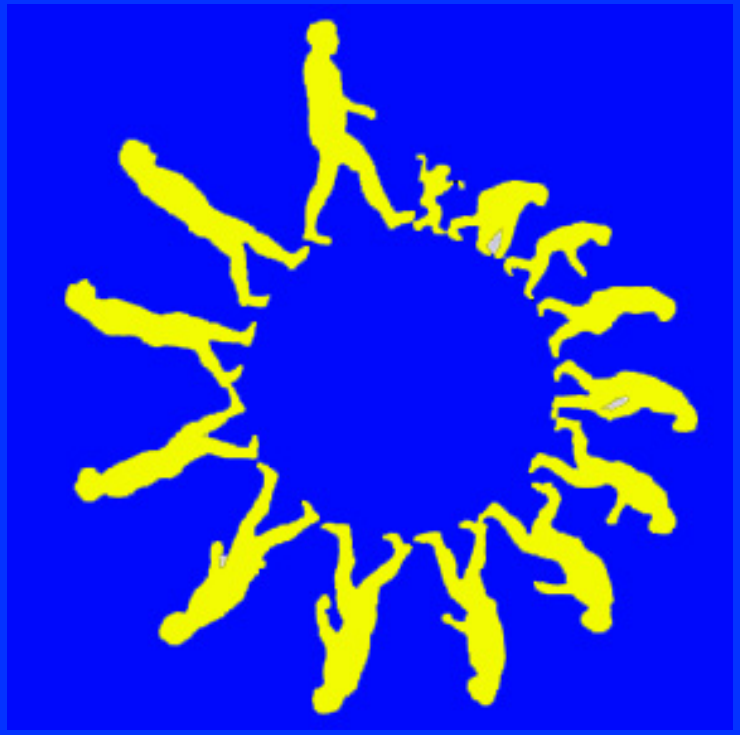
RESEARCH INFRASTRUCTURES AND HUMAN EVOLUTION

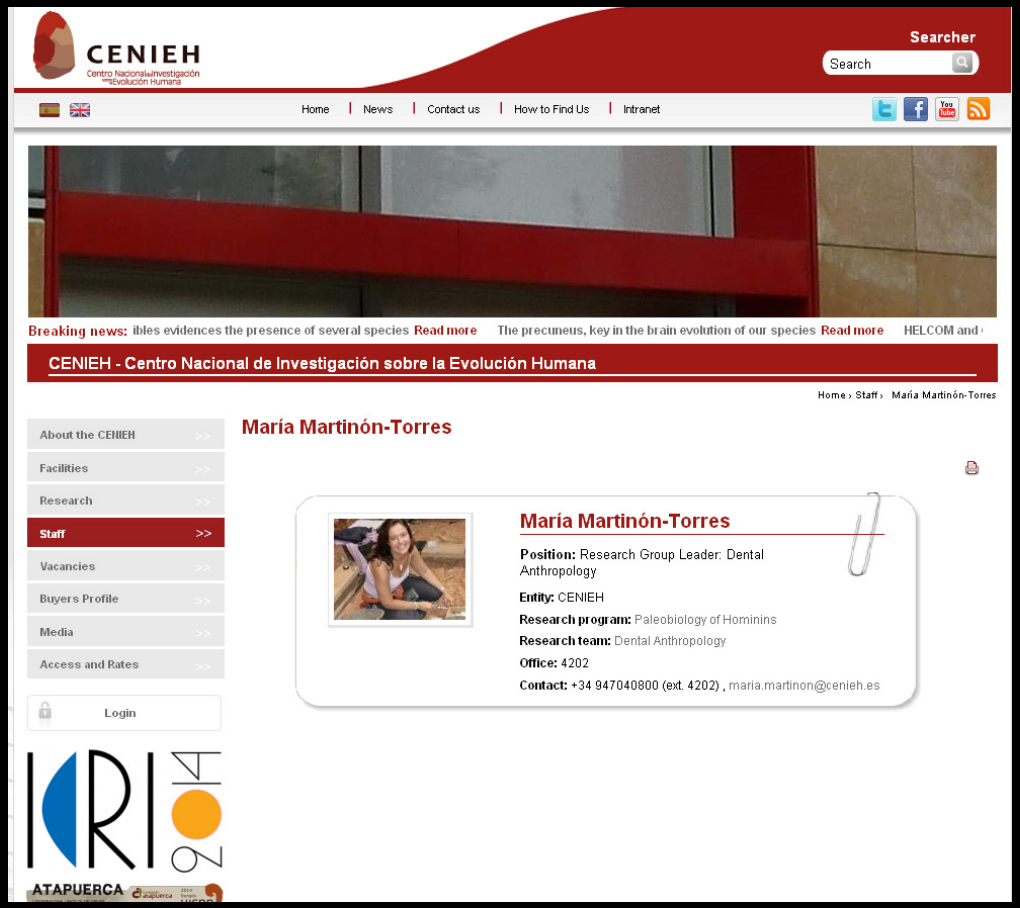
DR. MARÍA MARTINÓN TORRES



CENIEH

IRI 2014

Palaeobiology of Hominins





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Unique Research and Technology Infrastructure (ICTS)



- Hominin Paleobiology
- Spatial archaeology
- Geochronology
- Prehistoric Technology
- Geology

- Laboratories
- Restoration Conservation Area

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Geochronology Technology & Facilities

Luminescence Dating



Neptune Multicollector inductively coupled plasma-mass spectrometer U-series





Long core, SQUID Rock, Magnetometer

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Laser Ablation



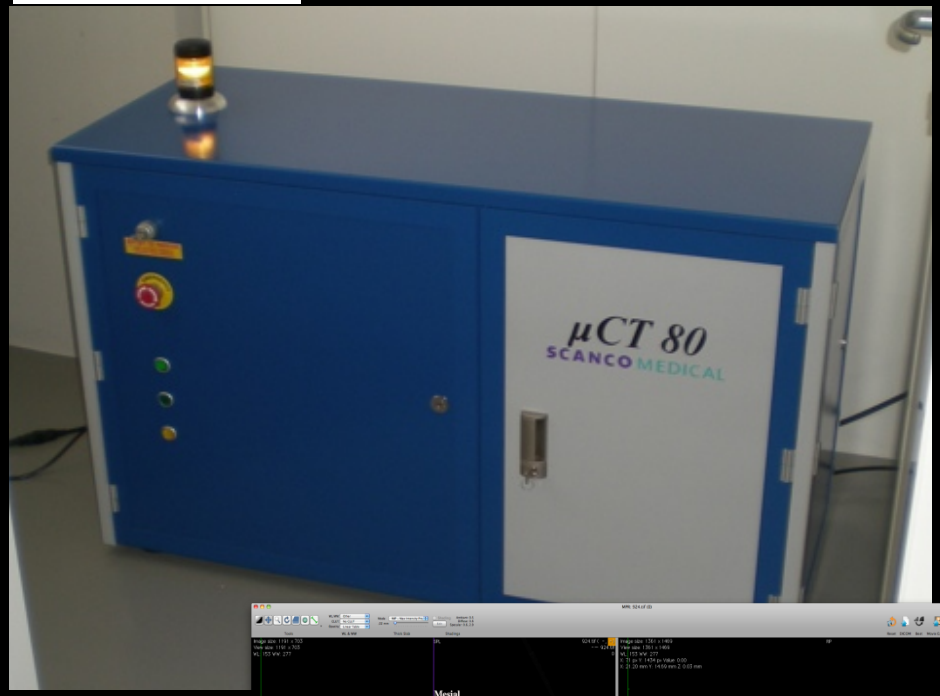


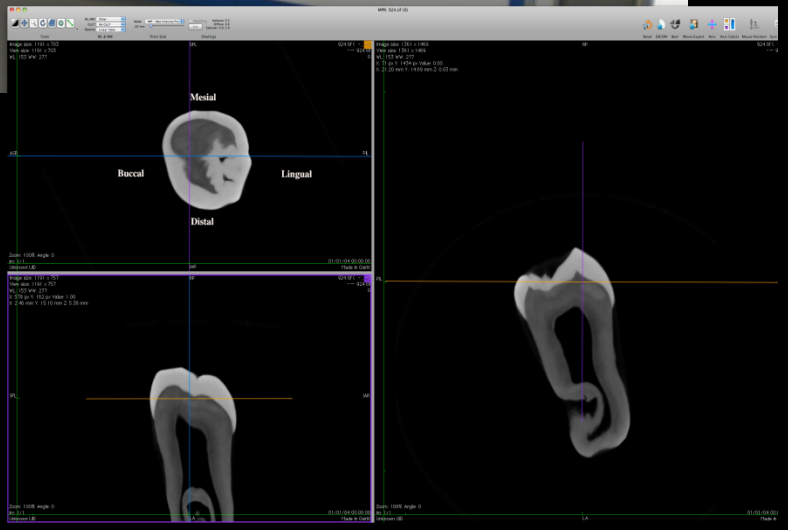
Optima, elemental analysis

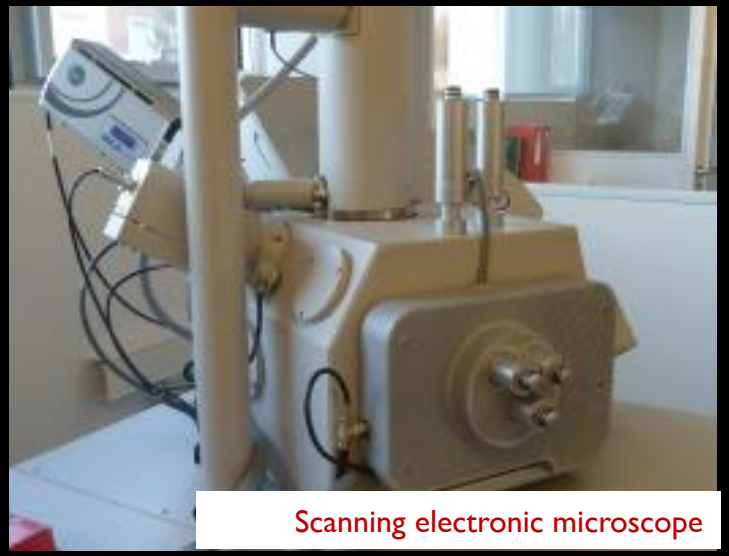
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CENIEH Research Infrastructures

Microtomography







Scanning electronic microscope

Confocal microscope




ATAPUERCA SITES
BURGOS
Madrid

Sistema Atapuerca, Cultura de la Evolución



CENIEH
8.850 m²

Human Evolution Museum
15.375 m²

Auditorium and Congress Hall
35.320 m²



KEY MESSAGE 1

Research on human evolution is essentially multi-disciplinary and multi-institutional as it is a holistic approach to human nature (anatomy, development, diet, disease) and it also addresses the context of the findings (archaeology, chronology and palaeoclimate).



INFRASTRUCTURE FOR THE TRANSFER AND SOCIALIZATION OF KNOWLEDGE:



Multi-institutional refers here not only to the different centers, universities and institutions that contribute to the development of the specific research topic but also to all the services and departments that articulate and complete the whole

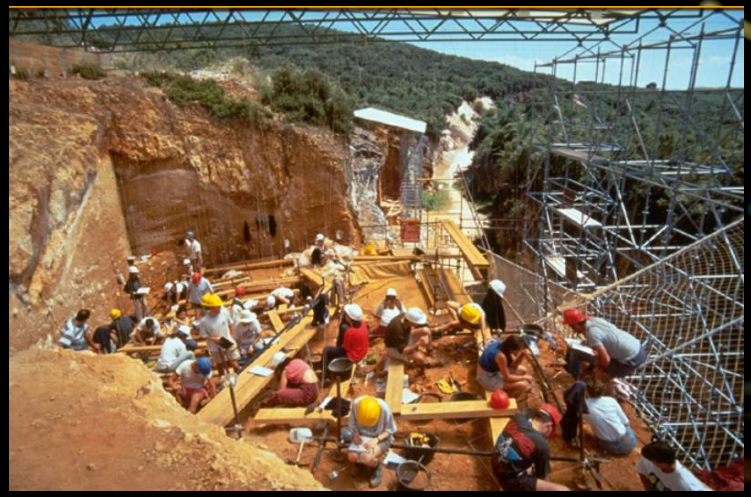
CHAIN OF KNOWLEDGE:



EDUCATION
TRAINING
DISSEMINATION
OUTREACH

RESEARCH → **results** → **SOCIETY**

Education and dissemination as Infrastructure









SISTEMA ATAPUERCA benefits for Community of Castilla y León (data from 2012):

-54 million euros benefit

-new 1000 job positions

-500.000 tourists



Programs of expert exchanges, research stays in host institutions and co-directions of PhDs: diversification and dynamic interaction of new scientists and ideas



Quaternary International 223-224 (2010) 439

Out of Asia: The initial colonisation of Europe in the Early and Middle Pleistocene

R.W. Dennell [a,*], M. Martinón-Torres [b], J.M. Bermúdez de Castro [b]



PNAS | August 14, 2007 | vol. 104 | no. 33 | 13279–13282

Dental evidence on the hominin dispersals during the Pleistocene

M. Martinón-Torres*†, J. M. Bermúdez de Castro*, A. Gómez-Robles*, J. L. Arsuaga†‡, E. Carbonell§, D. Lordkipanidze¶, G. Manzi‖, and A. Margvelashvili*¶

Contents lists available at SciVerse ScienceDirect

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



A new model for the evolution of the human Pleistocene populations of Europe

José María Bermúdez de Castro*, María Martinón-Torres

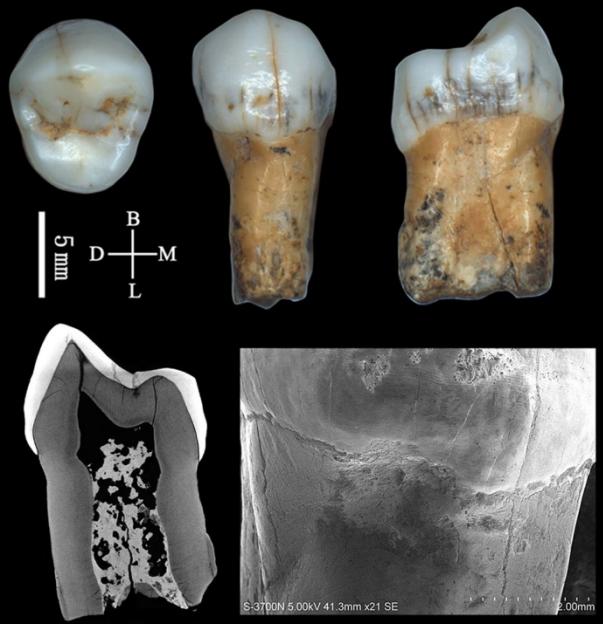
National Research Center for Human Evolution (CENIEH), Paseo Sierra de Atapuerca s/n, 09002 Burgos, Spain

Multi-institutional collaboration



The comparisons of hominin fossils between China and Spain, and human origin and evolution in Eurasia (Grant n°GJHZ201314). *Funding source*: Cooperation Program of Bureau of International Cooperation (BIC), Chinese Academy of Science.

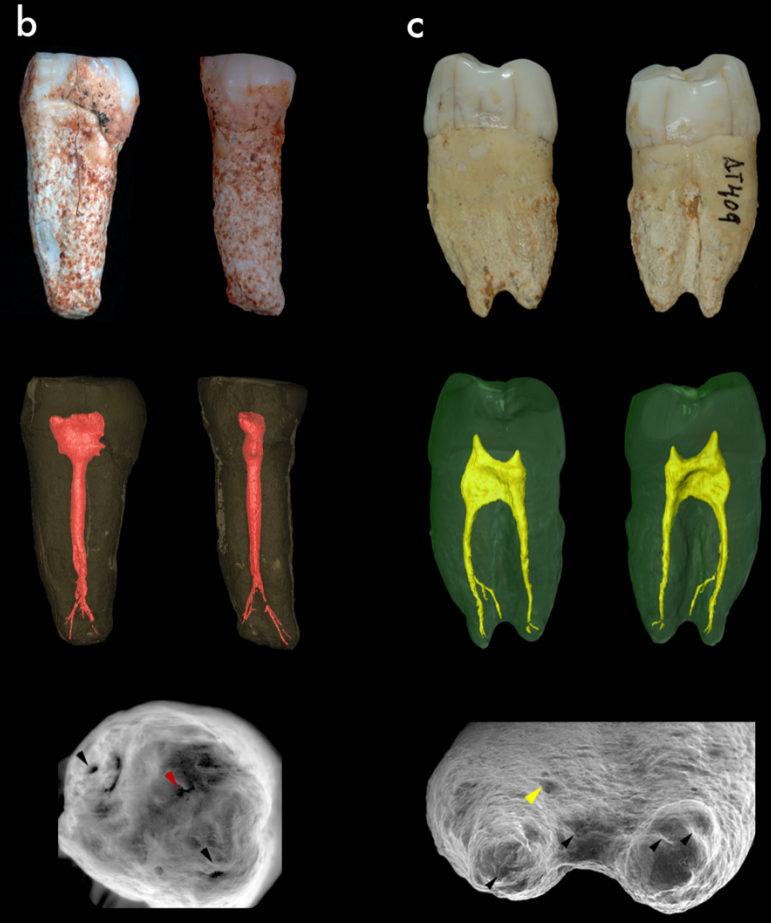
Memorandum of agreement between CENIEH (Dental Anthropology Group) and Institute of Vertebrate Paleontology and Palaeoanthropology of Beijing





KEY MESSAGE 2

Technology has been key to maximize the palaeobiological information that can be extracted from the fragile and rare fossil record. New generation of non-invasive imaging tools has helped to address the conflicting requirements of safeguard versus exploitation of the fossil record and allows a virtual sharing and handling of fossils, ensuring its integrity.



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Oldest human DNA found in Spain

By **Elizabeth Landau**, CNN
December 10, 2013 -- Updated 1430 GMT (2230 HKT)

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A drawing shows what the species of Homo heidelbergensis might have looked like 400,000 years ago.

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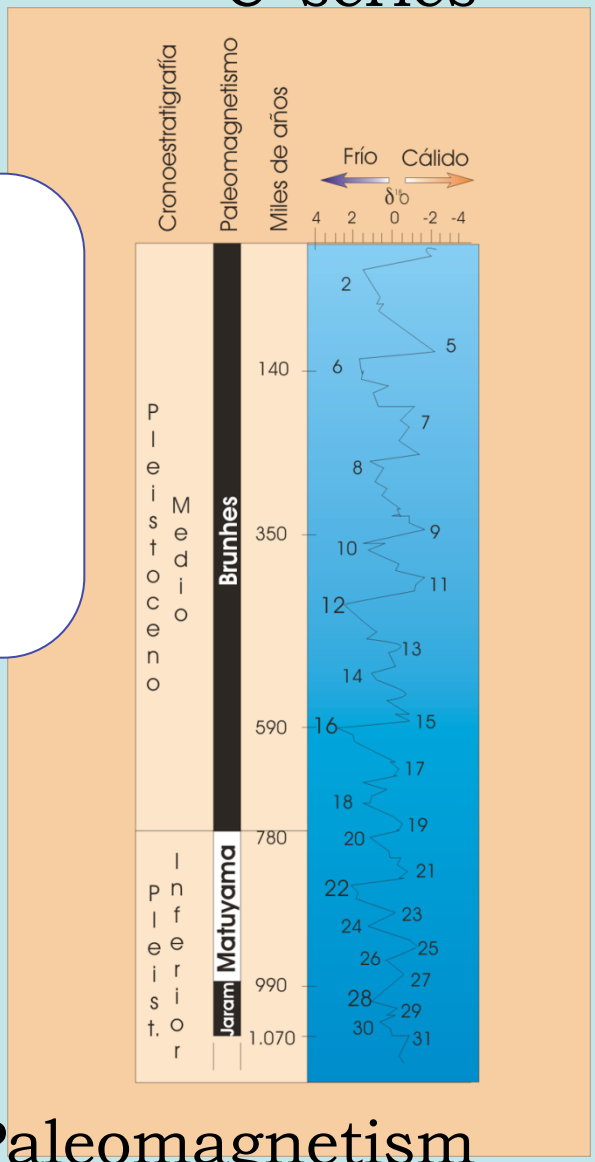
Thermoluminiscence

Geochronology:
ESR
U-series





Early Pleistocene
900.000 years,



Paleomagnetism

A Hominid from the Lower Pleistocene of Atapuerca, Spain: Possible Ancestor to Neandertals and Modern Humans

J. M. Bermúdez de Castro, *et al.*

Science **276**, 1392 (1997);
DOI: 10.1126/science.276.5317.1392

Science

AAAS

Homo antecessor



20 March 2008 | www.nature.com/nature | £10

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

nature



THE FIRST EUROPEANS

The jaw that puts humans in Spain a million-plus years ago

CARBON NANOTUBES
Electron spin–orbit coupling

OBESITY
The genetic network of a disease

VISION
Retina cells are looking up

NATUREJOBS
Vaccine centre

PNAS

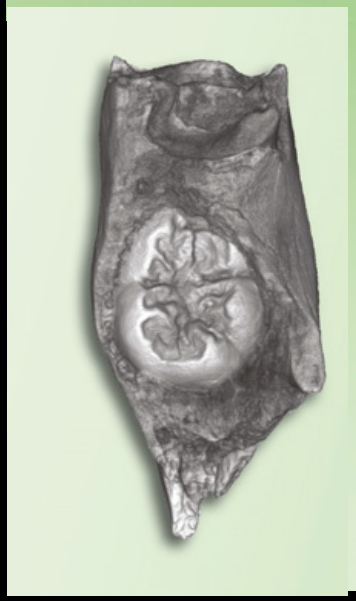
New immature hominin fossil from European Lower Pleistocene shows the earliest evidence of a modern human dental development pattern

José María Bermúdez de Castro[a,1], María Martinón-Torres[a], Leyre Prado[a], Aida Gómez-Robles[a], Jordi Rosell[b],









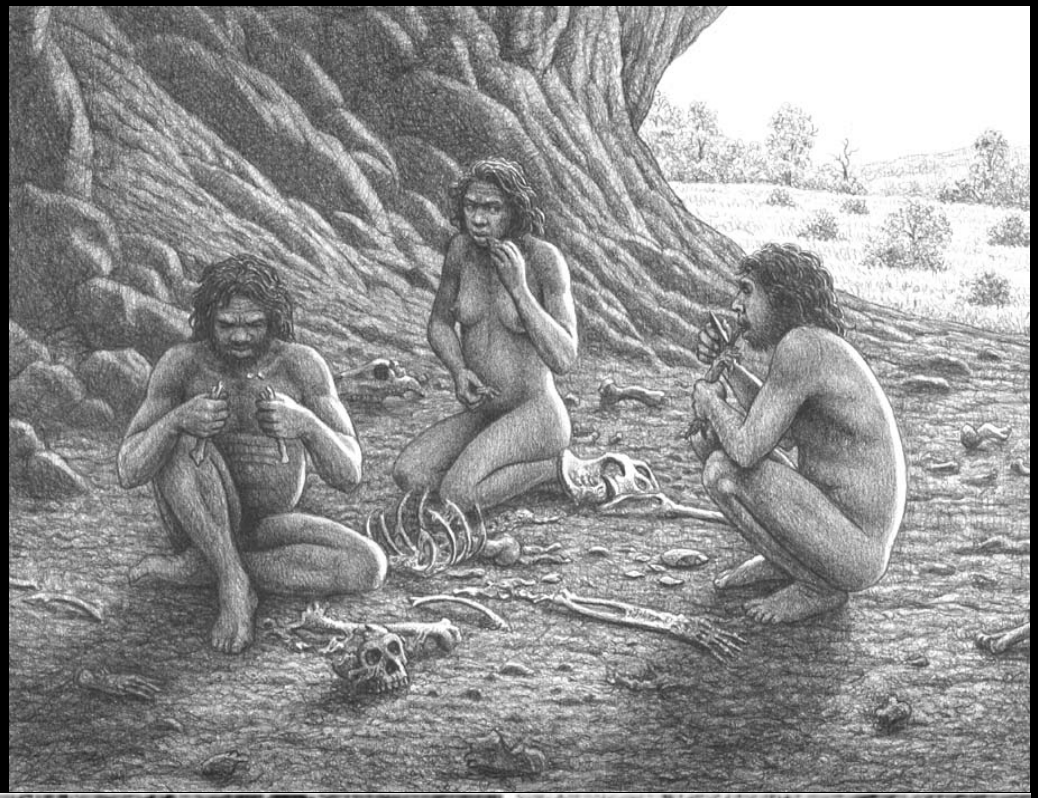


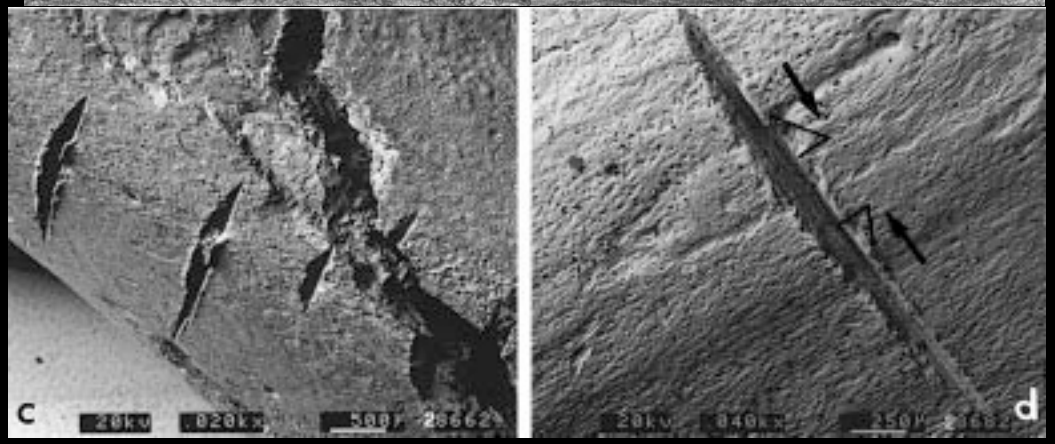
CANNIBALISM in the EARLY PLEISTOCENE of ATAPUERCA



1 cm







OPEN ACCESS Freely available online

PLOS ONE

Facial Morphogenesis of the Earliest Europeans

Rodrigo S. Lacruz[1]*, José María Bermúdez de Castro[2], María Martinón-Torres[2], Paul O'Higgins[3], Michael L. Paine[1], Eudald Carbonell[4], Juan Luis Arsuaga[5], Timothy G. Bromage[6]



KNM-WT 15.000
Homo ergaster
Cerebro: 850 cc



ATD6-69
Homo antecessor
Cerebro: más de 1000 cc

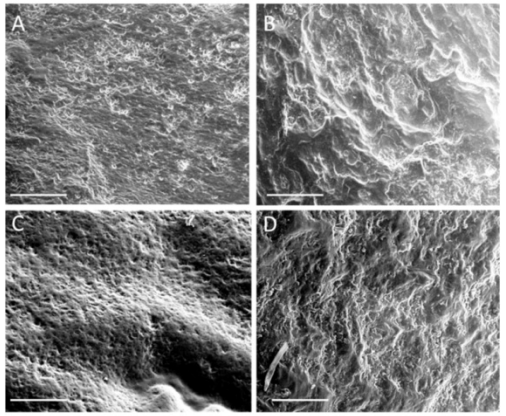
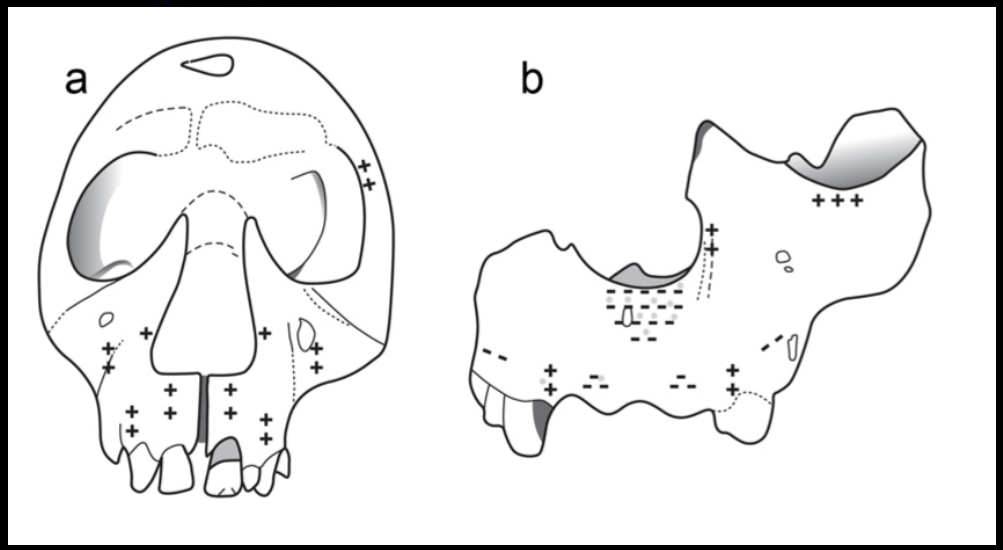
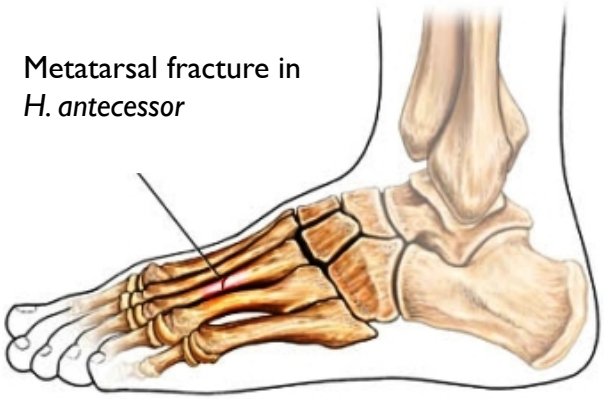
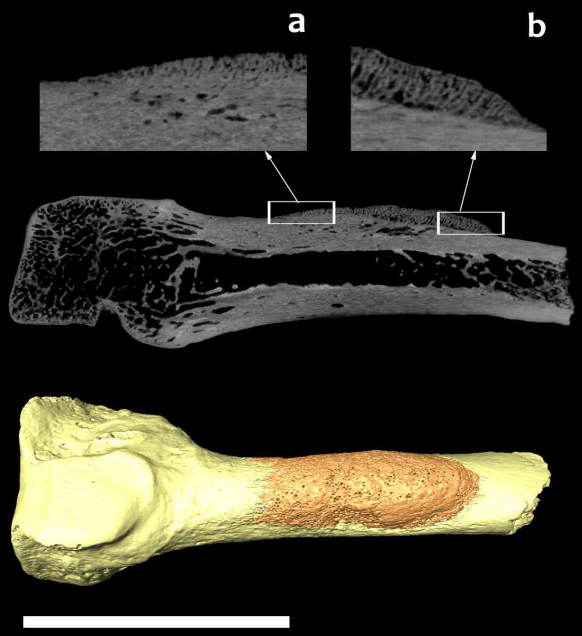


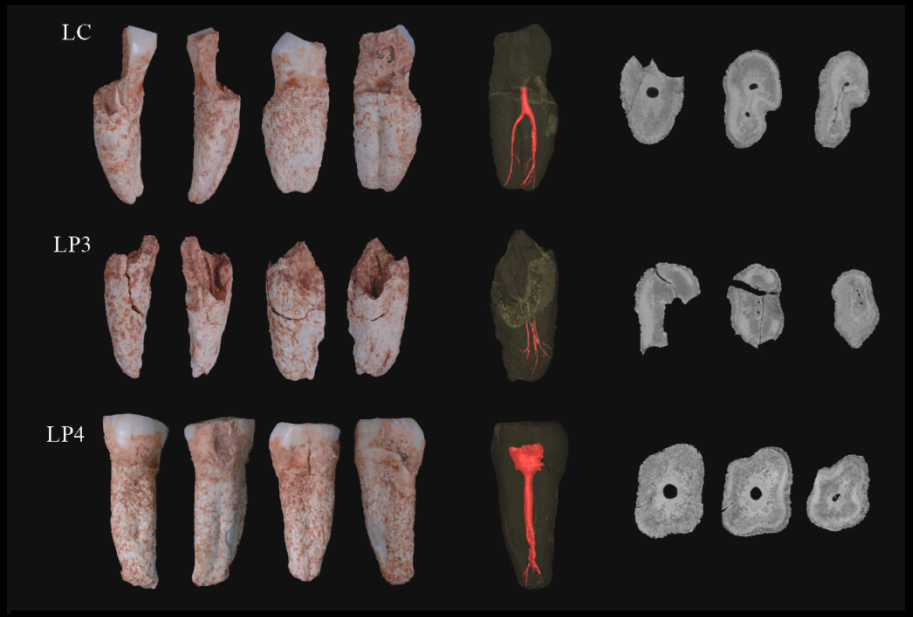
Figure 3. Scanning Electron Micrographs of facial growth remodeling in KNM-WT 15000 and ATD6-69. Images "**A''** and "**B''** are representative of growth remodeling fields in KNM-WT 15000 (*H. erectus*). Image "**A''** shows depository fields in the clivus area of this specimen. For comparison, "**B''** shows resorptive fields in the anterior aspect of the mandibular ramus of this specimen. Scale bars (A, B) = 50 μm. Images "**C**" and "**D**" represent growth remodeling fields of the specimen ATD6-69 (*H. antecessor*). Image "**C**" shows depository fields near the zygomatic region whereas "**D**" is a representative resorptive field in the clivus of ATD6-69. Scale bars (C,D) = 100 μm. All images shown here are taken from high resolution replicas examined in the scanning electron microscope.
doi:10.1371/journal.pone.0065199.g003



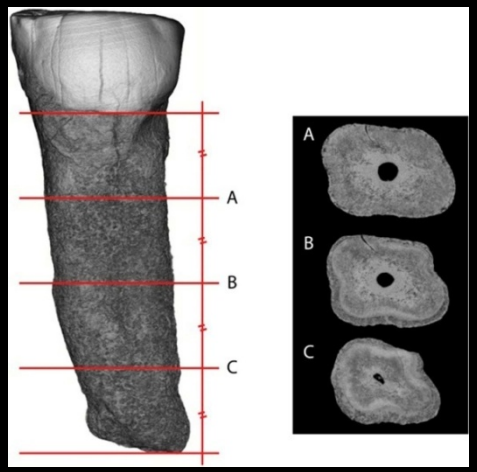
Metatarsal fracture in
H. antecessor

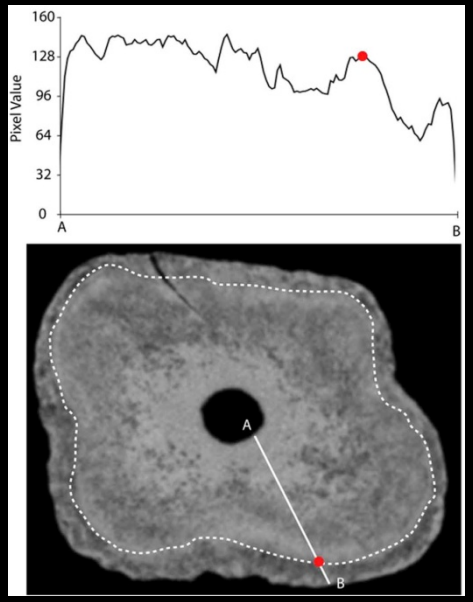






Hypercementosis





PNAS PNAS PNAS PNAS

SEE COMMENTARY

Craniosynostosis in the Middle Pleistocene human Cranium 14 from the Sima de los Huesos, Atapuerca, Spain

Ana Gracia[a,1], Juan Luis Arsuaga[a,b,1], Ignacio Martinez[a,c], Carlos Lorenzo[d], José Miguel Carretero[e], José María Bermúdez de Castro[f], and Eudald Carbonell[d]

[a]Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos, c/ Sinesio Delgado 4, Pabellón 14, 28029 Madrid, Spain; [b]Departamento de Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, 28040 Madrid, Spain; [c]Área de Paleontología, Departamento de Geología, Universidad de Alcalá de Henares, 28871 Alcalá de Henares, Spain; [d]Institut de Paleoecología Humana i Evolució Social-Area de Prehistoria, Facultat de Lletres, Universitat Rovira i Virgili, Plaça Imperial Tarraco 1, 43005 Tarragona, Spain; [e]Departamento de Ciencias Históricas y Geografía, Facultad de Humanidades y Educación, Universidad de Burgos, 09001 Burgos, Spain; and [f]Centro Nacional de Investigación sobre la Evolución Humana, Avenida de la Paz 28, 09004 Burgos, Spain

Contributed by Juan Luis Arsuaga, February 12, 2009 (sent for review October 7, 2008)

We report here a previously undescribed human Middle Pleistocene immature specimen, Cranium 14, recovered at the Sima de los Huesos (SH) site (Atapuerca, Spain), that constitutes the oldest evidence in human evolution of a very rare pathology in our own species, lambdoid single suture craniosynostosis (SSC). Both the ecto- and endo-cranial deformities observed in this specimen are severe. All of the evidence points out that this severity implies that the SSC occurred before birth, and that facial asymmetries, as well as motor/cognitive disorders, were likely to be associated with this condition. The analysis of the present etiological data of this specimen lead us to consider that Cranium 14 is a case of isolated SSC, probably of traumatic origin. The existence of this pathological individual among the SH sample represents also a fact to take into account when referring to sociobiological behavior in Middle Pleistocene humans.

human evolution | paleopathology | sociobiology | congenital skull deformation

Paleopathology is the study of past diseases. In paleoanthropology, this is generally restricted to lesions of the bones and teeth. However, paleopathology can also inform about past human behavior in healthy individuals (ref. 1 and references therein), being cautious with the interpretation of health status of individuals and population based on any paleontological data (2, 3). Some pathological lesions produced by or related to human activities, including dietary aspects, can be treated, and social support can be provided by relatives or other members of

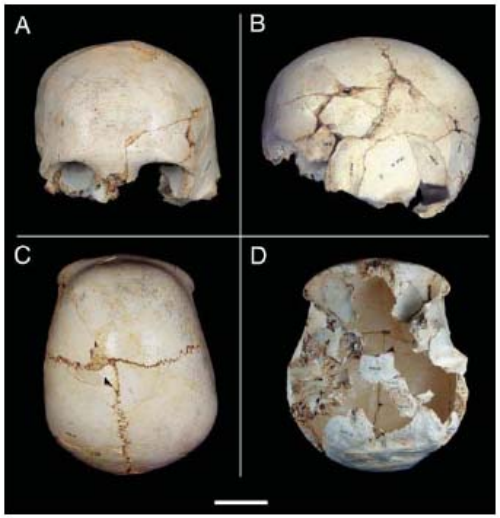
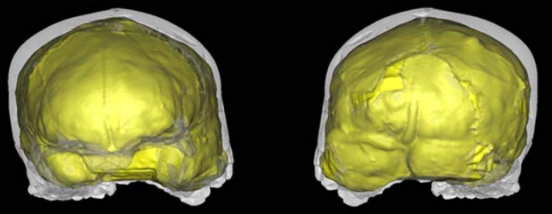
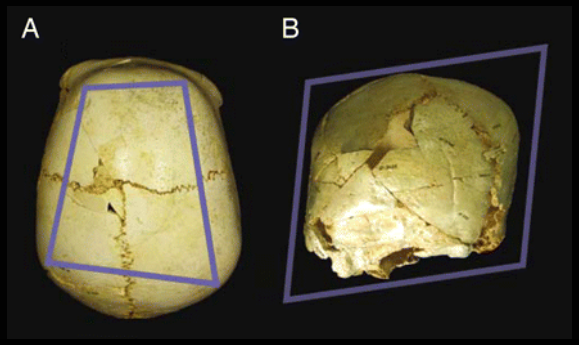
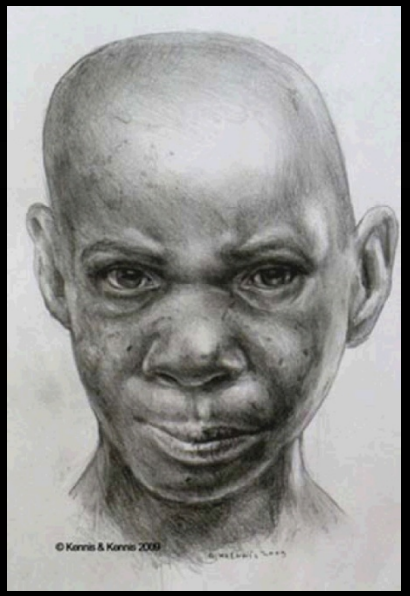


Fig. 1. Cranium 14 from SH site. (*A*) Frontal view, showing the left glenoid and mastoid regions well below those of the right side. (*B*) Left lateral view. Note the rounded profile, and the vertical forehead. (*C*) Superior view. The

ANTHROPOLOGY








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I primi pensatori

MARÍA MARTINÓN-TORRES ON "SPEAKING" TO THE DEAD

SCIENTIST INTERVIEW: DECEMBER 2011



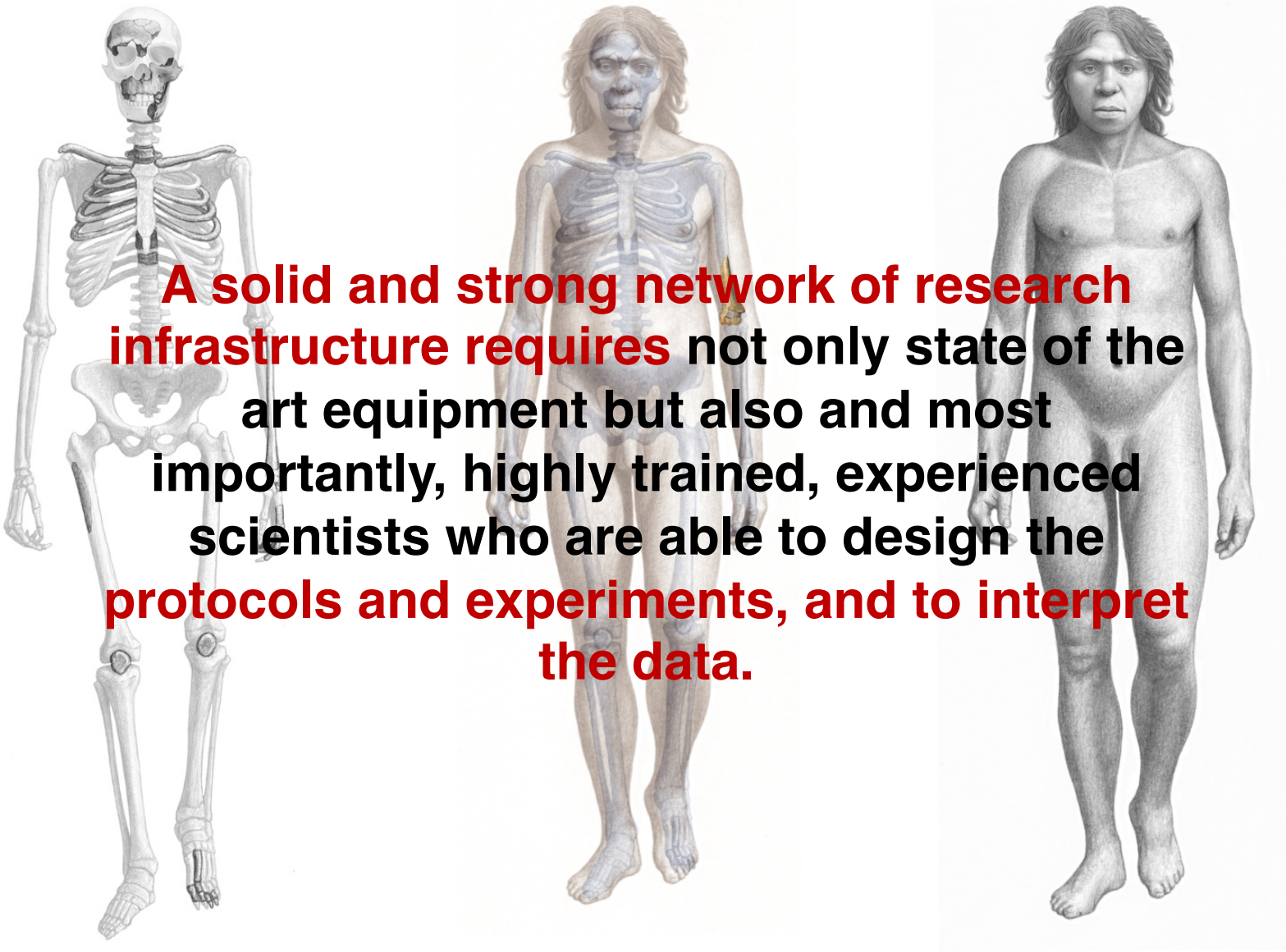
A recent analysis of *Essential Science Indicators*[SM] data from Thomson Reuters showed that the work of Dr. María Martinón-Torres has entered the top 1% in the field of Social Sciences. In addition, one of the papers she co-authored earlier this year, "Hominin variability, climatic instability and population demography in Middle Pleistocene Europe" (*Quaternary Sci. Rev.* 30[11-12]: 1511 -24, Sp. Iss. June 2011), has been named a Hot Paper in Geosciences.

Martinón-Torres is a Research Leader in the Dental Anthropology Group of the Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) in Burgos, Spain.

PHOTO: M. J. SIER.

BELOW, SHE TALKS WITH *SCIENCEWATCH.COM* ABOUT HER HIGHLY CITED WORK.

KEY MESSAGE 3



A solid and strong network of research infrastructure requires not only state of the art equipment but also and most importantly, highly trained, experienced scientists who are able to design the protocols and experiments, and to interpret the data.

EVROPA PRIMA PARS TERRÆ IN FORMA VIRGINIS.

SEPTENTRIO.



MERIDIES.

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Obtinet, Hiſpanum fronte gerit q; ſolum.
Pectore habet Gallos, Germanos corpore geſtat,
Ac pedibus Graios, Sauromatasq; fouet.

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