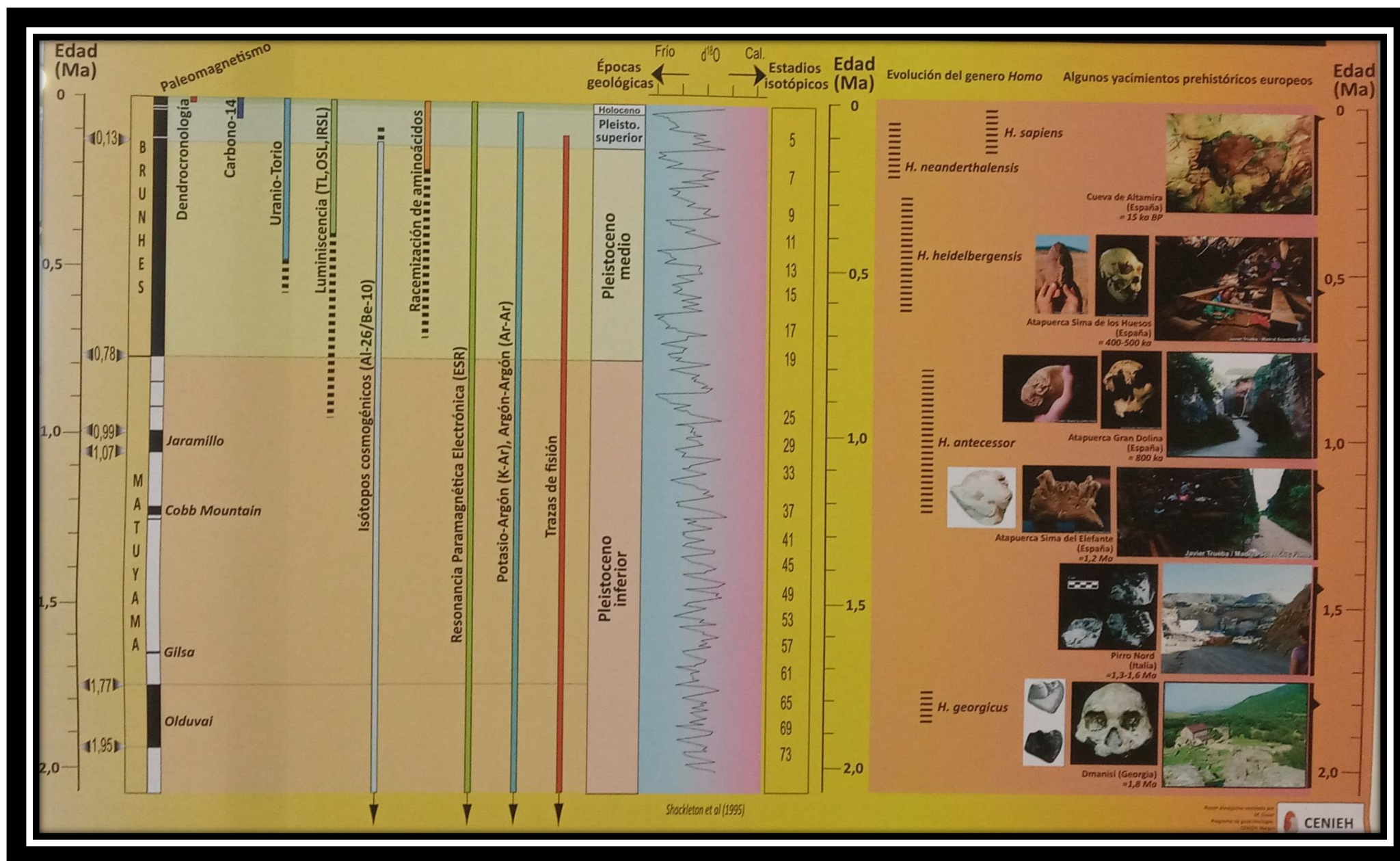
Universidad de Valladolid



Universidad de Oviedo



Relative and absolute dating



Uranium series

- MC-ICPMS
- ICPOES
- Clean room



- U/Th dating of speleothems and other carbonate materials and fossils
- Multielemental analysis of water, sediments, materials, etc.

➔ **Next:** Integration of a **laser ablation (LA) system** with the existing mass spectrometers (LA-MC-ICP-MS) for precise analysis of major, trace, and rare earth elements (REE) and in different isotopic systems (U-Th, U-Pb, Sr and Ca isotopes) for **provenance studies**, **paleomobility studies (Sr)** and **paleodiet studies (Ca)** and **in-situ U-Pb** for > 500 ka old.

Geochronology: Electro Spin Resonance (ESR)



Physical and Chemical preparation

- Dating quartz/enamel
- Dosimetric reconstructions of modern and old materials
- Study of the damage and effect of radiations



Q-band and X-band spectrometers



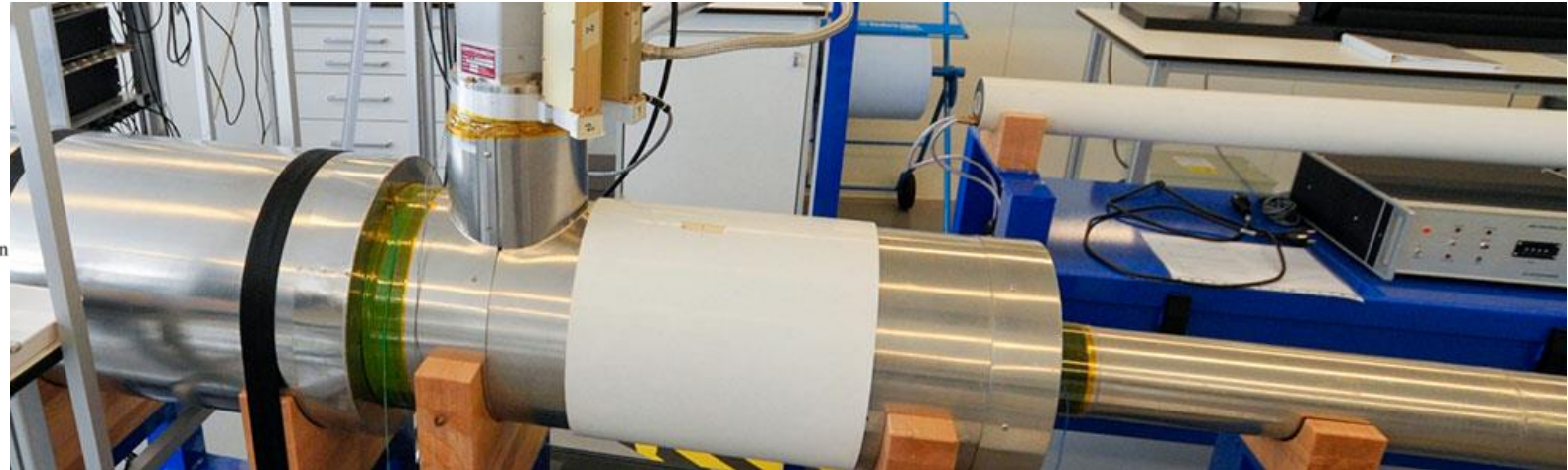
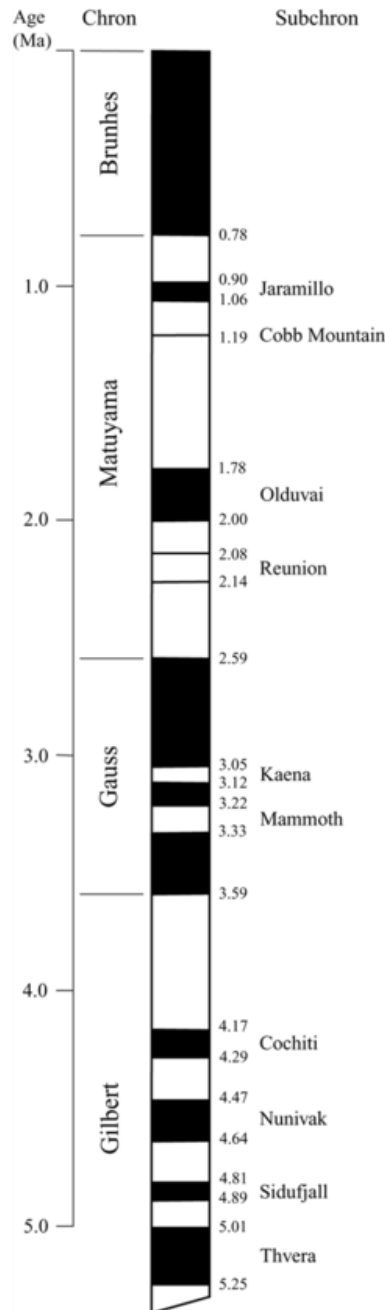
Gamma irradiation area

- Dating of land formations and sedimentary environments.

- Determination of sedimentation rates
Tectonic activity, tsunamis, landscape erosion



- Preparation and Analysis of Samples
- Measuring and Instrument Room - Beta Area
5 RISØ TL/OSL luminescence readers



2 G magnetometer

Magnetic and paramagnetic properties of materials



First results from the paleomagnetic study of Cumbre Vieja

02/08/2022

The CENIEH leads the first published study of the magnetic properties of the lava and ash produced during the 2021 eruption of this volcano on the island of La Palma (Canary Islands)

Geochronology: Cosmogenic Nuclides

- ^{10}Be and ^{26}Al



- **NEXT**: new meteoric ^{10}Be dating and carbonate ^{36}Cl dating,



- **Landscape erosion**: surface exposure dating on quartz-bearing rock/sediment (glacial, moraines, flood deposits...) from ~1000 years to ~4 million years (e.g., glacial moraines, fault scarp, landslides, flood deposits) and erosion rates of rock/soils.
- **Burial dating on quartz-bearing deposits** (e.g., in caves, fluvial/marine terraces) at timescales from ~400,000 years to ~4 million years

Relative and absolute dating



First direct dating of Homo antecessor

28/05/2018

The CENIEH has carried out the first direct dating of a fossil tooth of this species, found at the archaeological site of Gran Dolina at Atapuerca (Burgos, Spain), which confirms the age obtained in earlier indirect datings



Direct cosmogenic nuclide dating of Olduvai Lithic Industry

31/03/2022

The first attempt to apply cosmogenic nuclide isochron-burial dating directly to lithic tools from the Olduvai Gorge (Tanzania) dates the chronology of Bed II, a period of transition from Oldowan to Acheulean technology, to 1.5 million years a.



The CENIEH leads the first dating study of Pirro Nord site in Italy

17/04/2024

The first dating study of Pirro Nord, Italy, traditionally regarded as the oldest archaeological site in western Europe, indicates that it is probably much younger than anticipated, shedding a new light on our understanding of early human dispersals in this part of the continent

Landscape evolution and palaeoclimate



The Pyrenean glacier of Maladeta could disappear by the end of the next decade

06/09/2023

The CENIEH leads a study of the degradation and possible disappearance of one of the largest glaciers in the Pyrenees on foot of ten years of monitoring work using geomatic techniques



The CENIEH studies the biogeographic context of human evolution in eastern Africa Oriental

22/07/2024

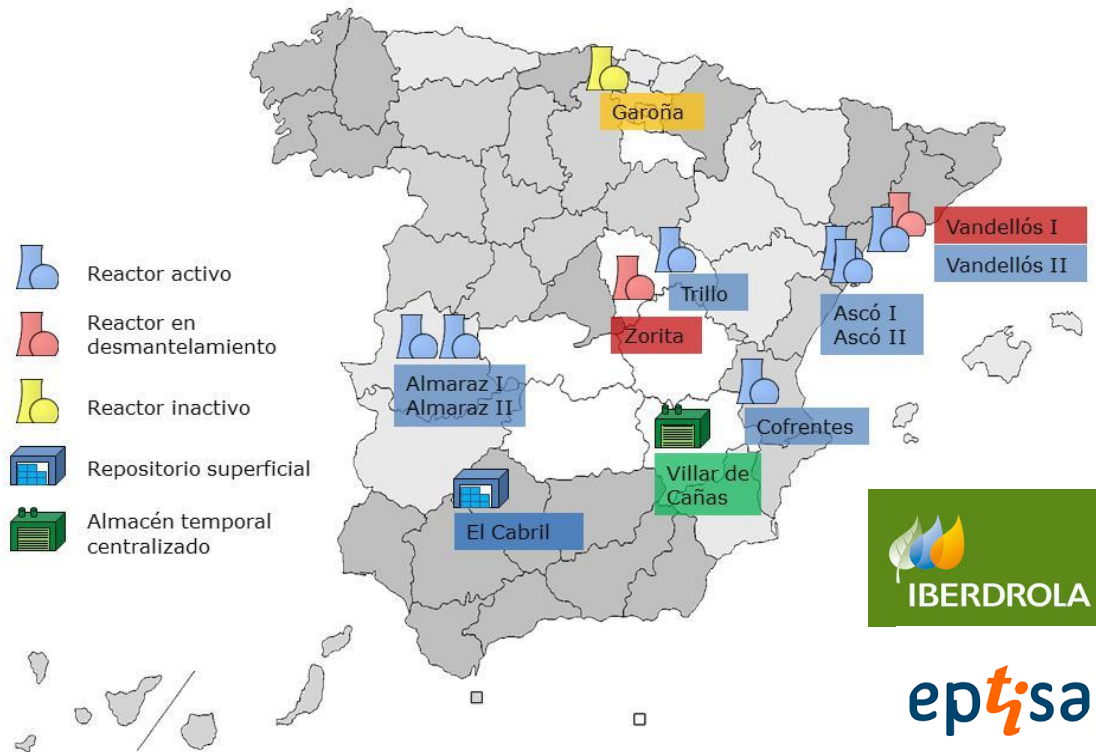
This study led by an international team offers new perspectives on how climatic and environmental changes influenced the evolution of mammals and hominins over the last six million years.



The ecosystems of northern Africa where the first hominins arrived are reconstructed

04/10/2024

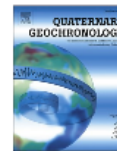
The CENIEH participates in the research which has revealed the environmental diversity 2.4 million years ago here for the first time, when the landscape was dominated by an arid environment, but offering a diversity of habitats and resources, which could have facilitated the occupation of the territory by these hominins



Contents lists available at ScienceDirect

Quaternary Geochronology

journal homepage: www.elsevier.com/locate/quageo



A multi-method dating approach to reassess the geochronology of faulted Quaternary deposits in the central sector of the Iberian Chain (NE Spain)

Davinia Moreno^{a,*}, Francisco Gutiérrez^b, Miren del Val^{a,c}, Domingo Carbonel^b, Fernando Jiménez^{a,d}, M Jesús Alonso^a, Virginia Martínez-Pillado^{e,a}, Oswaldo Guzmán^{f,a}, Gloria I. López^{g,a}, David Martínez^a

^a Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain

^b Departamento de Ciencias de la Tierra, Universidad de Zaragoza, Calle Pedro Cerbuna 12, 50009, Zaragoza, Spain

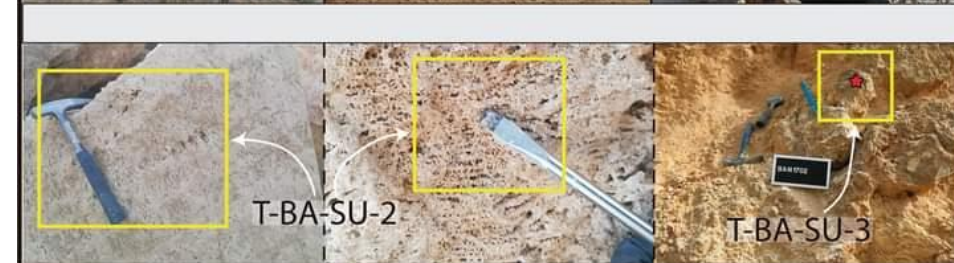
ESR SAMPLES



OSL SAMPLES



U/Th SAMPLES



- Topographic survey using laser scanner
- Photogrammetry
- Aerial mapping- GIS (Geographic Information Systems)-
- Generic and high-density 3D topography- Handheld laser scanning- Geophysics
- Hyperspectral and thermal cameras






Received: 24 December 2020 | Revised: 25 February 2021 | Accepted: 28 February 2021
DOI: 10.1002/esp.5112

RESEARCH ARTICLE

ESPL WILEY

Sinkhole subsidence monitoring combining terrestrial laser scanner and high-precision levelling

Jorge Sevil¹  | Alfonso Benito-Calvo²  | Francisco Gutiérrez¹ 






Received: 24 December 2020 | Revised: 25 February 2021 | Accepted: 28 February 2021

DOI: 10.1002/esp.5112

RESEARCH ARTICLE

ESPL WILEY

Sinkhole subsidence monitoring combining terrestrial laser scanner and high-precision levelling

Jorge Sevil¹  | Alfonso Benito-Calvo²  | Francisco Gutiérrez¹ 

The CENIEH studies the rock paintings in Cova del Tabac, a UNESCO World Heritage site

08/05/2024

The combination of 3D methods and hyperspectral recording made it possible to assess the presence of new paintings and learn how prehistoric groups used the morphology of the cavities to express their artistic manifestations



The human footprints of Ojo Guareña

05/03/2021

The CENIEH has participated in the study of the prints of bare feet found at the Sala y Galerías de las Huellas site in the Ojo Guareña Karst Complex (Burgos), which are the marks left in a soft floor sediment of an exploration by a small group of people between 4200 and 4600 years ago.



The Pyrenean rock glacier of La Paúl is moving almost 40 cm per year

04/01/2024

The CENIEH leads a study which applies eight years of geomatic work with drones, 3D laser scanners and satellite positioning systems to analyze this rock glacier in the Aragonese Pyrenees, with the aim of contributing to our understanding of the high-altitude cryosphere under conditions of climate change


Article

The dental proteome of *Homo antecessor*

<https://doi.org/10.1038/s41586-020-2153-8>

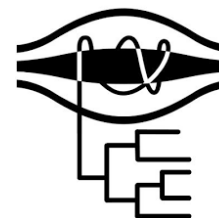
Received: 4 July 2019

Accepted: 21 January 2020

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Frido Welker^{1,22}, Jazmín Ramos-Madrigal^{1,22}, Petra Gutenbrunner^{2,22}, Meaghan Mackie^{1,3}, Shivani Tiwary², Rosa Rakownikow-Jersie-Christensen³, Cristina Chiva^{4,5}, Marc R. Dickinson⁶, Martin Kuhlwiilm⁷, Marc de Manuel⁷, Pere Gelabert⁷, María Martín-Torres^{8,9}, Ann Margvelashvili¹⁰, Juan Luis Arsuaga^{11,12}, Eudald Carbonell^{13,14}, Tomas Marques-Bonet^{4,7,15,16}, Kirsty Penkman⁶, Eduard Sabido^{4,5}, Jürgen Cox², Jesper V. Olsen², David Lordkipanidze^{10,17}, Fernando Racimo¹⁸, Carles Lalueza-Fox⁷, José María Bermúdez de Castro^{8,9}, Eske Willerslev^{18,19,20,21} & Enrico Cappellini¹

The phylogenetic relationships between hominins of the Early Pleistocene epoch in Eurasia, such as *Homo antecessor*, and hominins that appear later in the fossil record during the Middle Pleistocene epoch, such as *Homo sapiens*, are highly debated^{1–5}. For the oldest remains, the molecular study of these relationships is hindered by the

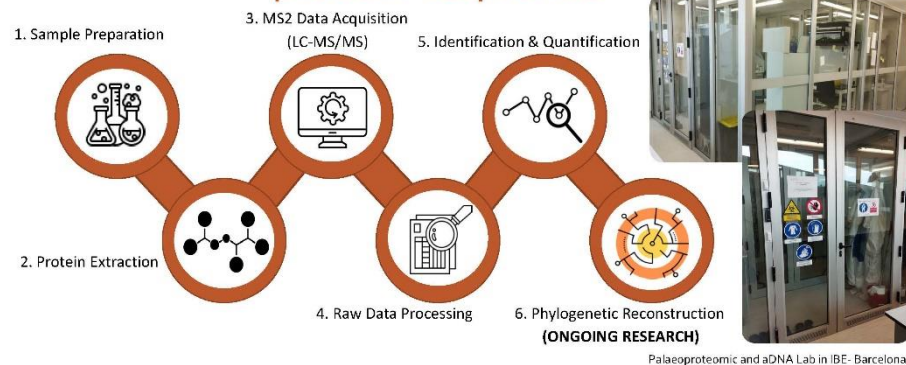


PUSHH MCS-ETN



Shot-gun proteomics

Methodology Workflow. From dental enamel to protein sequence



ENAMEL PROTEOME OF PLEISTOCENE CAVE BEARS FROM SIERRA DE ATAPUERCA SITES. PRELIMINARY RESULTS

ICBS28- BAYREUTH
Amanda Gutiérrez Carbajal



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 861389

PUSHH
Palaeoproteomics to Unleash
the Study of Human History



Palaeoproteomics and ancient DNA

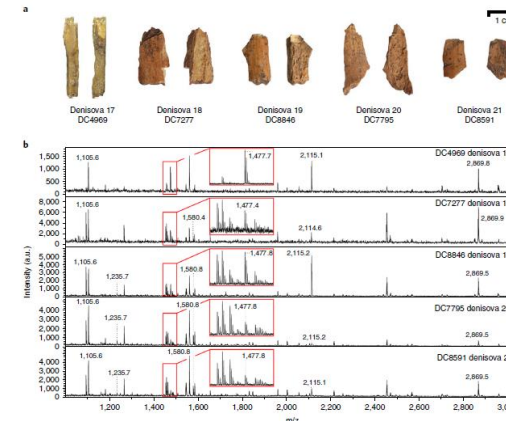
ZooMS: zooarchaeology my mass spectrometry: collagen fingerprinting

Dr. Samantha Brown



The earliest Denisovans and their cultural adaptation

Samantha Brown^{1,2,8}, Diyendo Massilani^{3,8}, Maxim B. Kozlikin⁴, Michael V. Shunkov⁴, Anatoly P. Derevianko⁴, Alexander Stoessel^{1,2,5}, Blair Jope-Street¹, Matthias Meyer³, Janet Kelso³, Svante Pääbo³, Thomas Higham^{6,7} and Katerina Douka^{1,7}



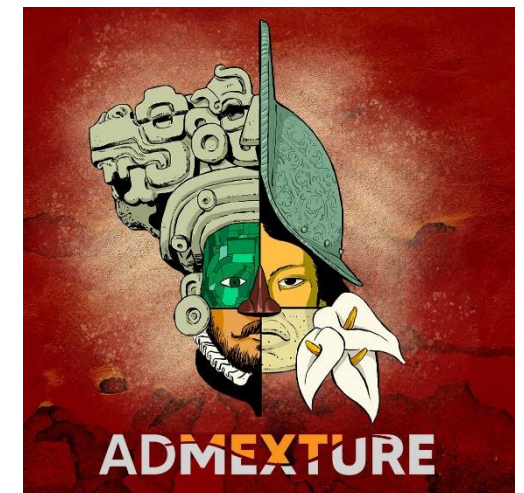
Grupo Transversal de Arqueología Molecular UBU-CENIEH



Dr. Cristina Valdiosera

ERC Advanced Grant.

Admixture: Biocultural roots of diversity and inequality in Mexico: 500 years of mestizo stories



Universal
testing
machine

Climatic test
chamber

Skeletization
area

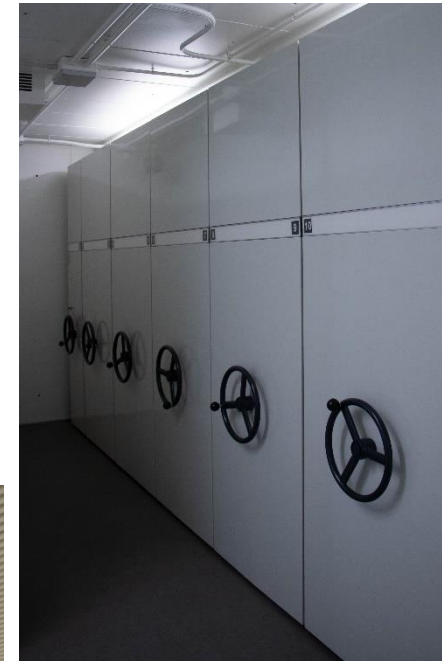
Experimental
knapping
area

3D reflected-
light
microscope



Reference collections

- Comparative Anatomy Osteological Collection
- Experimental Traceology Collection
- Mineral Collection (LITHO)
- Archaeopaleontological Collections -Ratón Pérez Collection
- NEXT:** Digitalization of collections



Campaña de recogida,
durante la XXIII Semana
de la Ciencia y la
Innovación de Madrid
(6 al 19 de noviembre)



Días de recogida:
Miércoles 8 y 15 de
noviembre / Jueves 9 y 16 de
noviembre

Horario: de 15:30 a 19:30

Lugar: Hall de la Clínica
Universitaria de la URJC,
Campus de Alcorcón (AVDA.
de Atenas, 5/N, 28922,
Alcorcón, Madrid).

Clínica Universitaria
UNIVERSIDAD REY JUAN CARLOS



- 3D Replicas/casts
- Management of archaeological and paleontological collections
- Intervention on cultural heritage: preventive and curative conservation
- Technical advice



Excavations



INTERRED IN AFRICA

Remains represent the
continent's earliest known
burial of a modern human



Article


Earliest known human burial in Africa

<https://doi.org/10.1038/s41586-021-03457-8>

Received: 12 May 2020

Accepted: 16 March 2021

Published online: 5 May 2021

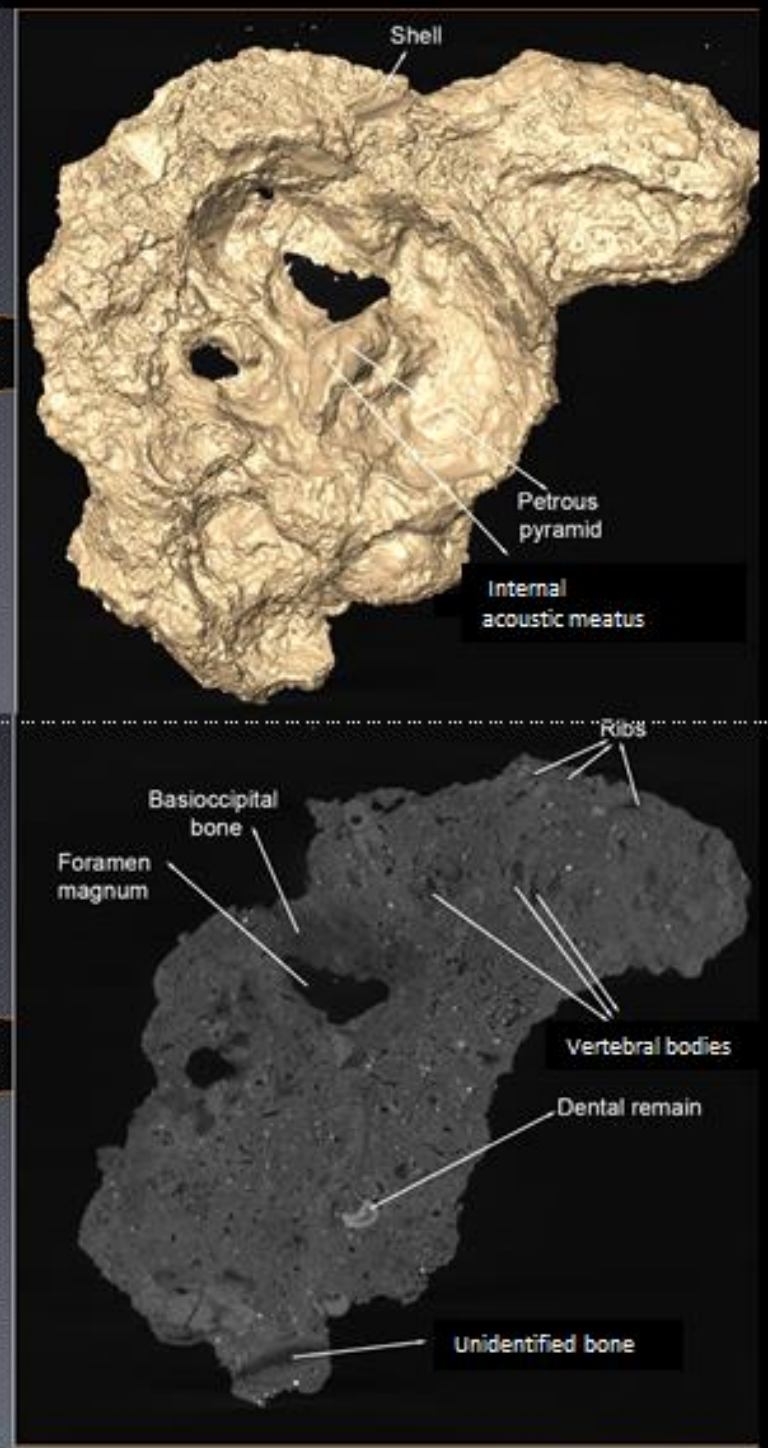
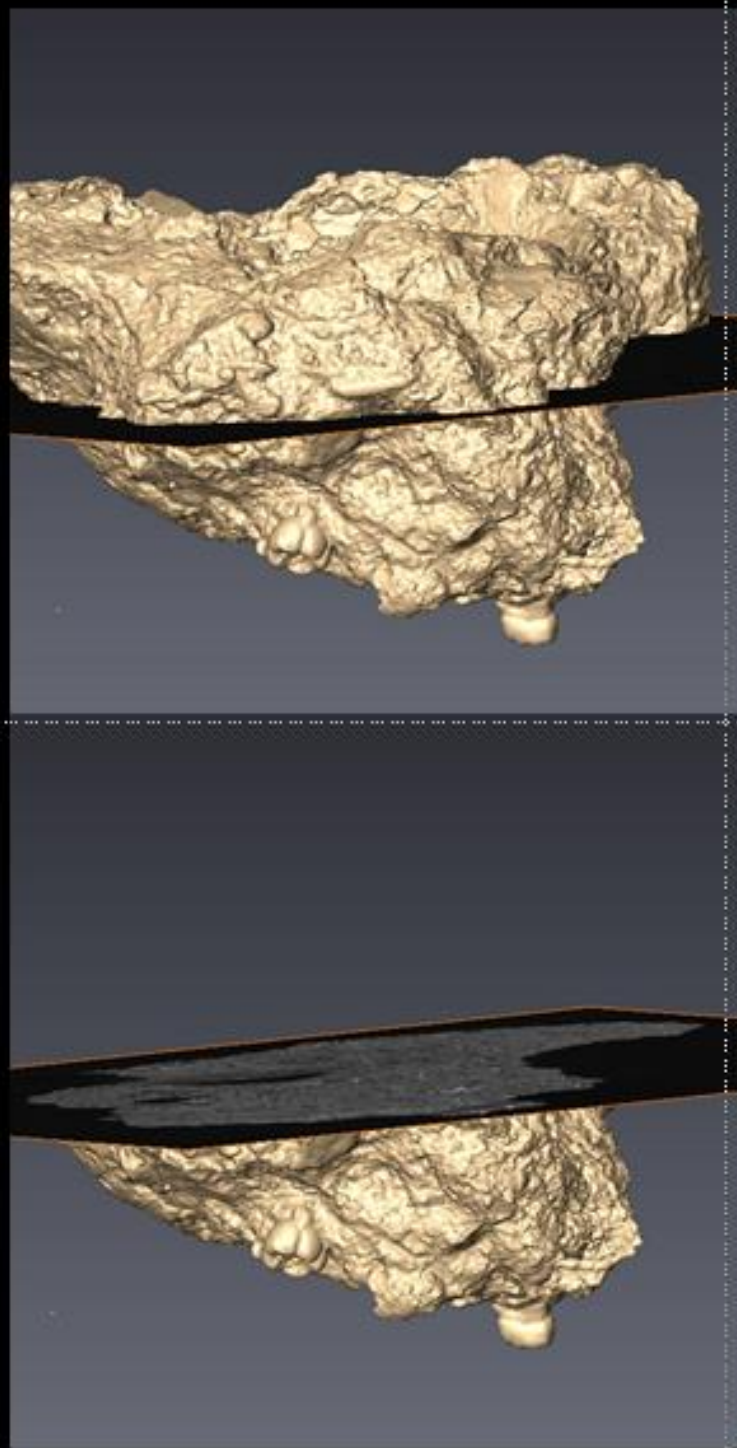
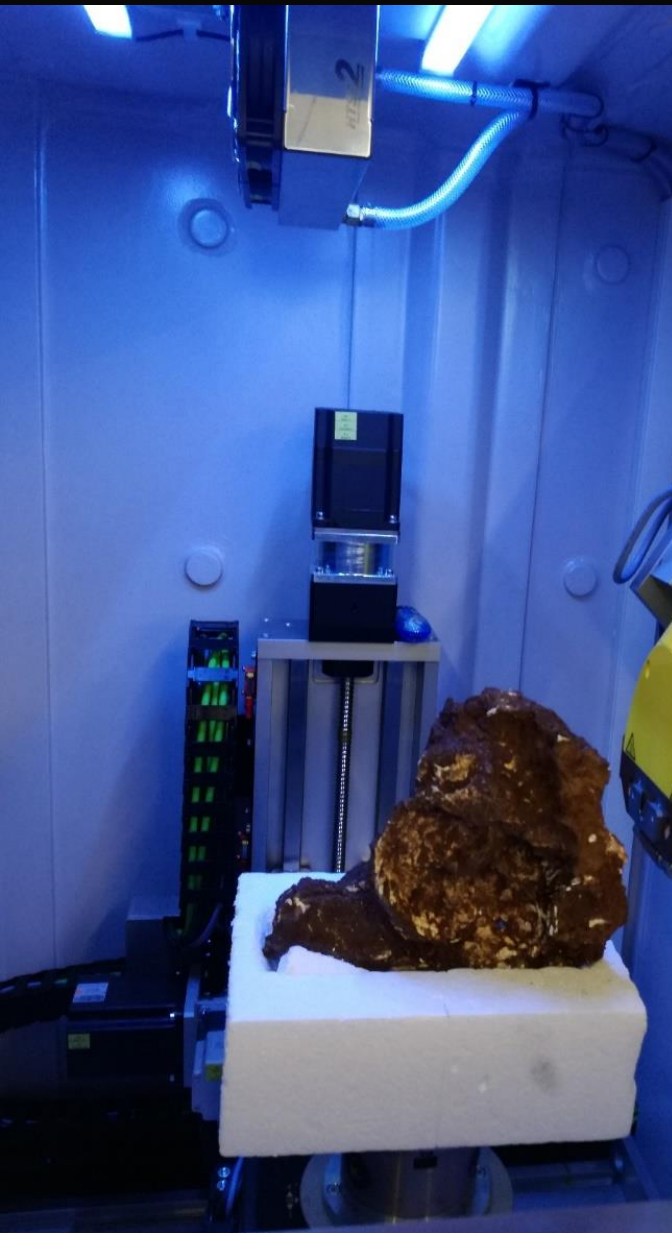
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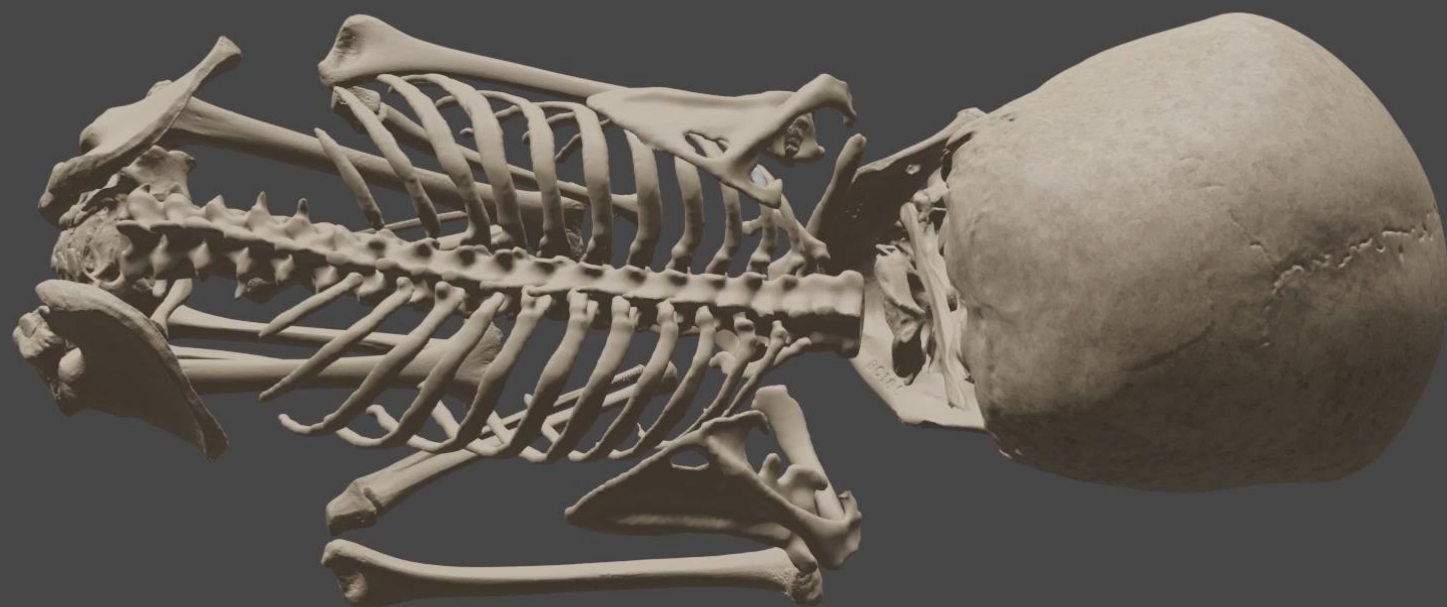
Maria Martín-Torres^{1,2,3,4}, Francesco d'Errico^{2,4}, Elena Santos^{5,6}, Ana Alvaro Gallo¹, Noel Amano⁷, William Archer^{8,9,10}, Simon J. Armitage^{11,4}, Juan Luis Arsuaga^{5,12}, José María Bermúdez de Castro^{1,2}, James Blinkhorn^{13,14}, Alison Crowther¹⁴, Katerina Douka¹⁵, Stéphan Dubernet¹⁶, Patrick Faulkner^{17,18}, Pilar Fernández-Colón¹, Nikos Kourampas^{19,20}, Jorge González García²⁰, David Larrelina¹, François-Xavier Le Bourdonnec¹⁶, George MacLeod¹⁹, Laura Martín-Francés^{1,2}, Diyendo Massilani²¹, Julio Mercader^{1,2,22}, Jennifer M. Miller⁷, Emmanuel Ndilema^{23,24}, Belén Notario¹, Africa Pittarch Martí^{25,26}, Mary E. Prendergast²⁵, Alain Queffelec³, Solange Rigaud³, Patrick Roberts^{27,28}, Mohammad Javad Shoaee⁷, Ceri Shipton^{26,27}, Ian Simpson¹⁶, Nicole Boivin^{29,30,31,32} & Michael D. Petraglia^{29,30,31,32}

The origin and evolution of hominin mortuary practices are topics of intense interest and debate^{1–3}. Human burials dated to the Middle Stone Age (MSA) are exceedingly rare in Africa and unknown in East Africa^{4–6}. Here we describe the partial skeleton of a roughly 2.5- to 3.0-year-old child dating to 78.3 ± 4.1 thousand years ago, which was recovered in the MSA layers of Panga ya Saidi (PYS), a cave site in the tropical upland coast of Kenya²⁸. Recent excavations have revealed a pit feature containing a child in a flexed position. Geochemical, granulometric and micromorphological analyses of the burial pit content and encasing archaeological layers indicate that the pit was deliberately excavated. Taphonomical evidence, such as the strict articulation or good anatomical association of the skeletal elements and histological evidence of putrefaction, support the in-place decomposition of the fresh body. The presence of little or no displacement of the unstable joints during decomposition points to an interment in a filled space (grave earth), making the PYS finding the oldest known human burial in Africa. The morphological assessment of the partial skeleton is consistent with its assignment to *Homo sapiens*, although the preservation of some primitive features in the dentition supports increasing evidence for non-gradual assembly of modern traits during the emergence of our species. The PYS burial sheds light on how MSA populations interacted with the dead.



Microtomografía





“Mtoto”, el niño





- Transfer knowledge
- Socialization of knowledge
- Inclusive and multi-format programme

VIERNES 29 DE SEPTIEMBRE DE 2023 | Burgos

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22BURGOS

Diario de Burgos MIÉRCOLES 2 DE JUNIO DE 2021

INCLUSIÓN SOCIAL | CONVENIO DE COLABORACIÓN

Aransbur y el Cenieh se alían para acercar la ciencia a los sordos

La asociación apoyará con intérpretes de lengua de signos, subtítulo en directo y distintos equipos de amplificación acústica al centro en el desarrollo de su programa de actividades

ALMUDENA SANZ / BURGOS

Con la mirada en el acceso al conocimiento como un derecho humano y el empeño de borrar barreras que entorpecen esta meta, el Centro Nacional de Investigación sobre la Evolución Humana (Cenieh) y la Asociación de Familias de Personas Sordas (Aransbur) firmaron ayer un convenio de colaboración por cuatro años para acercar la ciencia a este colectivo, hacerla más accesible y comprensible.

Para este fin Aransbur ofrecerá la solución más adecuada a cada situación. Estas pasan por la amplificación acústica, con equipos de ayuda individual que no interfieren ni molestan a las personas del entorno, mediante audífonos, equipos auxiliares o tecnología como Bluetooth, infrarrojos o wifi, subtítulo de los contenidos en directo, en el que la entidad burgalesa es pionera a través de su centro especial de empleo Mira lo Que te Digo (MQD), que sirve a importantes empresas como RTVE, y apoyo con intérpretes de lengua de signos.

Estos servicios se pondrán en marcha en citas como la Noche Europea de los Investigadores, la Semana de la Ciencia, Semana Mujer y Ciencia, Día de Darwin, la Jornada Cenieh Distinguished Annual Lecture o en la campaña de recogida de dientes del Raton Pérez, uno de los proyectos con más tirón entre los pequeños, a los que se podrán acercar los niños sordos.

Aransbur agradeció que el Cenieh se haya puesto como objetivo



La rueda de prensa de María Martín y José Luis Aranzón contó con una intérprete de lengua de signos. J. ORDOÑEZ (24)

el acceso inclusivo al conocimiento de sus investigaciones y avances poniendo la mirada en una parte importante de la sociedad, que por unas circunstancias u otras no oyen bien, oyen mal o no oyen nada, en unos casos desde su nacimiento y en otros por causas sobrevenidas a lo largo de su vida, que en Burgos alcanza al 10% de la población.

De salir una gran deuda con la sociedad, al facilitar el acercamiento

to a su programa a las personas con discapacidad auditiva, habló la directora del Cenieh, María Martín. Insistió en que el acceso al conocimiento es un derecho y llamó la atención sobre el ánimo de transmitirlo a toda la sociedad con un calendario estable de divulgación, cada vez con más contenidos, diversidad y más participación ciudadana, al que ya tocaba dar un paso adelante hacia la inclusión social.

«No podemos permitirnos mantener barreras que son salvable y que nos debilitan y empobrecen como especie y como sociedad», remachó la científica.

Al tiempo que se congratulaba por este avance, el presidente de Aransbur reconoció que aún quedan «muchas lagunas» y que «lo ideal sería que a través de la Consejería de Cultura llegáramos a todos los organismos».

SOLIDARIDAD

Cáritas continúa con los actos de la Semana de la Caridad

DB / BURGOS

Cáritas continúa con la celebración de la Semana de la Caridad, que arrancó el fin de semana pasado con el concierto de Oratorio Barroco en el Museo del Retablo. La ONG católica prosigue con el programa de esta iniciativa, que siempre desarrolla en las jornadas previas a la fiesta del Corpus.

Invita a todo el mundo a que llegue hasta el aparcamiento situado junto a la sede de Cáritas, en la calle San Francisco, para participar en la construcción de un mural colaborativo que lleve el título de *Thunde tu mano y enéscas*.

«Se trata de que todos los que lo deseen, voluntarios, grupos parroquiales, colegios, familias y ciudadanía en general, se acerquen caminando hasta la sede de Cáritas como lugar de esperanza y de compromiso para muchas personas», señalan desde la entidad, que mantiene la coreografía hasta este viernes.

Cáritas invita a colocar una mano en papel que puede ser decorada como se quiera y en su interior se podrá escribir algún mensaje de agradecimiento (un sentimiento, una palabra, un hecho, un deseo, una cita, un momento...) que recoja cómo se ha sentido la mano durante este año o se va hacer en un futuro con las personas más necesitadas, desahogadas, con dificultades...

La agenda seguirá con la Asamblea General, el viernes en la Facultad de Teología, y un encuentro de oración, el sábado en la Catedral (10.30 h.), dentro de la iniciativa pontificia 24 horas para el Señor.



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