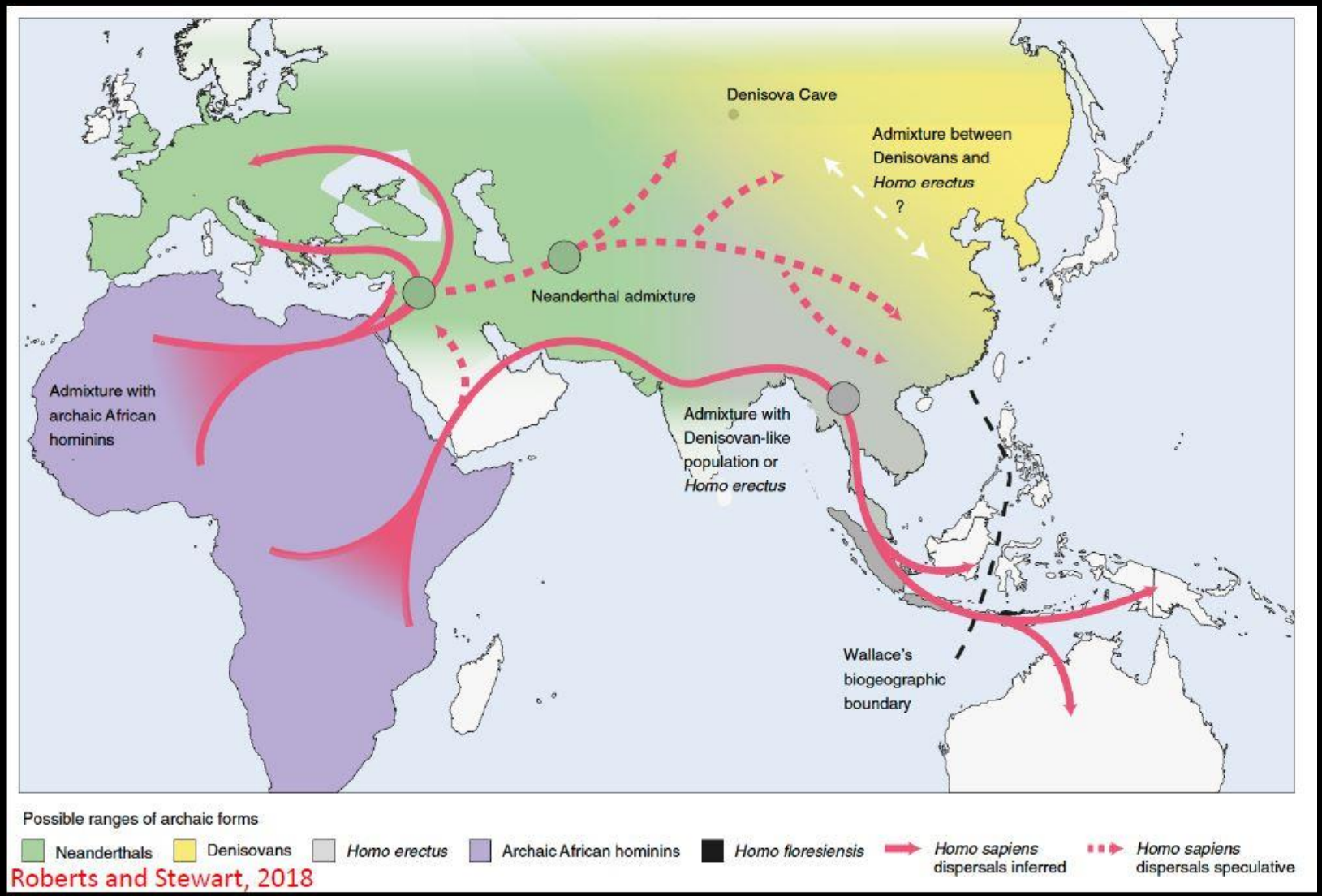
Università
degli Studi
di Ferrara

Marco Peresani

Cronologie e culture del Paleolitico
Lezione 12 – The Neanderthals and other humans and the appearance of the Anatomically Modern Humans



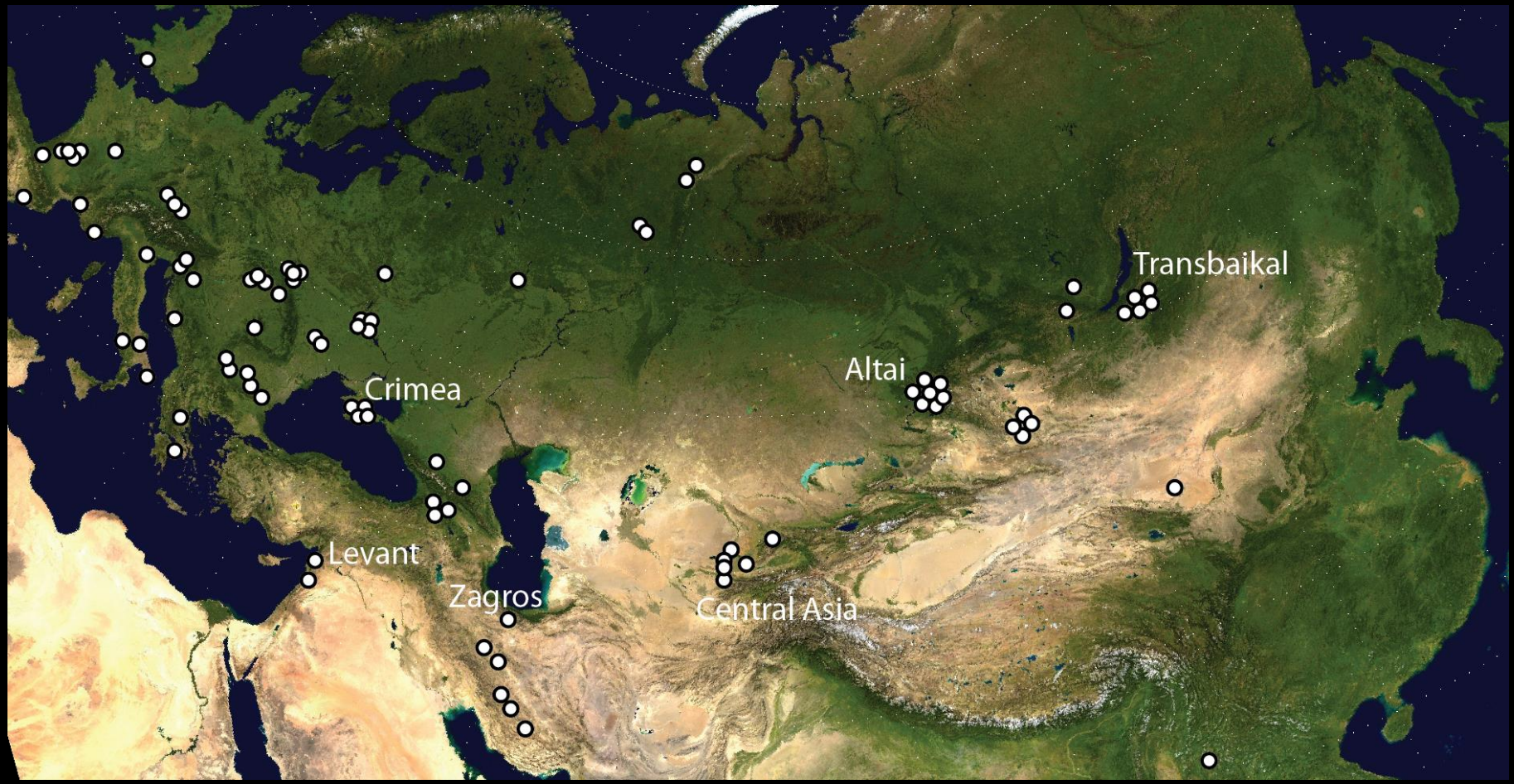
Roberts and Stewart, 2018

The human story 100-30,000 yr ago

until 2008 - 2014

- Neanderthals
- Modern humans
- Denisovans

PalaeoChron project 2013-2019

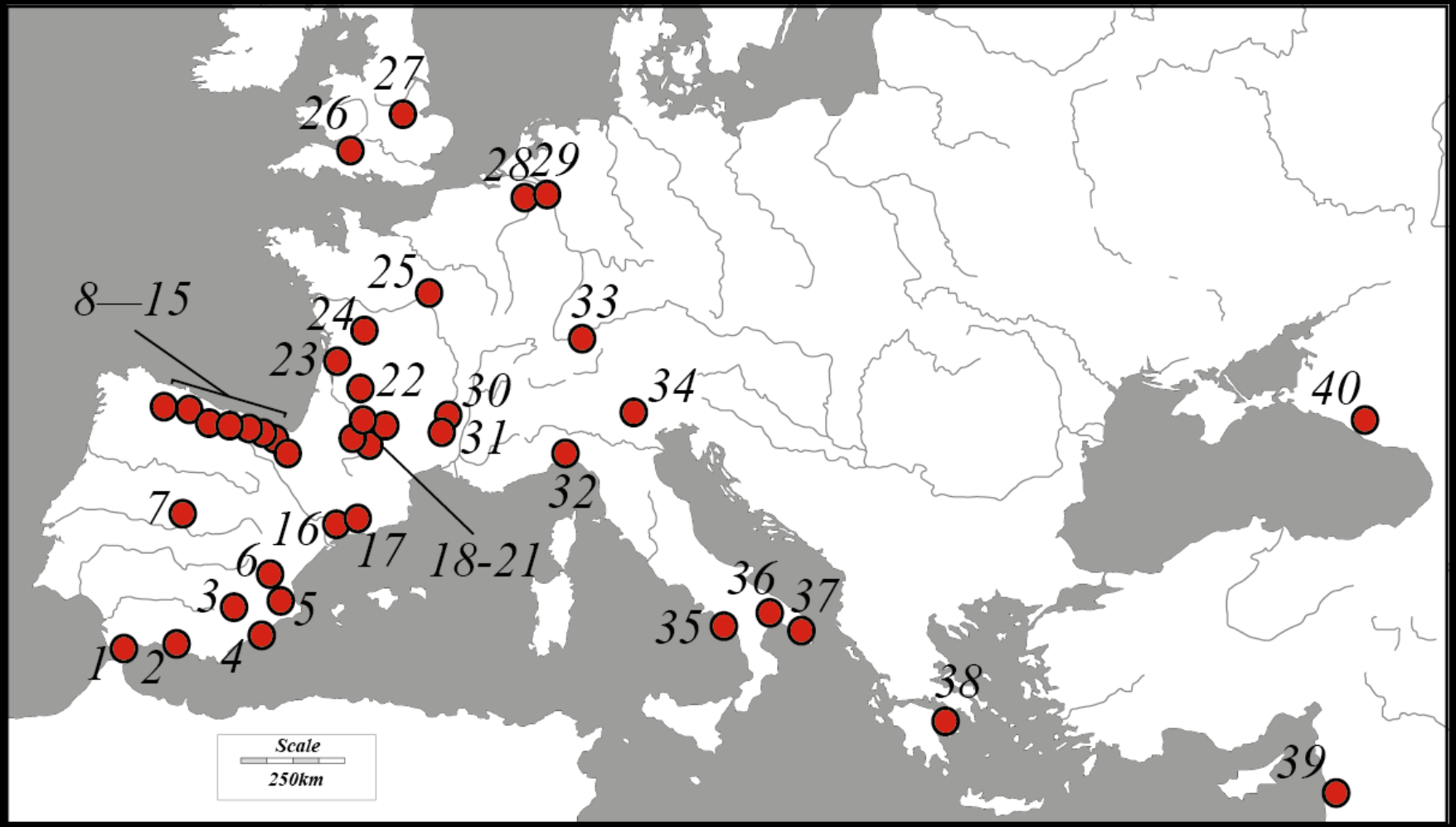


Kennis & Kennis

http://www.sci-news.com/genetics/science-neanderthals-interbred-eurasians-01837.html

When did Neanderthals disappear?

~200 new AMS dates related to Neanderthal occupation



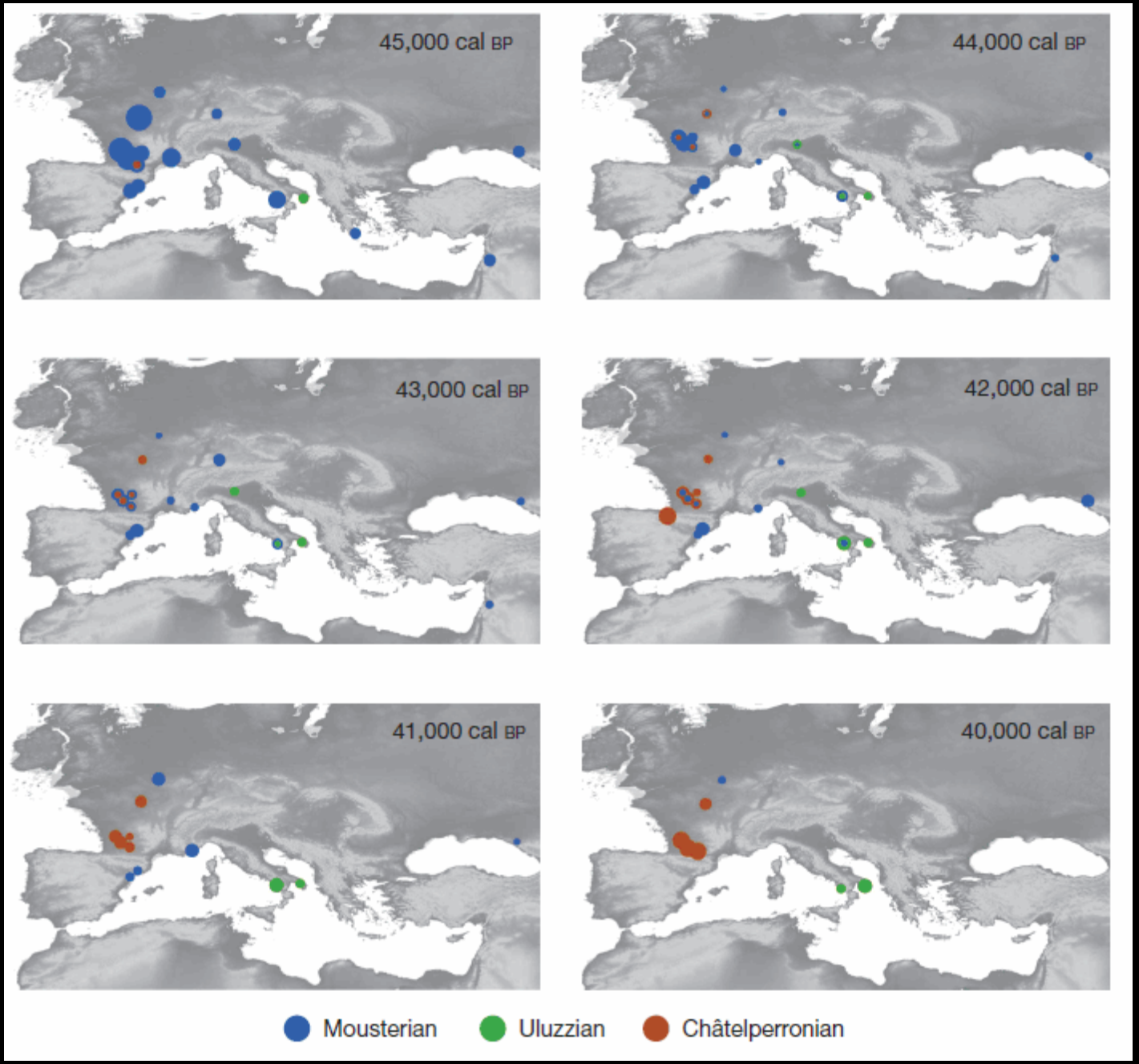
- Neanderthal sites in Europe end ~41,000-39,300 cal BP.
- Variability in the age of final Mousterian sites in Europe.
- Overlap in modern humans and Neanderthals for 2,600-5,400 years (95% prob.)

LETTER

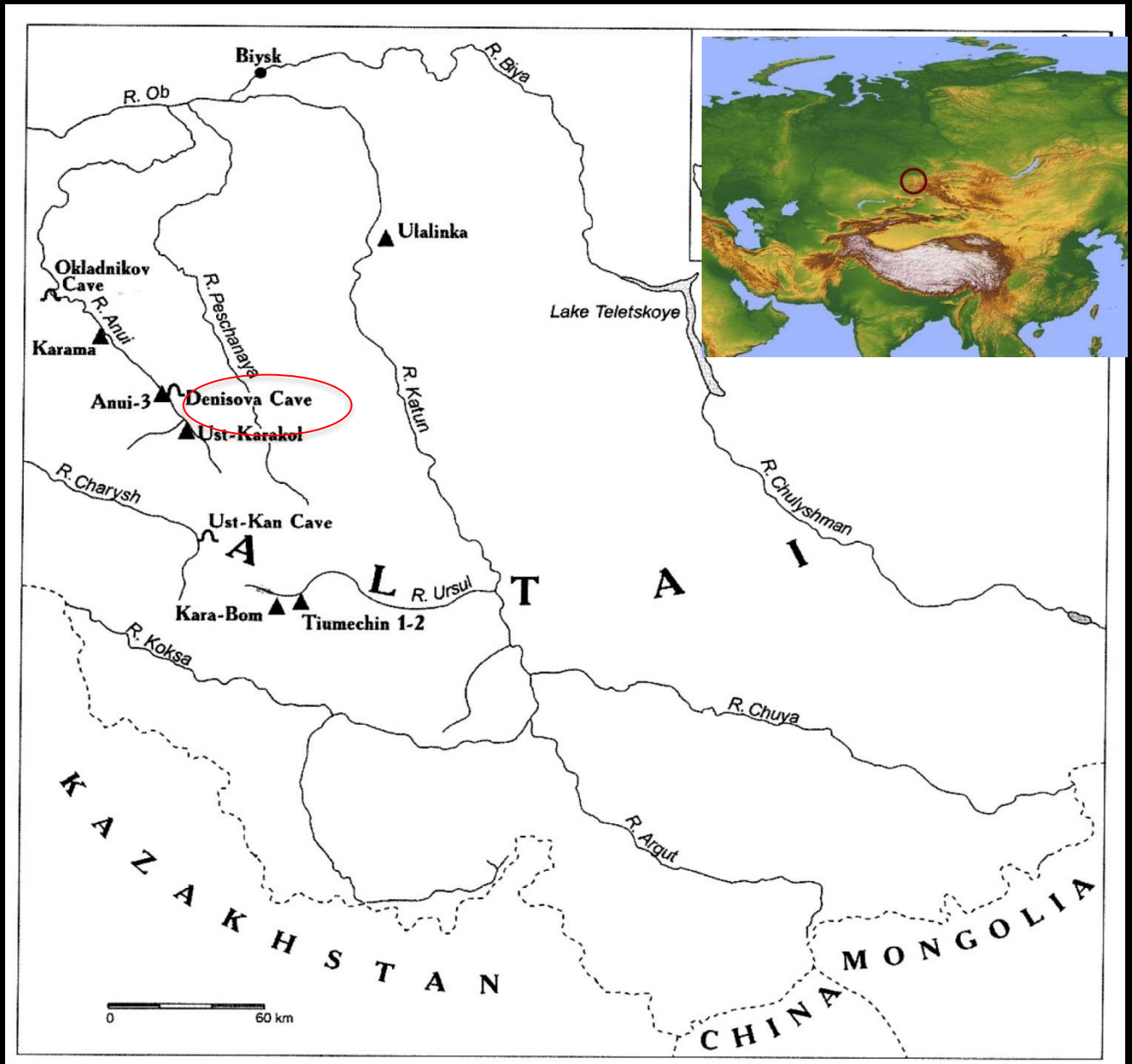
doi:10.1038/nature13621

The timing and spatiotemporal patterning of Neanderthal disappearance

Tom Higham[1], Katerina Douka[1], Rachel Wood[1,2], Christopher Bronk Ramsey[1], Fiona Brock[1], Laura Basell[3], Marta Camps[4], Alvaro Arrizabalaga[5], Javier Baena[6], Cecillio Barroso-Ruíz[7], Christopher Bergman[8], Coralie Boitard[9], Paolo Boscato[10], Miguel Caparrós[11], Nicholas J. Conard[12,13], Christelle Draily[14], Alain Froment[15], Bertila Galván[16], Paolo Gambassini[10], Alejandro Garcia-Moreno[17,37], Stefano Grimaldi[18], Paul Haesaerts[19], Brigitte Holt[20], Maria-Jose Iriarte-Chiapusso[5], Arthur Jelinek[21], Jesús F. Jordá Pardo[22], José-Manuel Maíllo-Fernández[22], Anat Marom[1,23], Julià Maroto[24], Mario Menéndez[22], Laure Metz[25], Eugène Morin[26], Adriana Moroni[10], Fabio Negrino[27], Eleni Panagopoulou[28], Marco Peresani[29], Stéphane Pirson[30], Marco de la Rasilla[31], Julien Riel-Salvatore[32], Annamaria Ronchitelli[10], David Santamaria[31], Patrick Semal[33], Ludovic Slimak[25], Joaquim Soler[24], Narcís Soler[24], Aritza Villaluenga[17], Ron Pinhasi[34] & Roger Jacobi[35,36]‡

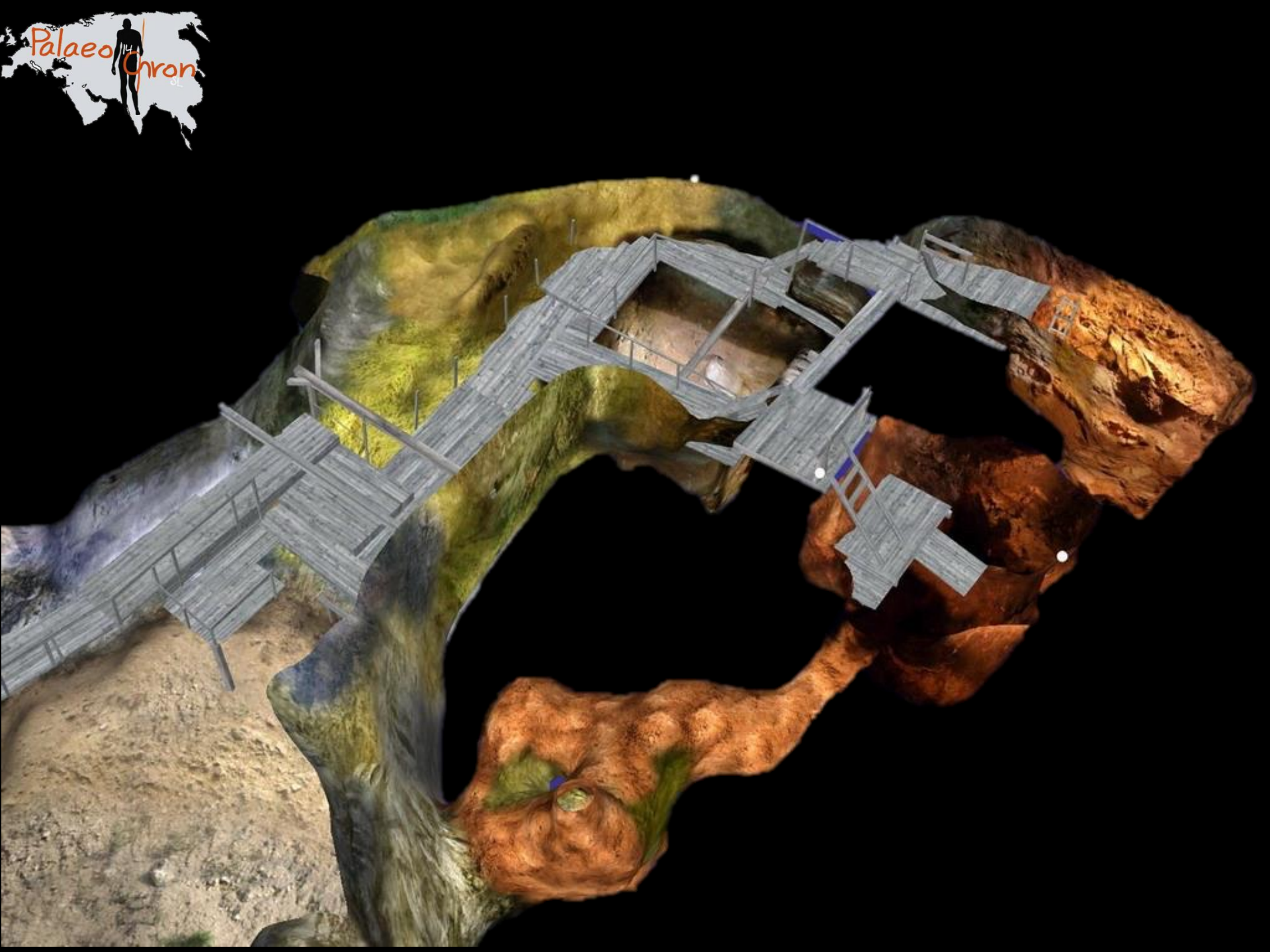

45,000 cal BP
44,000 cal BP
43,000 cal BP
42,000 cal BP
41,000 cal BP
40,000 cal BP
Mousterian
Uluzzian
Châtelperronian

Denisova Cave

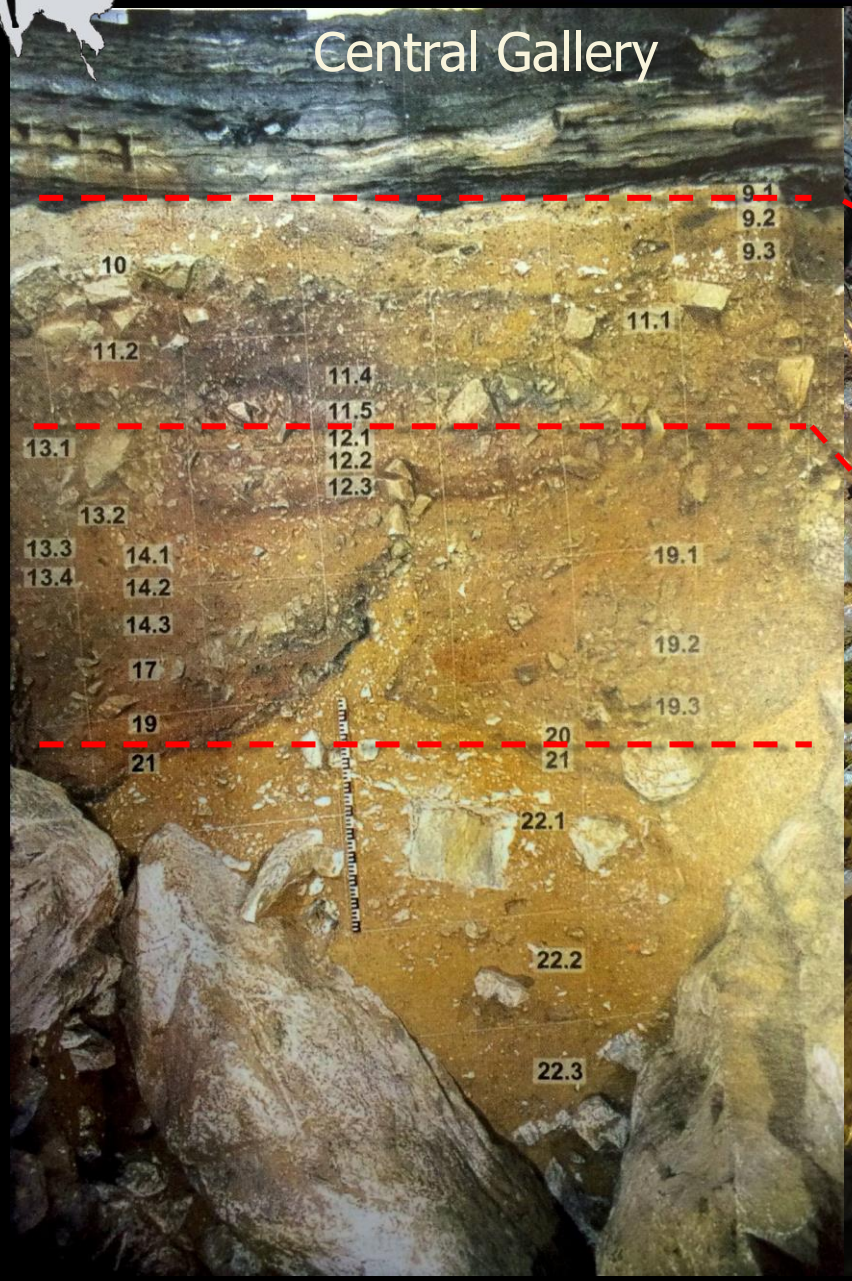


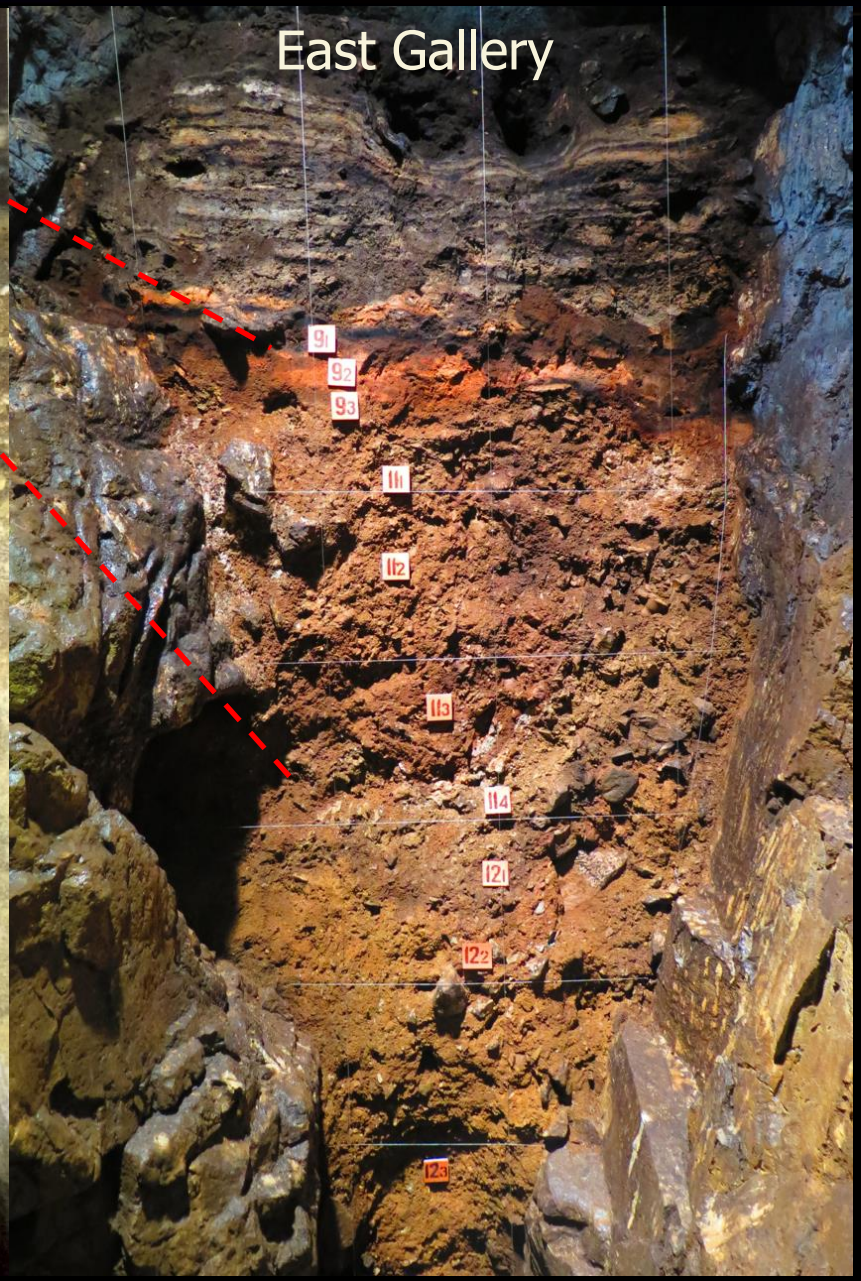
Denisovans

"The genome in search of a fossil"


Palaeo
Chron

Stratigraphy





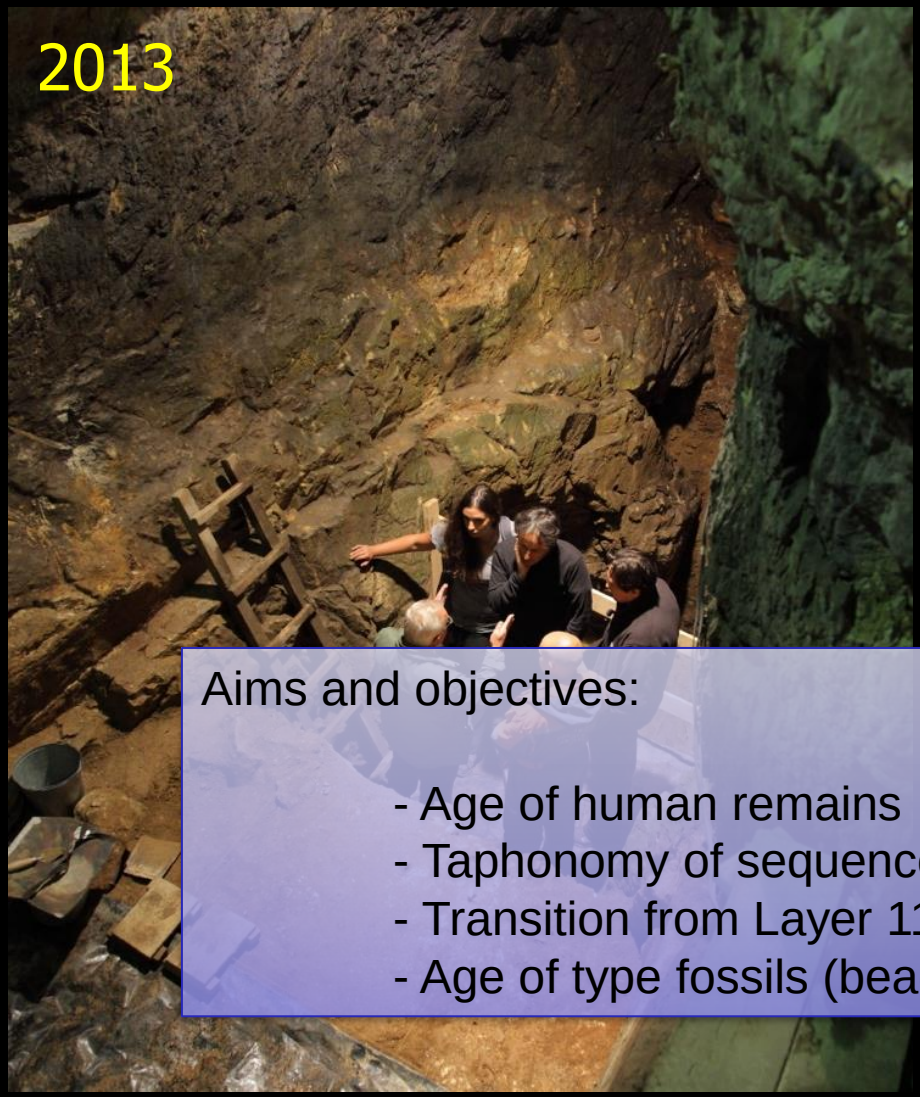
Hol

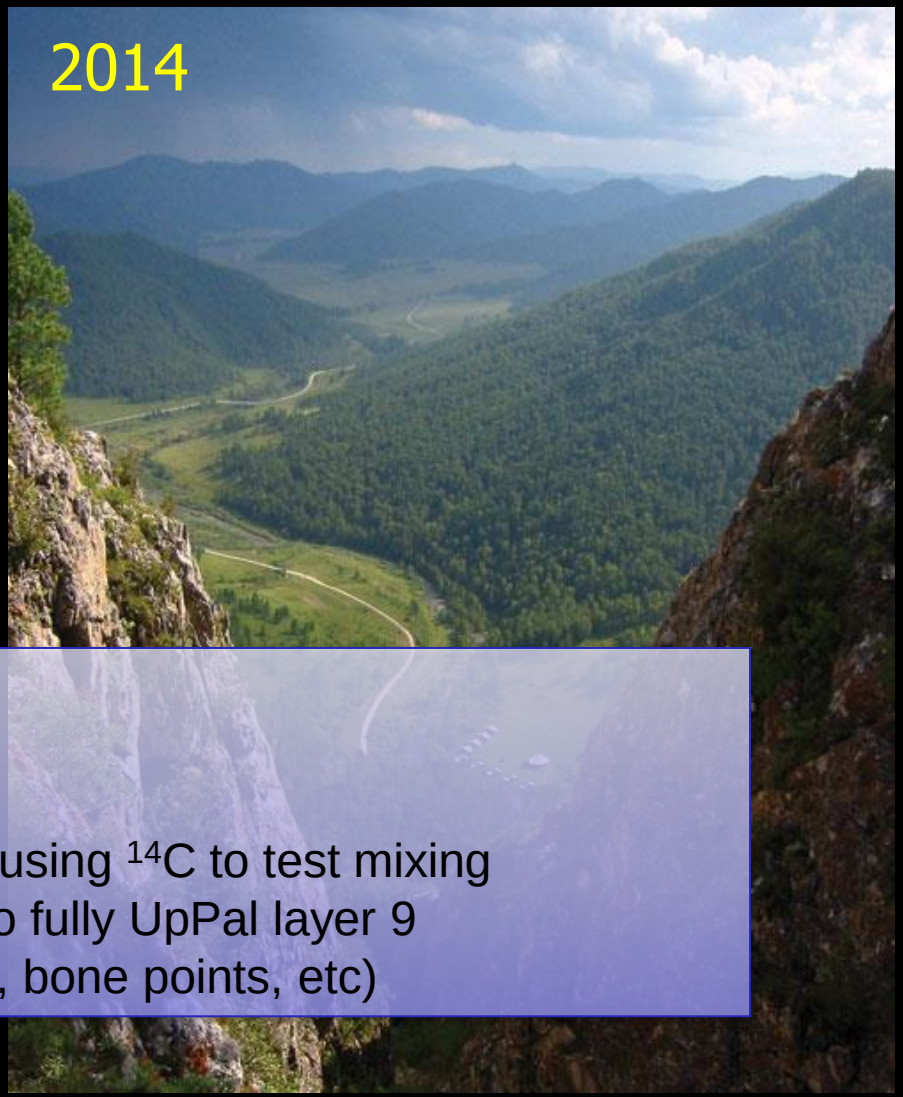
EU Pal 11-9

M Pal 20-12

Acheulean?/Early M Pal 22-21

New dating

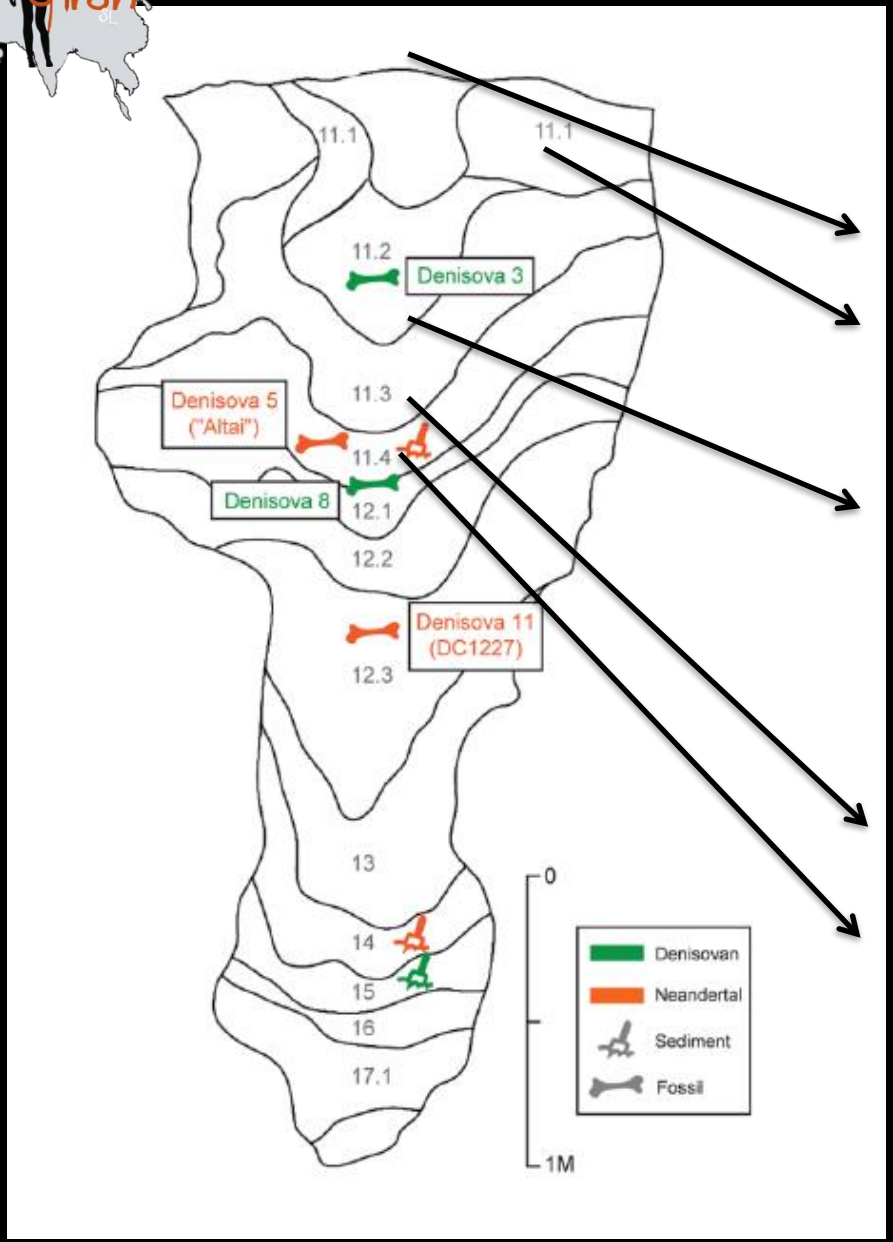




Aims and objectives:

- Age of human remains
- Taphonomy of sequence, using ^{14}C to test mixing
- Transition from Layer 11 to fully UpPal layer 9
- Age of type fossils (beads, bone points, etc)

New ^{14}C dates



9.2 : 45,500 ± 2300

11.1 : 27,820 ± 340 *bead*
47,900 ± 3100

11.2 : 35,400 ± 900 *bead*
41,300 ± 2400 *bead*
41,300 ± 900
> 48600
> 50100

11.3 : > 49400

11.4 : > 47900
>49900
>50000
>50000

Phalanx context (same layer, square & year of excav.)

Human remains

Denisova 4: Molar, South Gallery, Layer 11.1 – m. DENISOVAN

Denisova 3: Finger phalanx, East Gallery, Layer 11.2 – f. DENISOVAN

Denisova 5 ("Altai"): Toe phalanx, East gallery, Layer 11.4 – f. NEANDERTHAL

Denisova 8: Molar, East gallery, Layer 11. 4 – m. DENISOVAN

Denisova 9: Hand phalanx, East gallery, Layer 12.4 – m. NEANDERTHAL

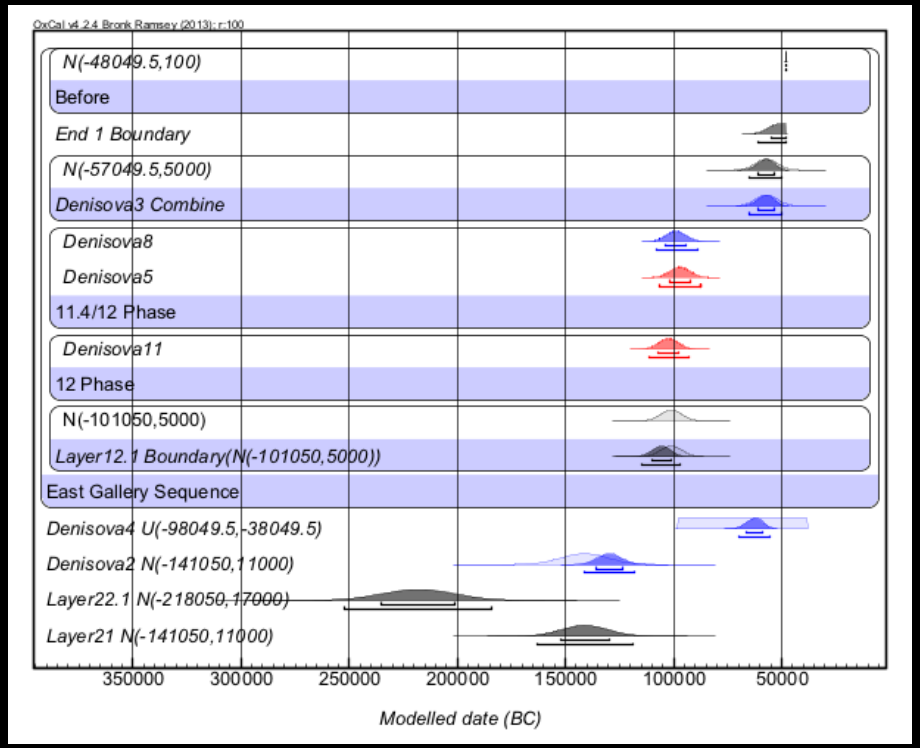
Denisova 2: Molar, Central Gallery, Layer 22.1 – f. DENISOVAN

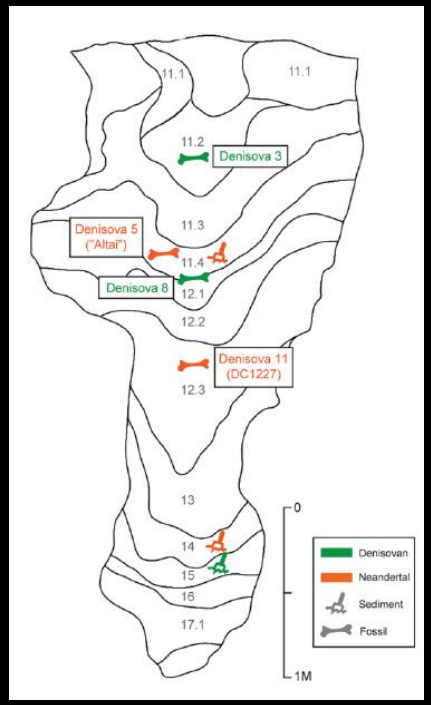
Reich et al. 2010, Krause et al. 2010; Sawyer et al. 2015, Slon et al. 2017

New ^{14}C dates from the ORAU

Bayesian modelling

Age estimates for hominin fossils and the onset of the Upper Palaeolithic at Denisova Cave





All Neanderthal fossils — as well as Denisova 11, the daughter of a Neanderthal and a Denisovan — date to between 80,000 and 140,000 years ago. The youngest Denisovan dates to 52,000–76,000 years ago. Direct radiocarbon dating of Upper Palaeolithic tooth pendants and bone points yielded the earliest evidence for the production of these artefacts in northern Eurasia, between 43,000 and 49,000 calibrated years before present (taken as ad 1950).

Homo floresiensis (Flores)

Liang Bua

100,000-60,000 ka

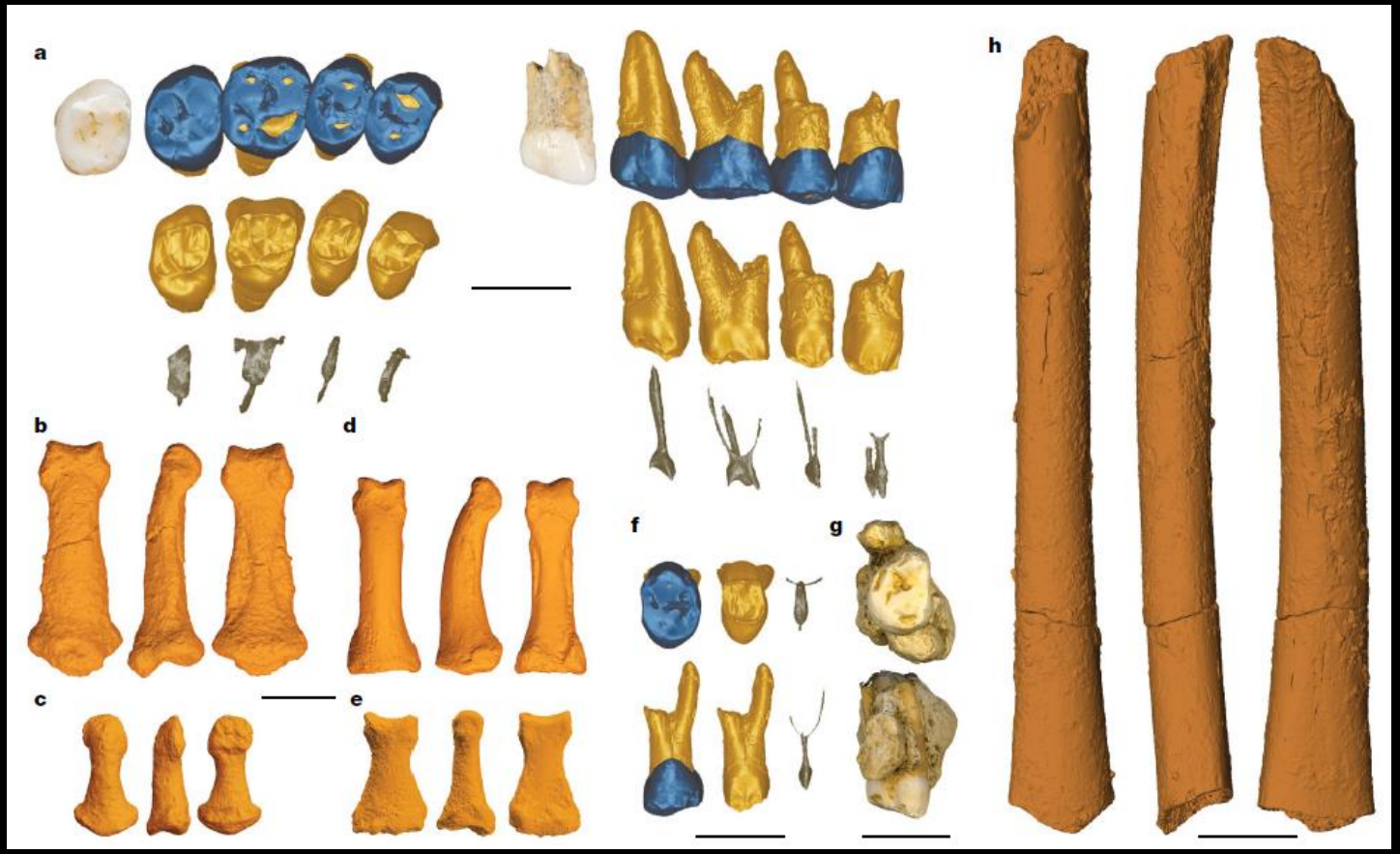
A new species of *Homo* from the Late Pleistocene of the Philippines

Florent Détroit[1]*, Armand Salvador Mijares[2,3]*, Julien Corny[1], Guillaume Daver[4], Clément Zanolli[5,6], Eusebio Dizon[3], Emil Robles[2], Rainer Grün[7,8] & Philip J. Piper[3,9]

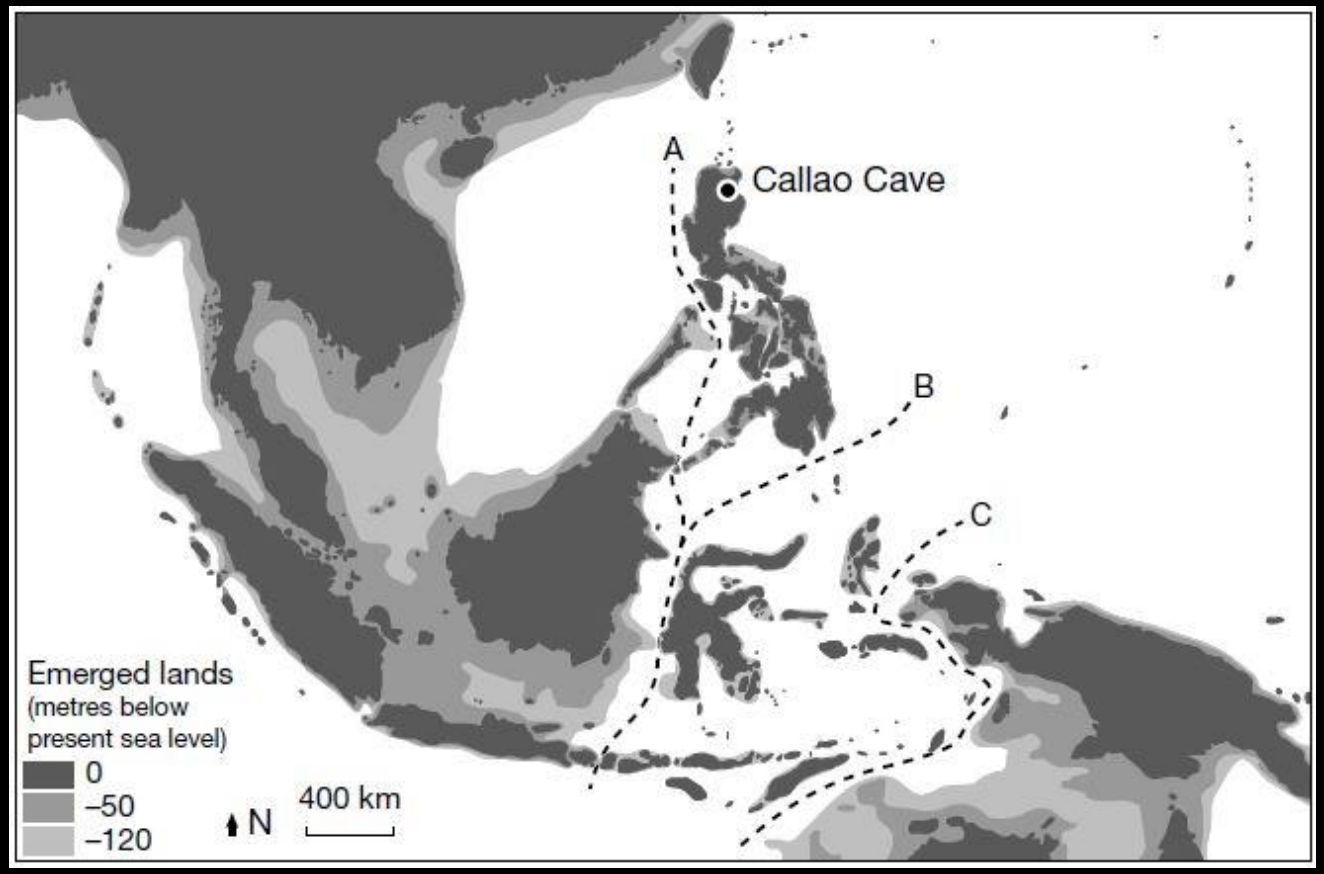
Bone remains from three homin individuals discovered since 2007 in Callao Cave (Northern Luzon, the Philippines) and dated to 67 ky BP provide the earliest direct evidence of a human presence in the Philippines.

Specimens display a combination of primitive and derived morphological features that is different from the combination of features found in other species in the genus Homo (including *Homo floresiensis* and *Homo sapiens*) and warrants their attribution to a new species, which we name *Homo luzonensis*.

The presence of another and previously unknown hominin species east of the Wallace Line during the Late Pleistocene epoch underscores the importance of island Southeast Asia in the evolution of the genus Homo.

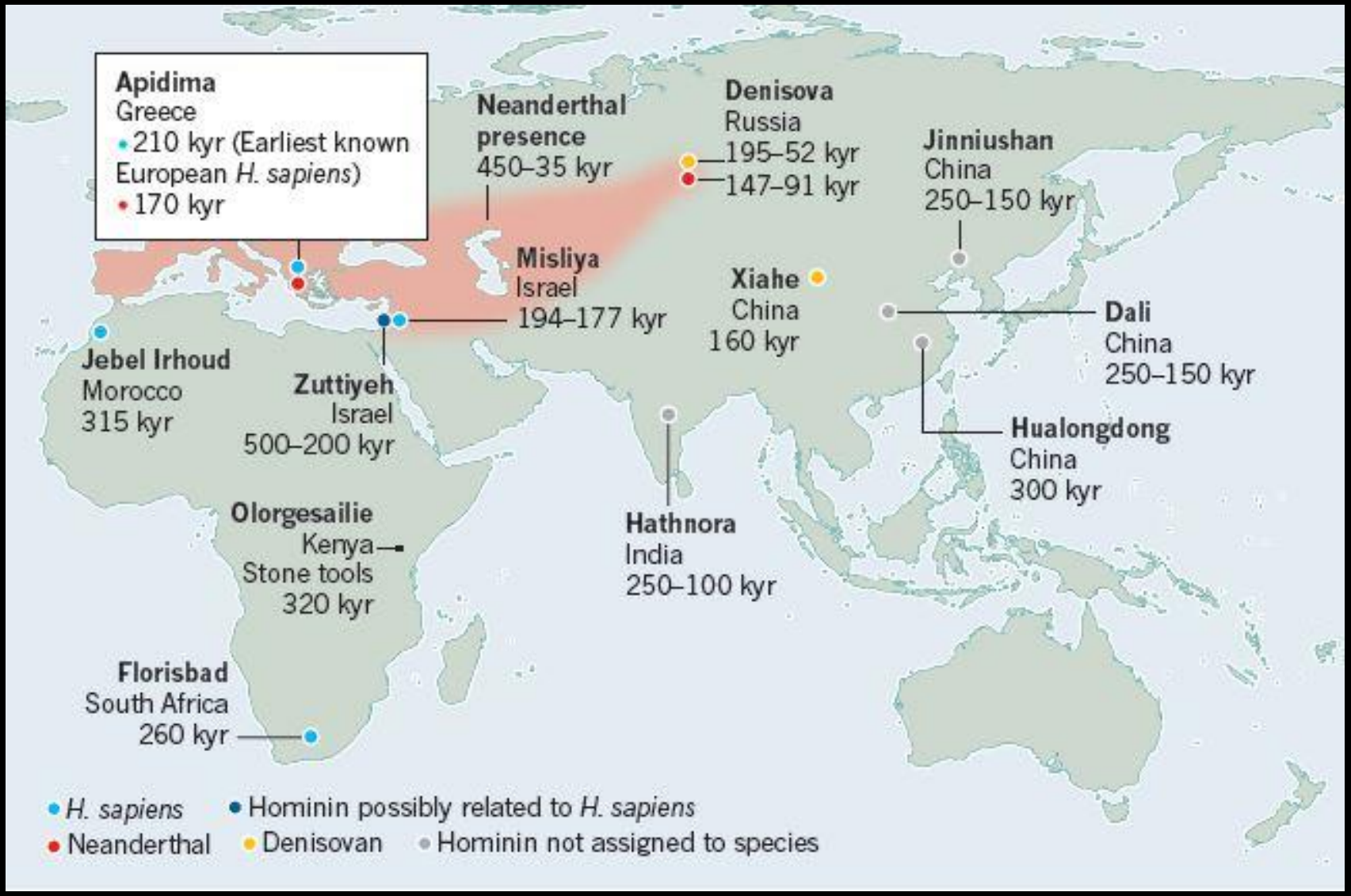


Fossil remains of *H. luzonensis*.
a, **Holotype** CCH6: postcanine maxillary teeth in occlusal (left) and buccal (right) aspects, with three-dimensional rendering of enamel (dark blue), dentine and cement (light brown), and pulp cavity (dark grey) for CCH6-b–CCH6-e.



Map showing the location of Callao Cave on Luzon Island (the Philippines), emerged lands at 50 and 120 m below present sea level and the major biogeographical boundaries recognized in the area.
A, Wallace's Line modified by Huxley;
B, Wallace's Line;
C, Lydekker's Line.
Luzon Island lies in between the original Wallace's Line and the Wallace's Line modified by Huxley and was never connected to mainland Asia during the Quaternary.

THE THIRD OUT OF AFRICA: HOMO SAPIENS



Some key early fossils of Homo sapiens and related species in Africa and Eurasia.

La valle del fiume Omo, in Etiopia.

Abdur
(125.000 anni fa)

Lago Ciad

Herto Bouri
(160.000-154.000 anni fa)

Omo Valley
(195.000 anni fa)

GREAT RIFT VALLEY

Lago Turkana

GREAT RIFT VALLEY

Lago Vittoria

GREAT RIFT VALLEY

Lago Tanganica

GREAT RIFT VALLEY

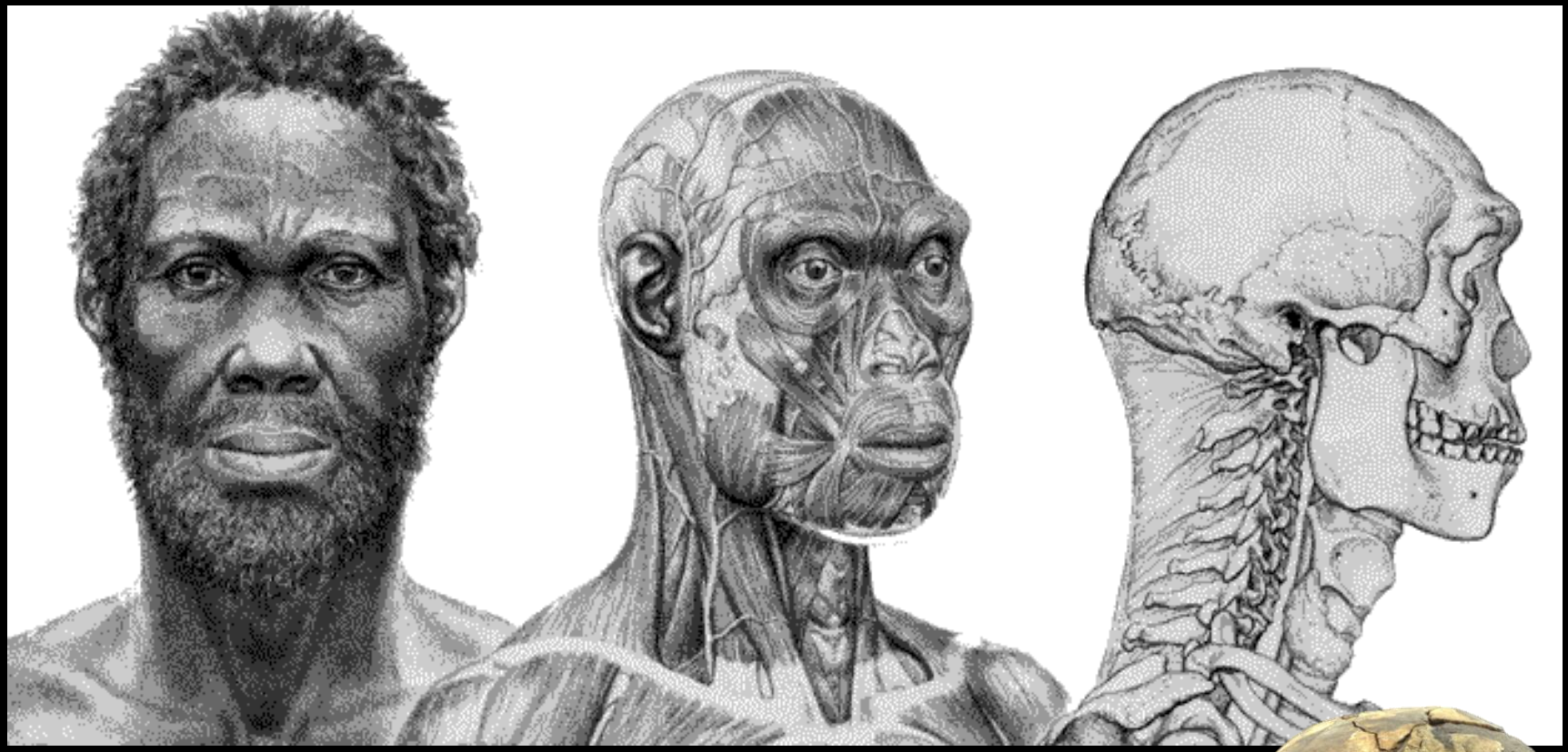
Lago Malawi / Niassa

Border Cave
(100.000 anni fa)

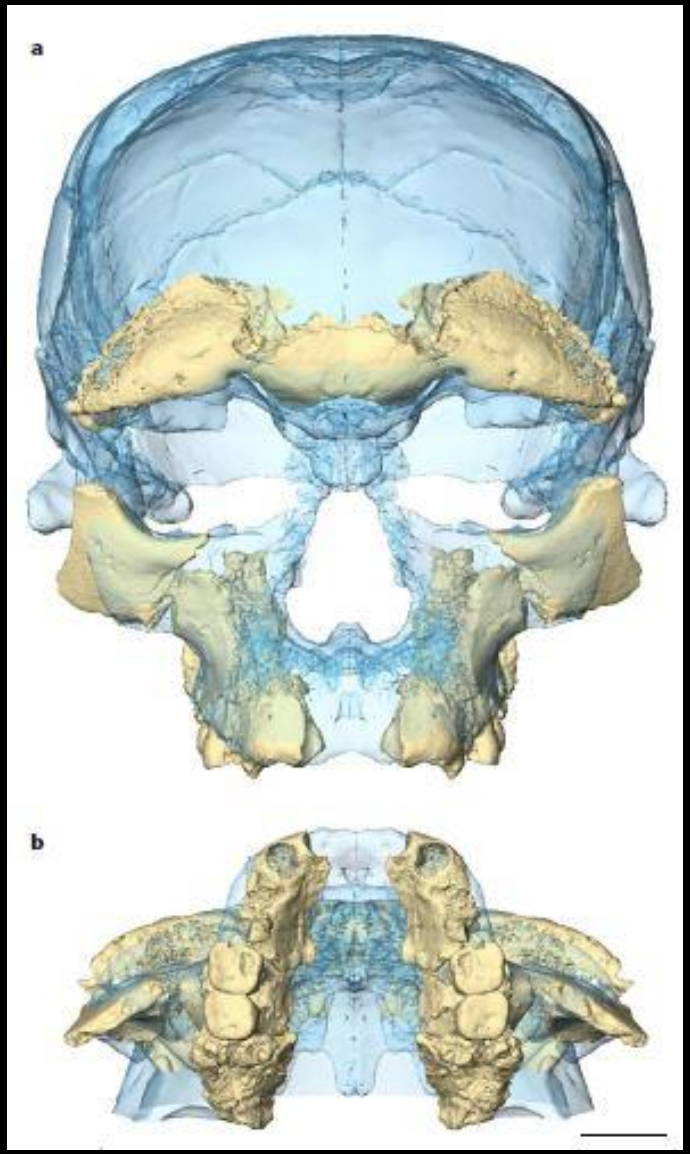
Pinnacle Point
(164.000 anni fa)

Klasies River Cave
(120.000-60.000 anni fa)

Blombos Cave
(140.000-100.000 anni fa)



Homo sapiens hidaltu, 160K



LETTER

doi:10.1038/nature22336

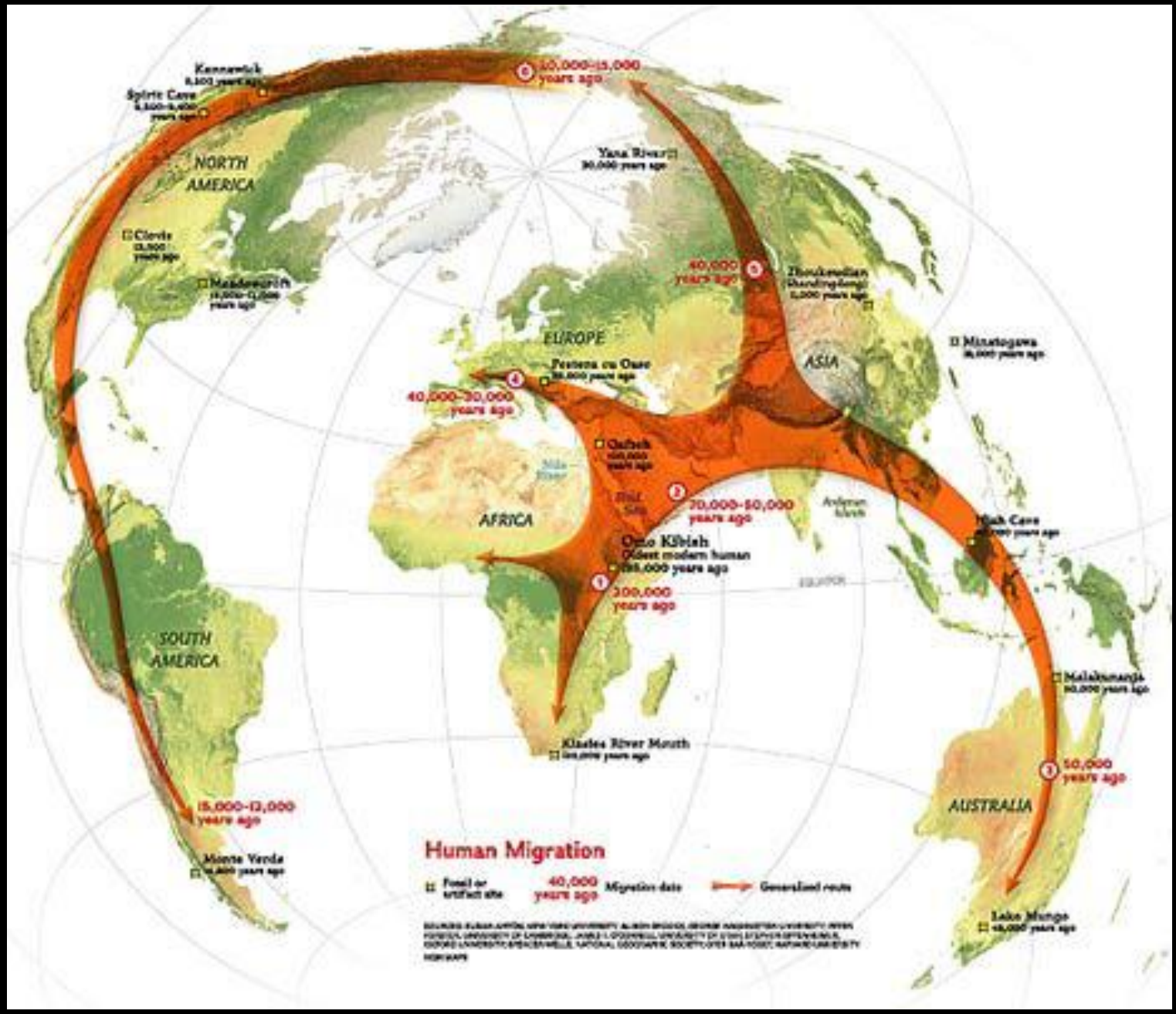
New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*

Jean-Jacques Hublin[1,2], Abdelouahed Ben-Ncer[3], Shara E. Bailey[4], Sarah E. Freidline[1], Simon Neubauer[1], Matthew M. Skinner[5], Inga Bergmann[1], Adeline Le Cabec[1], Stefano Benazzi[6], Katerina Harvati[7] & Philipp Gunz[1]

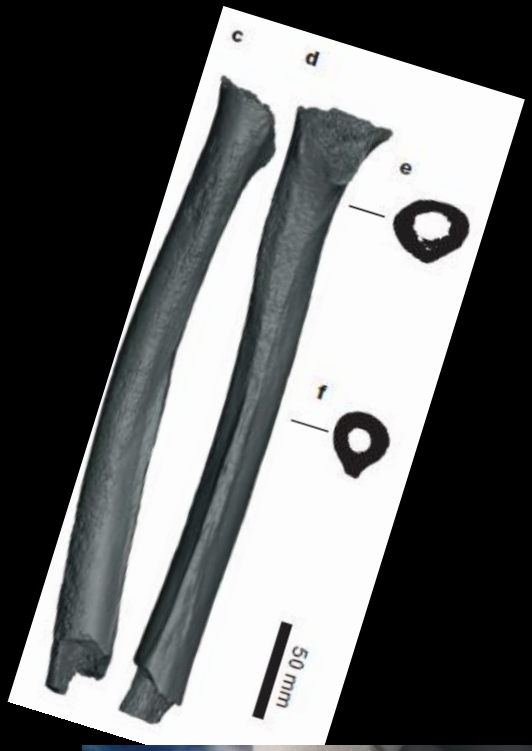
We identified a mosaic of features including facial, mandibular and dental morphology that aligns the Jebel Irhoud material with early or recent anatomically modern humans and more primitive neurocranial and endocranial morphology.

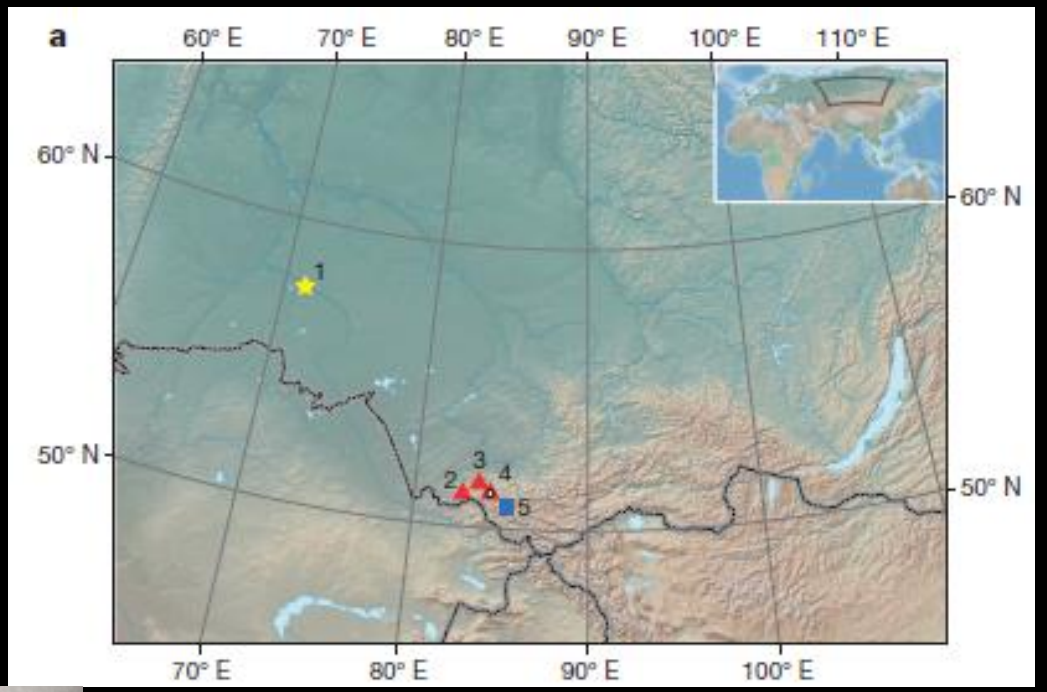
In combination with an age of 315 ± 34 thousand years, this evidence makes Jebel Irhoud the oldest and richest African Middle Stone Age hominin site that documents early stages of the *H. sapiens* clade in which key features of modern morphology were established.

Furthermore, it shows that the evolutionary processes behind the emergence of *H. sapiens* involved the whole African continent.


NORTH AMERICA
SOUTH AMERICA
EUROPE
ASIA
AFRICA
AUSTRALIA
40,000–15,000 years ago
40,000 years ago
40,000–30,000 years ago
70,000–50,000 years ago
200,000 years ago
50,000 years ago
15,000–12,000 years ago
Kennewick
Spirit Cave
Clovis
Meadowcroft
Yana River
Zhoukoudian
Mintagawa
Peștera cu Oase
Qafzeh
Omo Kibish
Oldest modern human
195,000 years ago
Niah Cave
Malakunanja
Klasies River Mouth
Monte Verde
Lake Mungo
Human Migration
Fossil or artifact site
40,000 years ago
Migration date
Generalized route

First modern humans in Central Asia





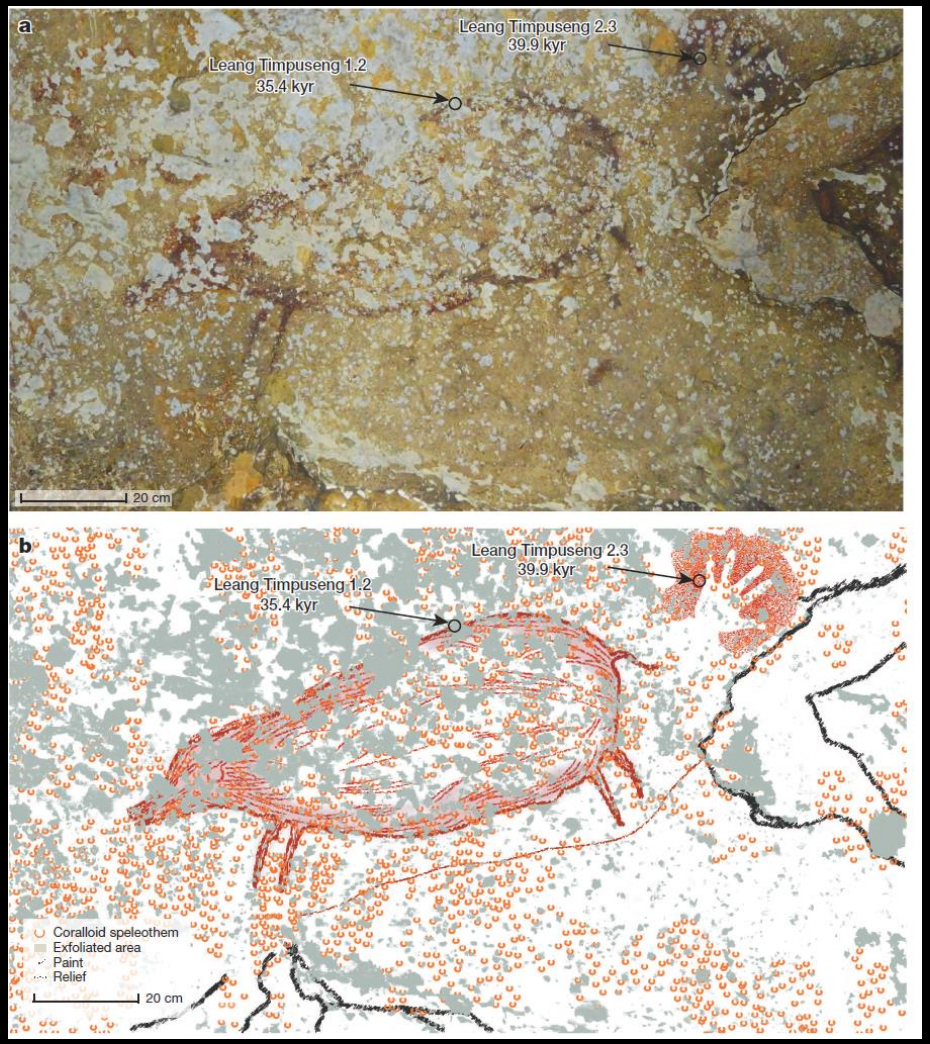
Ust-ishim femura

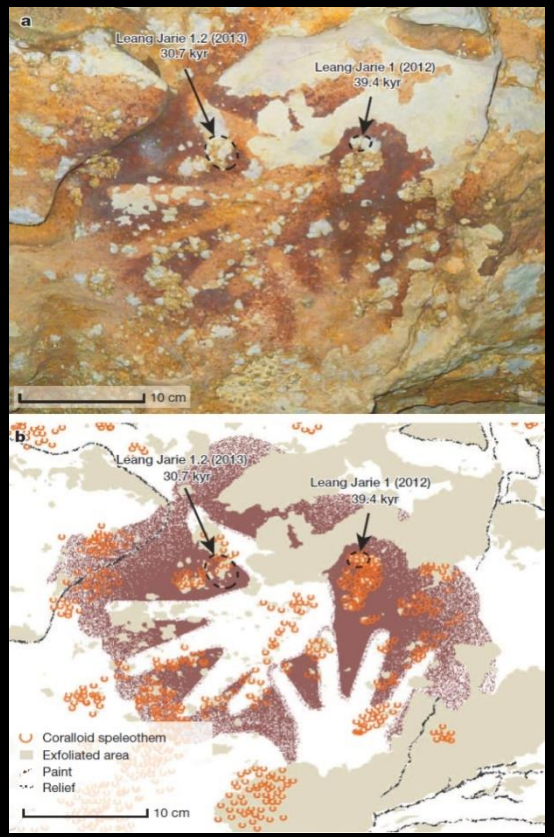
LETTER

doi:10.1038/nature13422

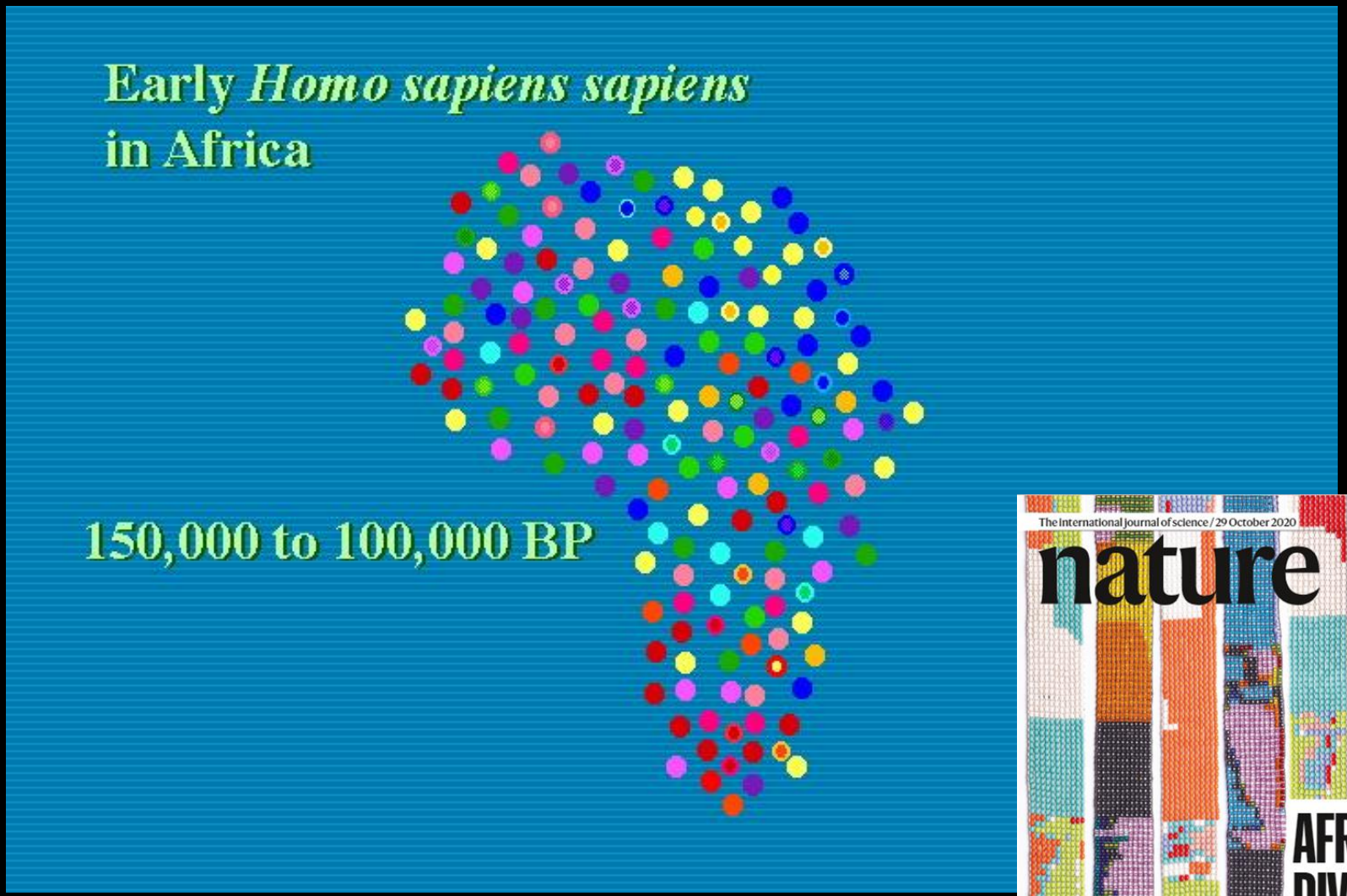
Pleistocene cave art from Sulawesi, Indonesia

M. Aubert[1,2]*, A. Brumm[1]†*, M. Ramli[3], T. Sutikna[1,4], E. W. Saptomo[4], B. Hakim[5], M. J. Morwood‡, G. D. van den Bergh[1], L. Kinsley[6] & A. Dosseto[7,8]



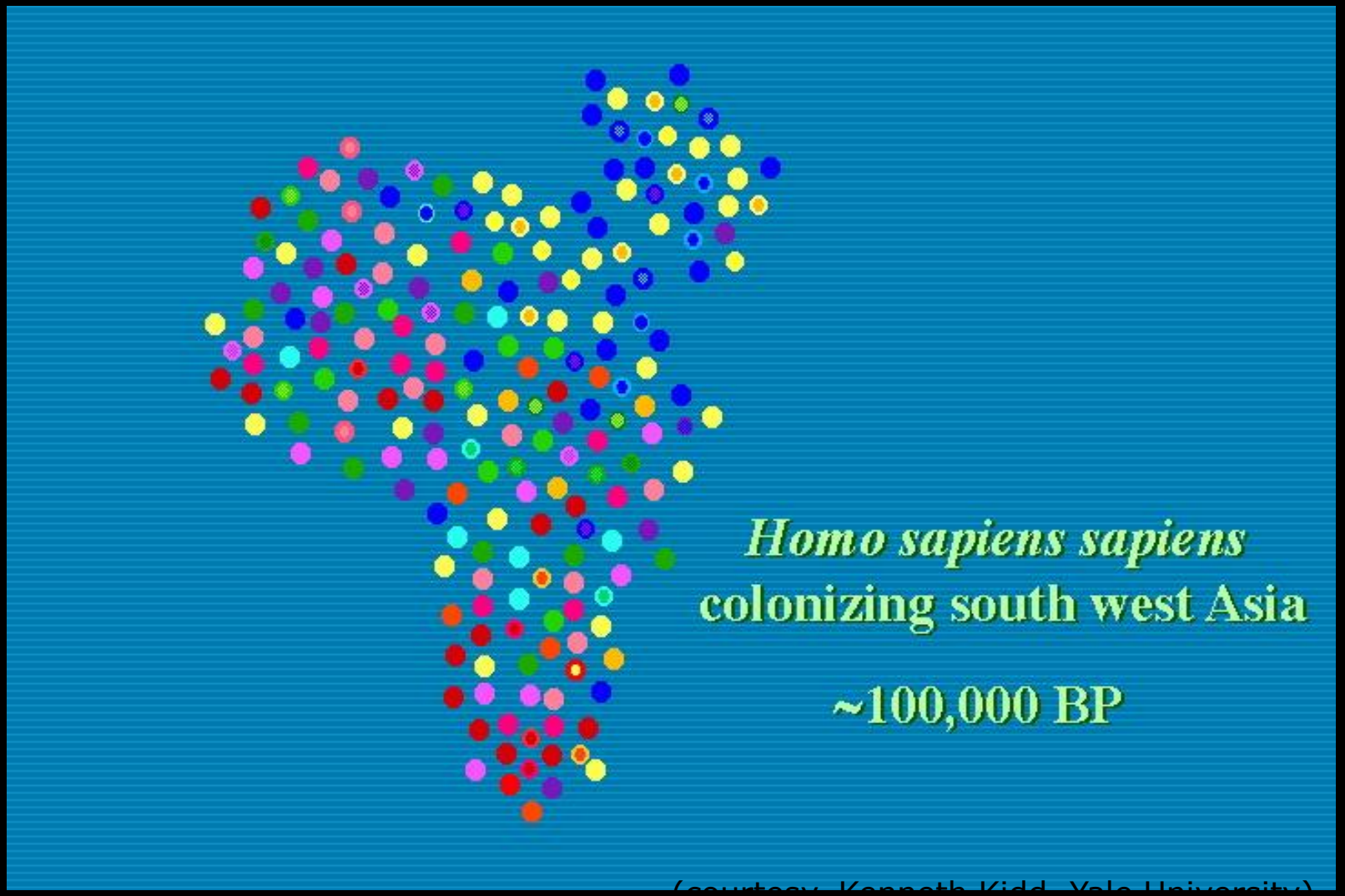


Genetic variability of african population

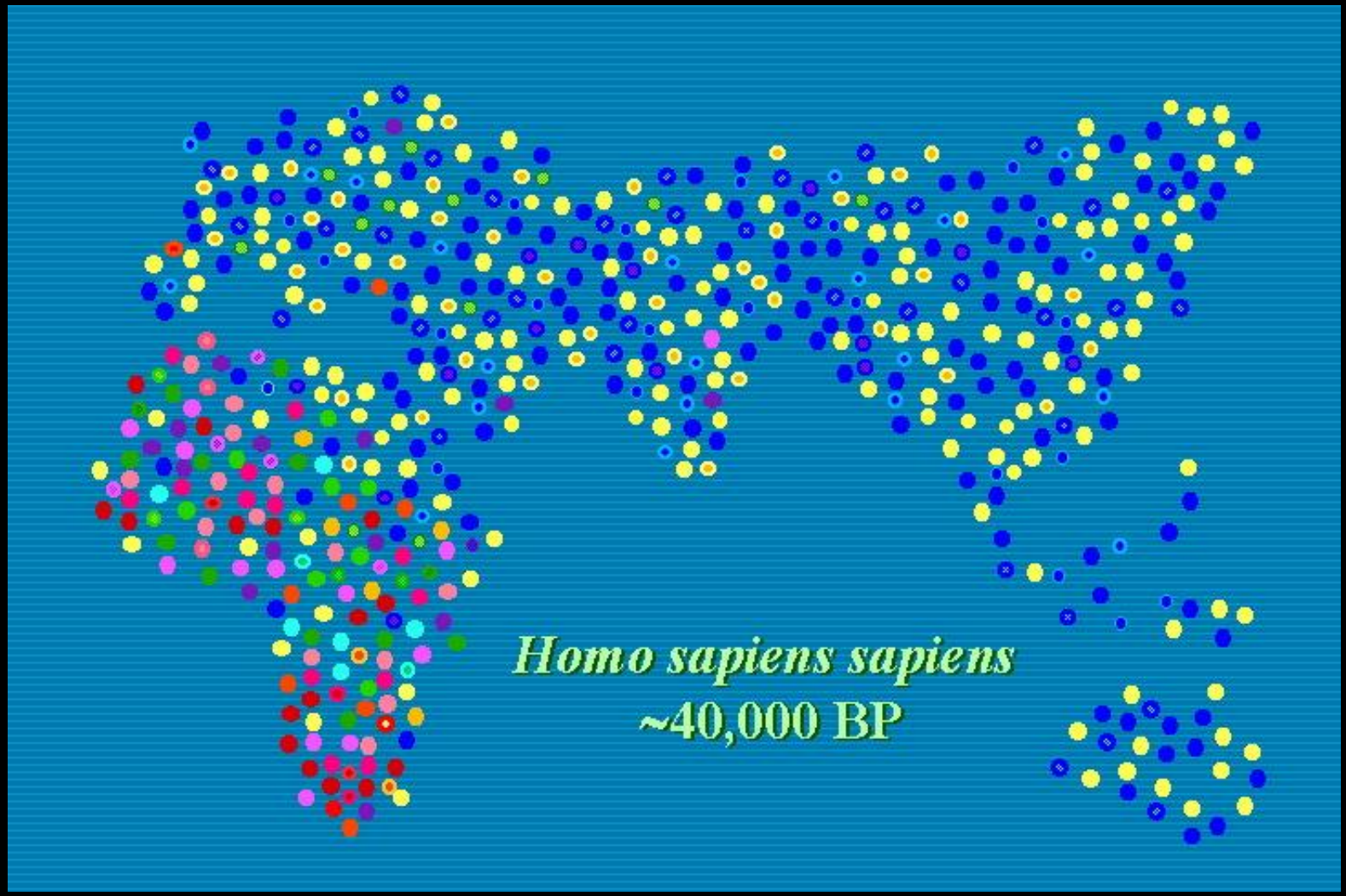


(courtesy, Kenneth Kidd, Yale University)

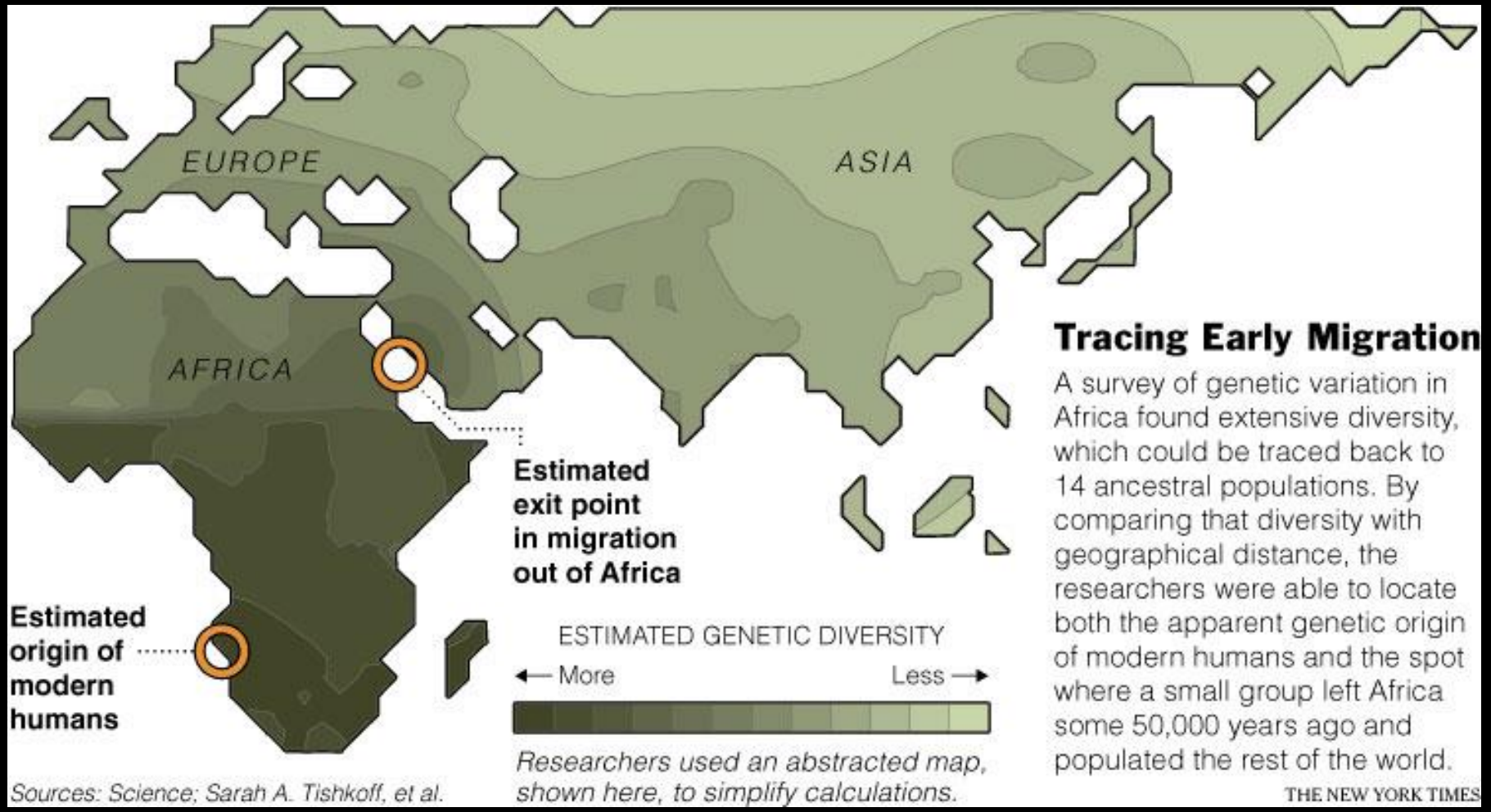
Genetic drift of the first AMH populations out of Africa



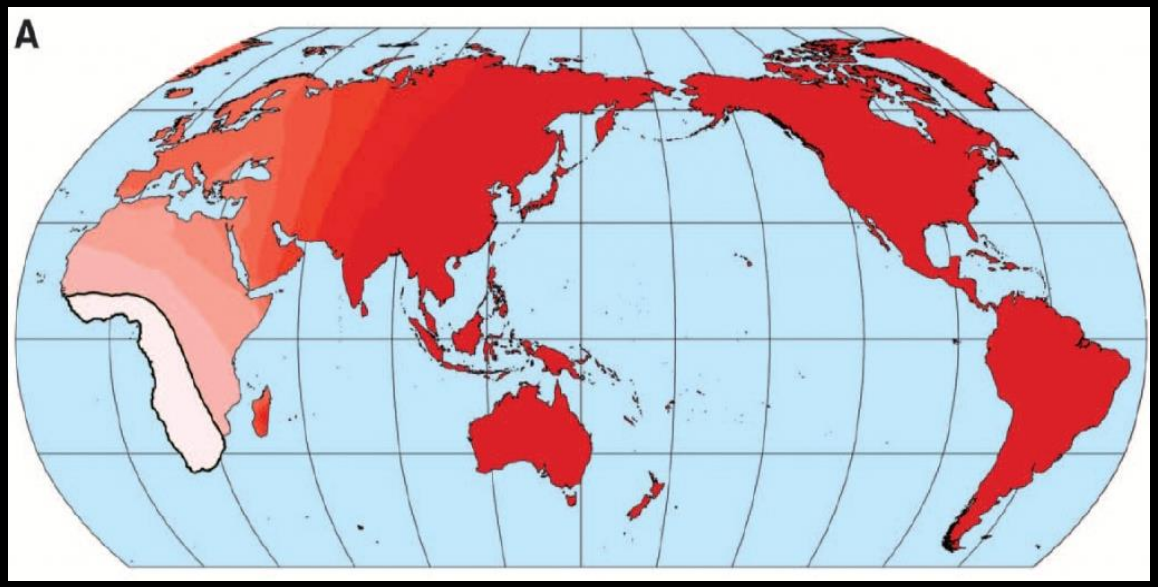
Reduction of genetic variability of euroasiatic population



(courtesy, Kenneth Kidd, Yale University)


EUROPE
ASIA
AFRICA
Estimated exit point in migration out of Africa
Estimated origin of modern humans
ESTIMATED GENETIC DIVERSITY
More
Less
Researchers used an abstracted map, shown here, to simplify calculations.
Sources: Science; Sarah A. Tishkoff, et al.
Tracing Early Migration
A survey of genetic variation in Africa found extensive diversity, which could be traced back to 14 ancestral populations. By comparing that diversity with geographical distance, the researchers were able to locate both the apparent genetic origin of modern humans and the spot where a small group left Africa some 50,000 years ago and populated the rest of the world.
THE NEW YORK TIMES

A connection between language and expansion?



Atkinson, Q. D. 2011. Science 332:346-349.

"Truly modern language, akin to languages spoken today, may thus have been the key cultural innovation that allowed the emergence of these and other hallmarks of behavioral modernity and ultimately led to our colonization of the globe"

"Language was central to human expansion across the globe. It was our secret weapon, and as soon we got language we became a really dangerous species"

(Mark Pagel, NYT, April 14, 2011)

"Close Encounters of the Prehistoric Kind"

Science, May 7, 2010

"The long-awaited sequence of the Neanderthal genome suggests that modern humans and Neanderthals interbred tens of thousands of years ago, perhaps in the Middle East"

Ancient DNA pinpoints Paleolithic liaison in Europe

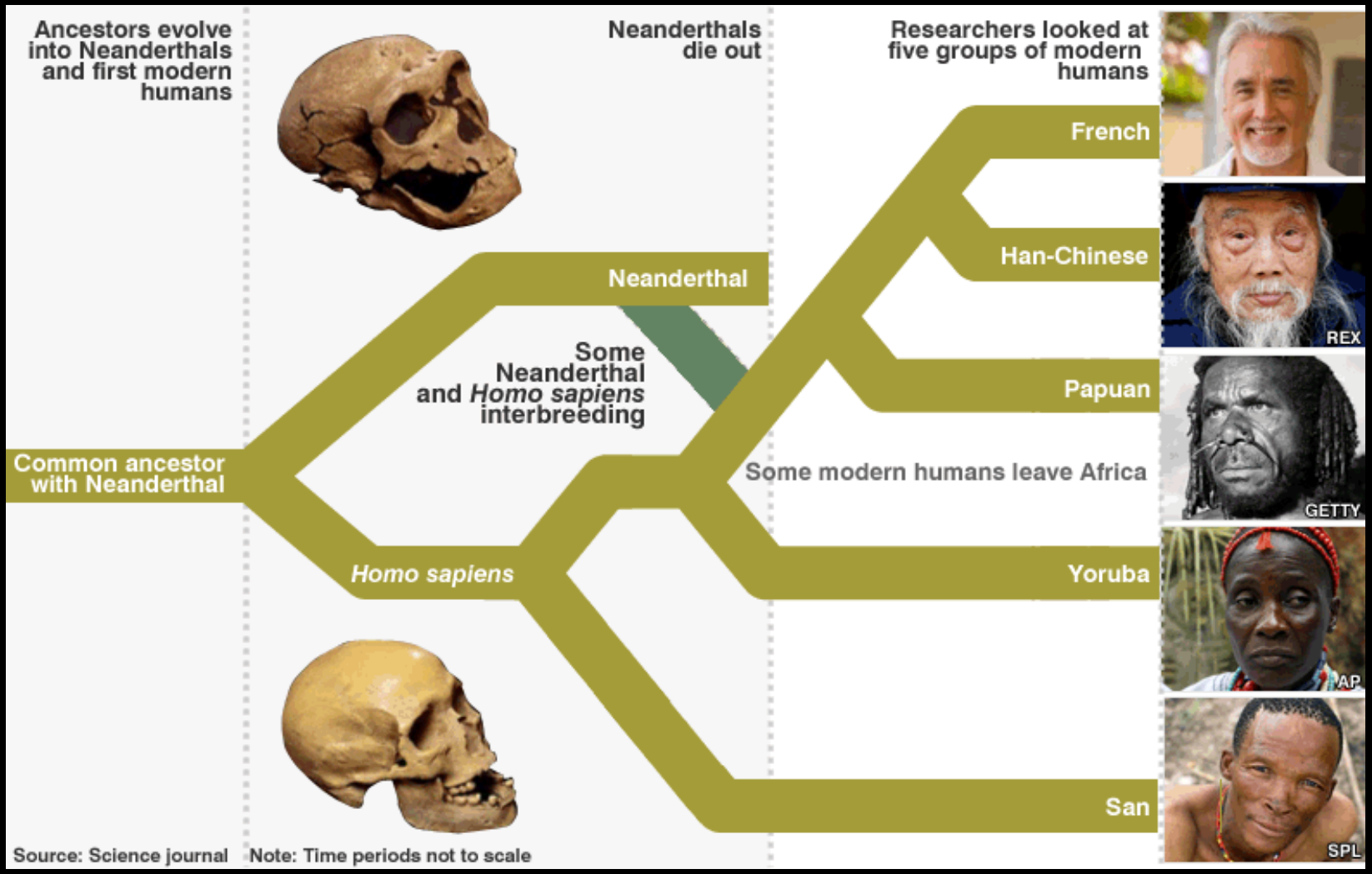
Romanian fossil was the great-great-great-grandson of a Neandertal—but an evolutionary dead end

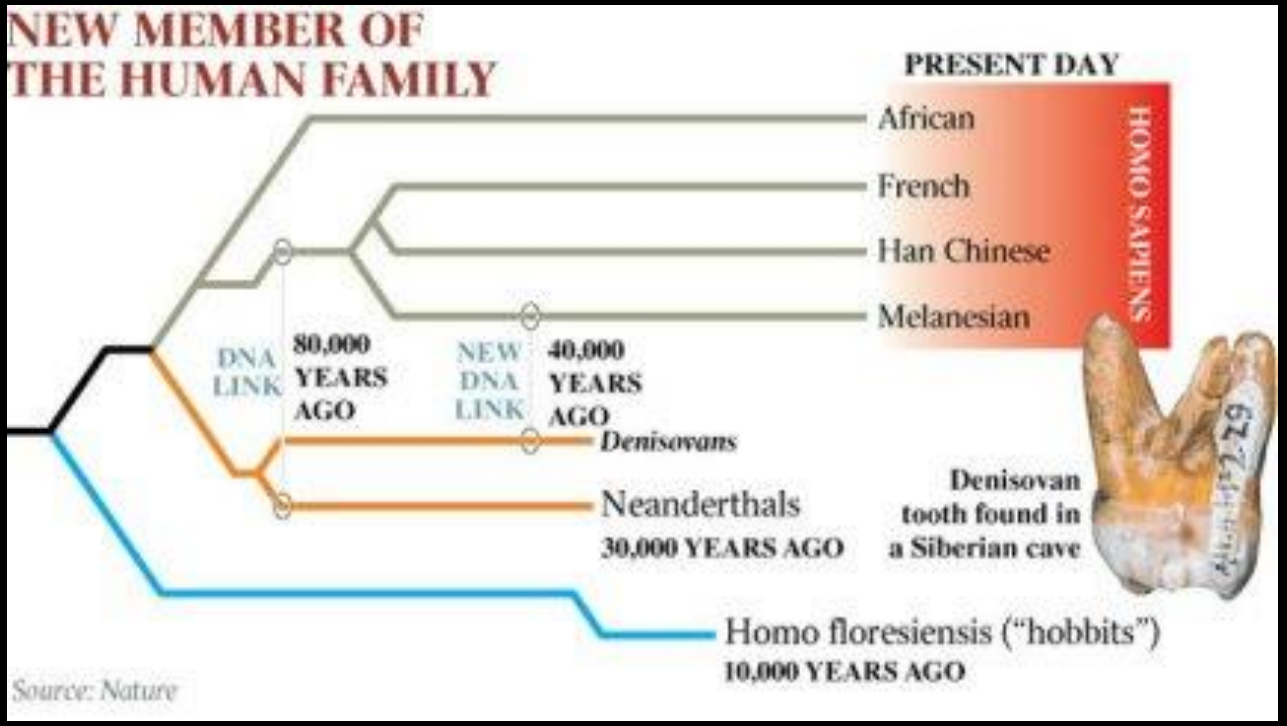
….that the Oase man had far more Neandertal DNA—composing 4.8% to 11.3% of his genome—than either the ancient modern humans from Russia or living Europeans and Asians…

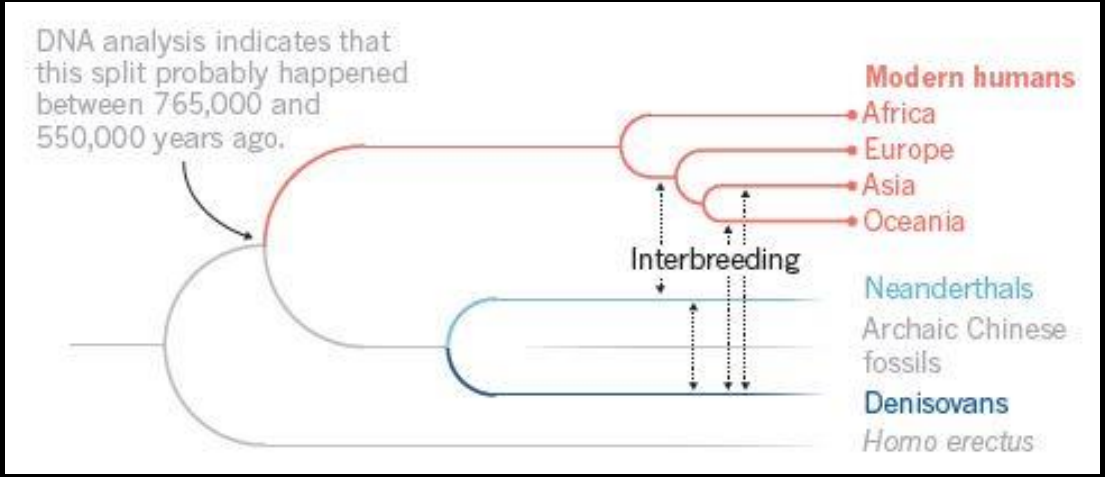
PNAS

An early modern human from the Peştera cu Oase, Romania

Erik Trinkaus*†, Oana Moldovan‡, Ştefan Milota§, Adrian Bilgăr¶, Laurenţiu Sarcina§, Sheela Athreya||, Shara E. Bailey**, Ricardo Rodrigo††, Gherase Mircea§, Thomas Higham‡‡, Christopher Bronk Ramsey‡‡, and Johannes van der Plicht§§


Ancestors evolve into Neanderthals and first modern humans
Neanderthals die out
Researchers looked at five groups of modern humans
French
Han-Chinese
Papuan
Yoruba
San
Neanderthal
Some Neanderthal and Homo sapiens interbreeding
Common ancestor with Neanderthal
Homo sapiens
Some modern humans leave Africa
REX
GETTY
AP
SPL
Source: Science journal
Note: Time periods not to scale


NEW MEMBER OF THE HUMAN FAMILY
PRESENT DAY
African
French
Han Chinese
Melanesian
HOMO SAPIENS
DNA LINK
80,000 YEARS AGO
NEW DNA LINK
40,000 YEARS AGO
Denisovans
Neanderthals
30,000 YEARS AGO
Denisovan tooth found in a Siberian cave
Homo floresiensis ("hobbits")
10,000 YEARS AGO
Source: Nature


DNA analysis indicates that this split probably happened between 765,000 and 550,000 years ago.
Modern humans
Africa
Europe
Asia
Oceania
Interbreeding
Neanderthals
Archaic Chinese fossils
Denisovans
Homo erectus

Article

Initial Upper Palaeolithic humans in Europe had recent Neanderthal ancestry

Unlike two previously studied H. sapiens individuals of similar ages from Romania and Siberia who did not contribute detectably to later populations, these individuals from Bacho Kiro are more closely related to present-day and ancient populations in East Asia and the Americas than to later west Eurasian populations. This indicates that they belonged to a modern human migration into Europe that was not previously known from the genetic record, and provides evidence that there was at least some continuity between the earliest modern humans in Europe and later people in Eurasia. Moreover, we find that all three individuals had Neanderthal ancestors a few generations back in their family history, confirming that the first European modern humans mixed with Neanderthals and suggesting that such mixing could have been common.

Archaeological sites that have yielded genetic data and/or IUP assemblages

1, Bacho Kiro Cave; 2, Ust'Ishim; 3, Peştera cu Oase; 4, Tianyuan Cave; 5, 6, Kostenki14 (Markina Gora) and Kostenki12 (Vokovskaya); 7, Troisème Caverne of Goyet; 8, Sunghir; 9, Peştera Muierilor; 10, Grotta Paglicci; 11, Peştera Cioclovina Uscată; 12, Krems Wachtberg; 13, Yana RHS; 14, 15, Dolní Věstonice and Pavlov; 16, Grotta del Cavallo; 17, Kents Cavern; 18, Grotta di Fumane; 19, Brno-Bohunice; 20, Stánska Skála III; 21, Temnata; 22, Kulychivka; 23, Korolevo 1 and 2; 24, Shlyakh; 25, 26, Üçagizli and Kanal Cave; 27, Um el'Tlel; 28, Jerf Ajlah; 29, Yabrud II; 30–32, Antelias; Abou Halka and Ksar Akil; 33–35, Emireh, El Wad and Raqefet; 36, Boker Tachtit; 37, Denisova Cave; 38, Kara-Bom; 39, Ust-Karakol 1; 40, Kara-Tenesh; 41, Makarvo IV; 42, Kamenka A–C; 43, Khotyk; 44, Podzvonkaya; 45, 46, Tolbor4 and Tolbor16; 47, Tsangan-Agui; 48–50, Suindonggou1, 2 and 9

Ghosts in the cave

A mysterious group of ancient humans known as Denisovans is helping to rewrite our understanding of human evolution. Who were they?

Current Biology

The Combined Landscape of Denisovan and Neanderthal Ancestry in Present-Day Humans

Highlights

- Denisovan admixture into modern humans occurred after Neanderthal admixture
- There is more Denisovan ancestry in South Asians than expected from current models
- Denisovan ancestry has been subject to positive and negative selection after admixture
- Male infertility most likely occurred after modern human interbreeding with Denisovans

Authors

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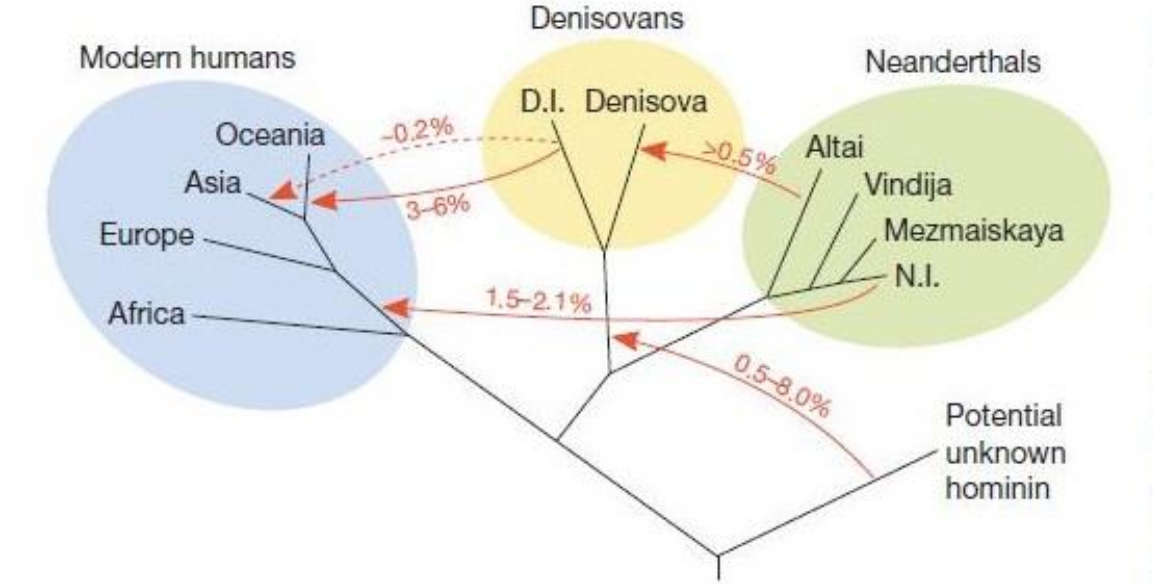
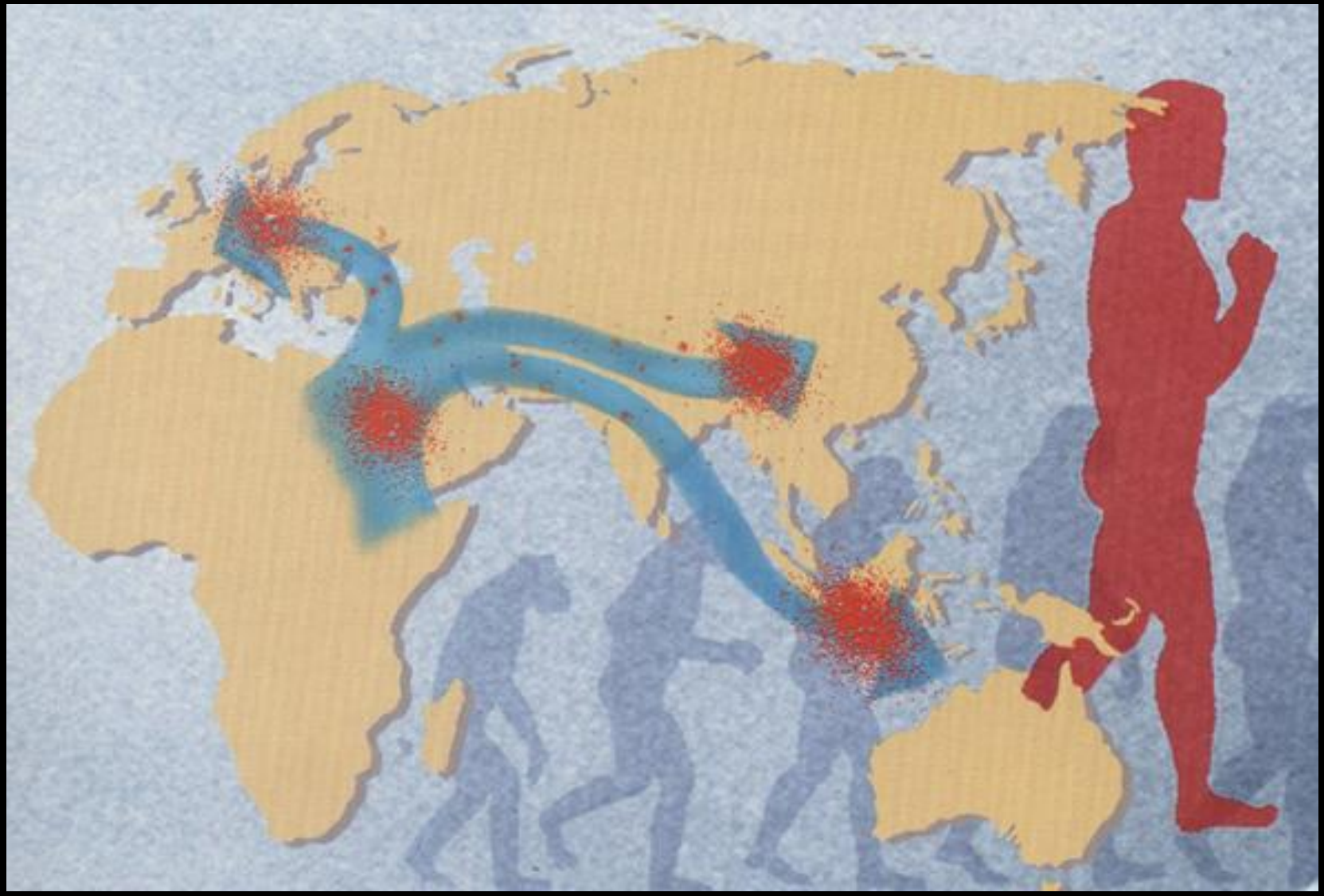
In Brief

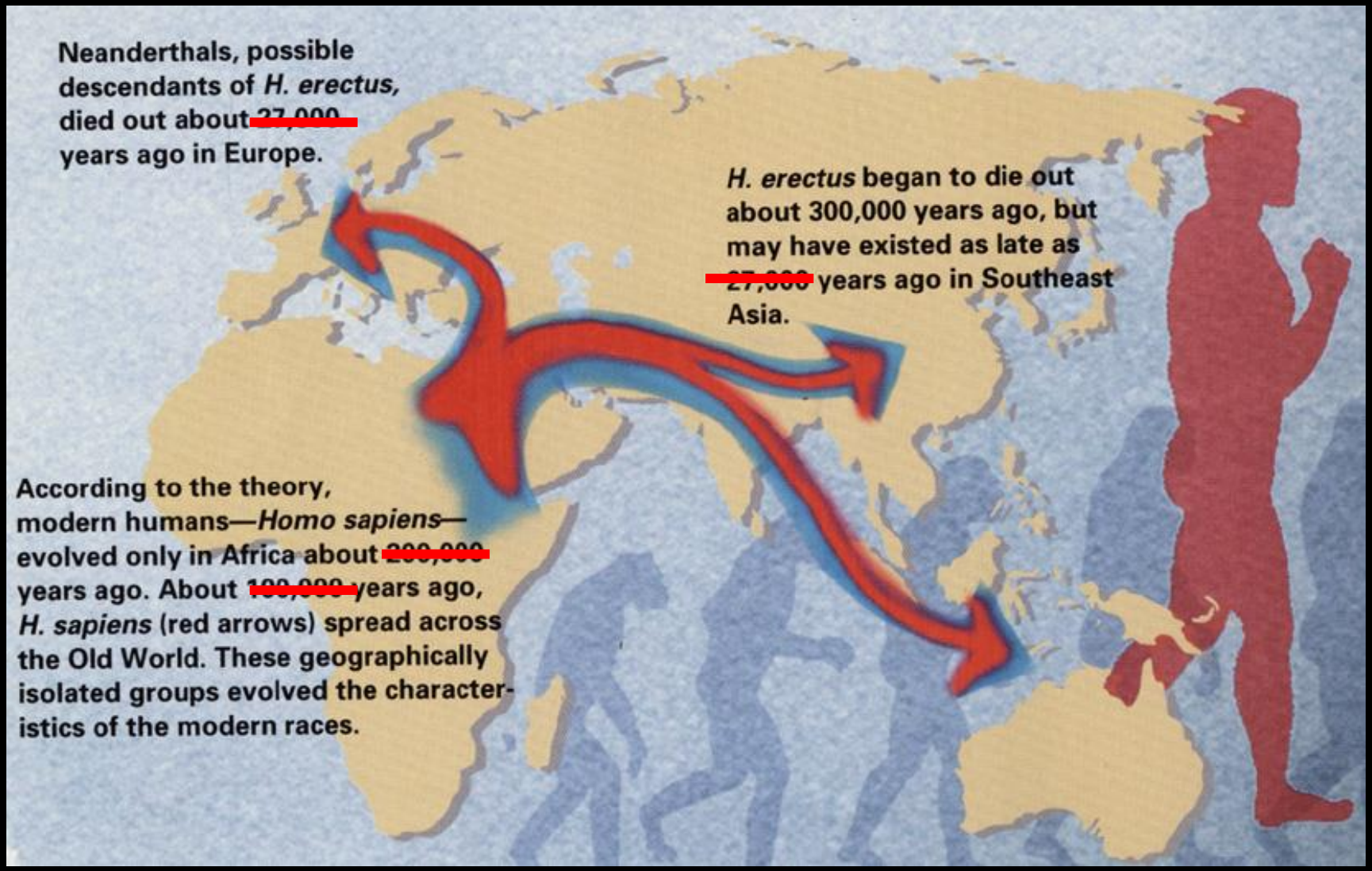
Sankararaman et al. present a map of



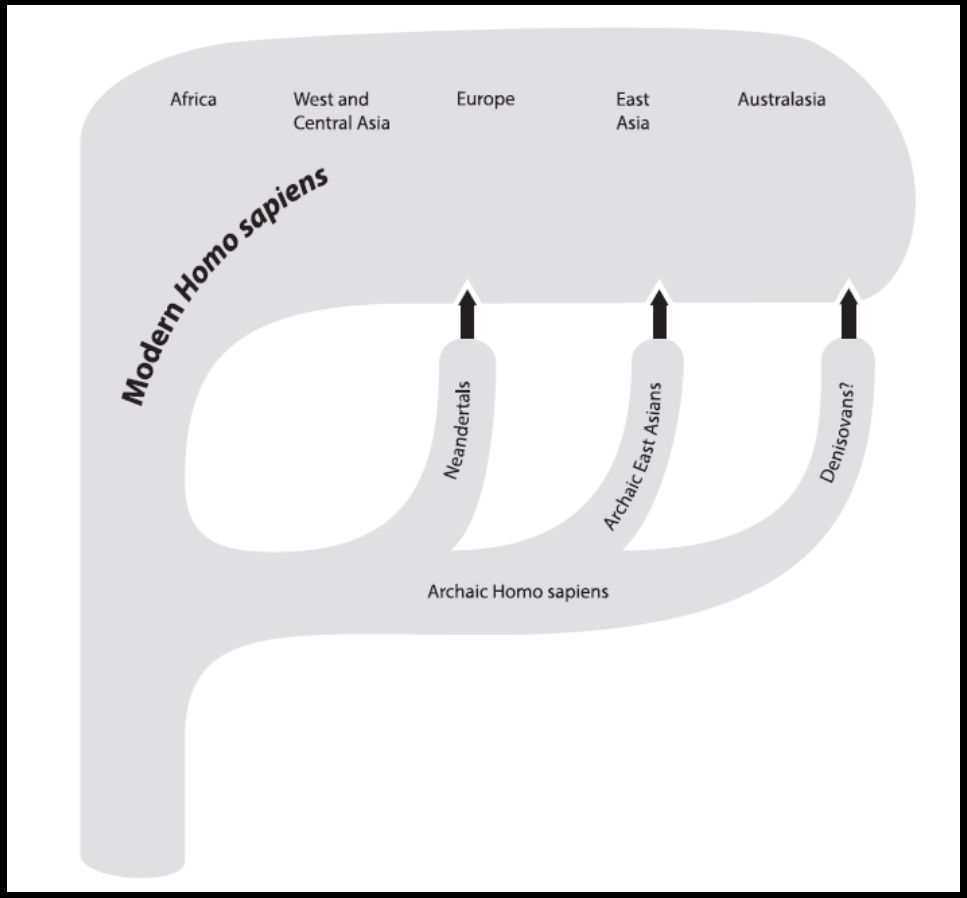
Multiregional model about the appearance of Modern Humans



Substitution model about the appearance of Modern Humans



Multiple ibridizations? Out of Africa + partial interbreeding



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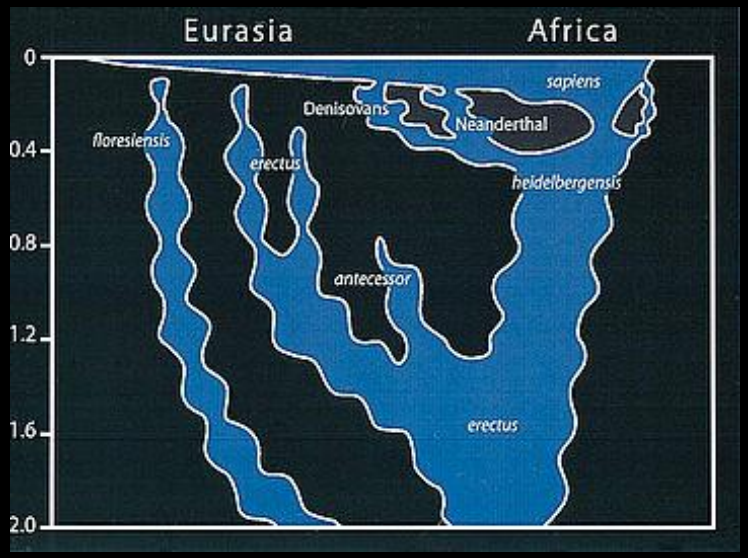
The Assimilation Model of modern human origins in light of current genetic and genomic knowledge

Fred H. Smith [a,*], James C.M. Ahern [b,c], Ivor Janković [b,c], Ivor Karavanić [b,d]

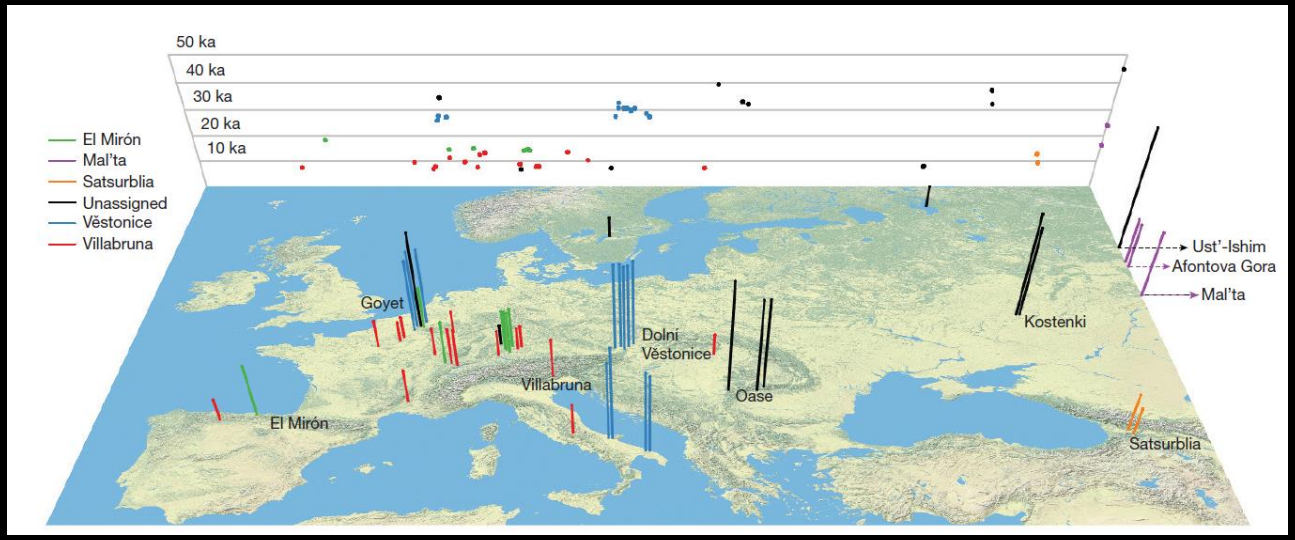


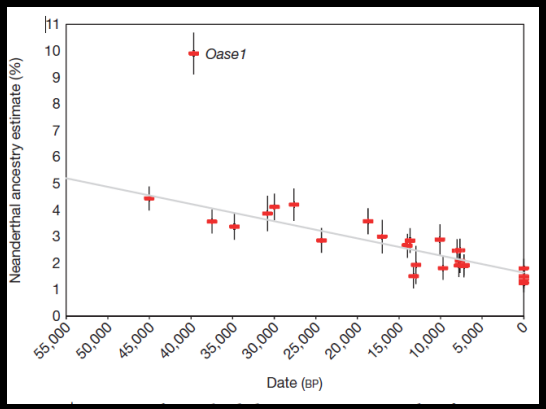
Schematic diagram of the **Assimilation Model**. The strong majority of modern human biology is clearly of **African origin**, but genomic and morphological data both demonstrate relatively small, but significant, archaic contributions from Neandertals, Denisovans and possibly other archaic human groups (dark arrows). It is possible that the Denisovans are archaic East Asians rather than Australasians. Also, while the arrows are shown as the same size, it is certainly the case that the extent of contribution varied among Eurasian regions.

Not only one sapiens..

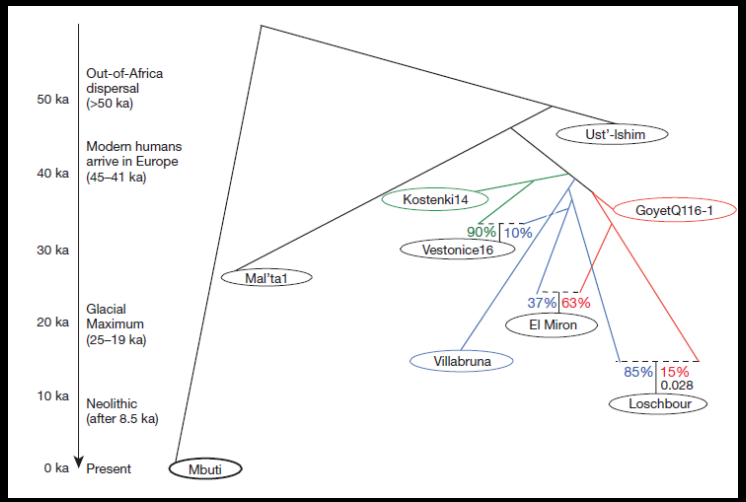
The genetic history of Ice Age Europe

Qiaomei Fu[1,2,3], Cosimo Posth[4,5]*, Mateja Hajdinjak[3]*, Martin Petr[3], Swapan Mallick[2,6,7], Daniel Fernandes[8,9],





Decreasing Neandertal DNA in Palaeolithic euroasiatic humanity

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Liv. A2R
Fogliazza 2014


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Fogliazza 2014
Grotta di Fumane – Pech de l'Azé
mysterians

Human specis : polimorphic and politypic

Polimorphic>members are genotipically different

Politypic>groups characterized by «genetic pools»

Differences between human, similitudes, equalities….

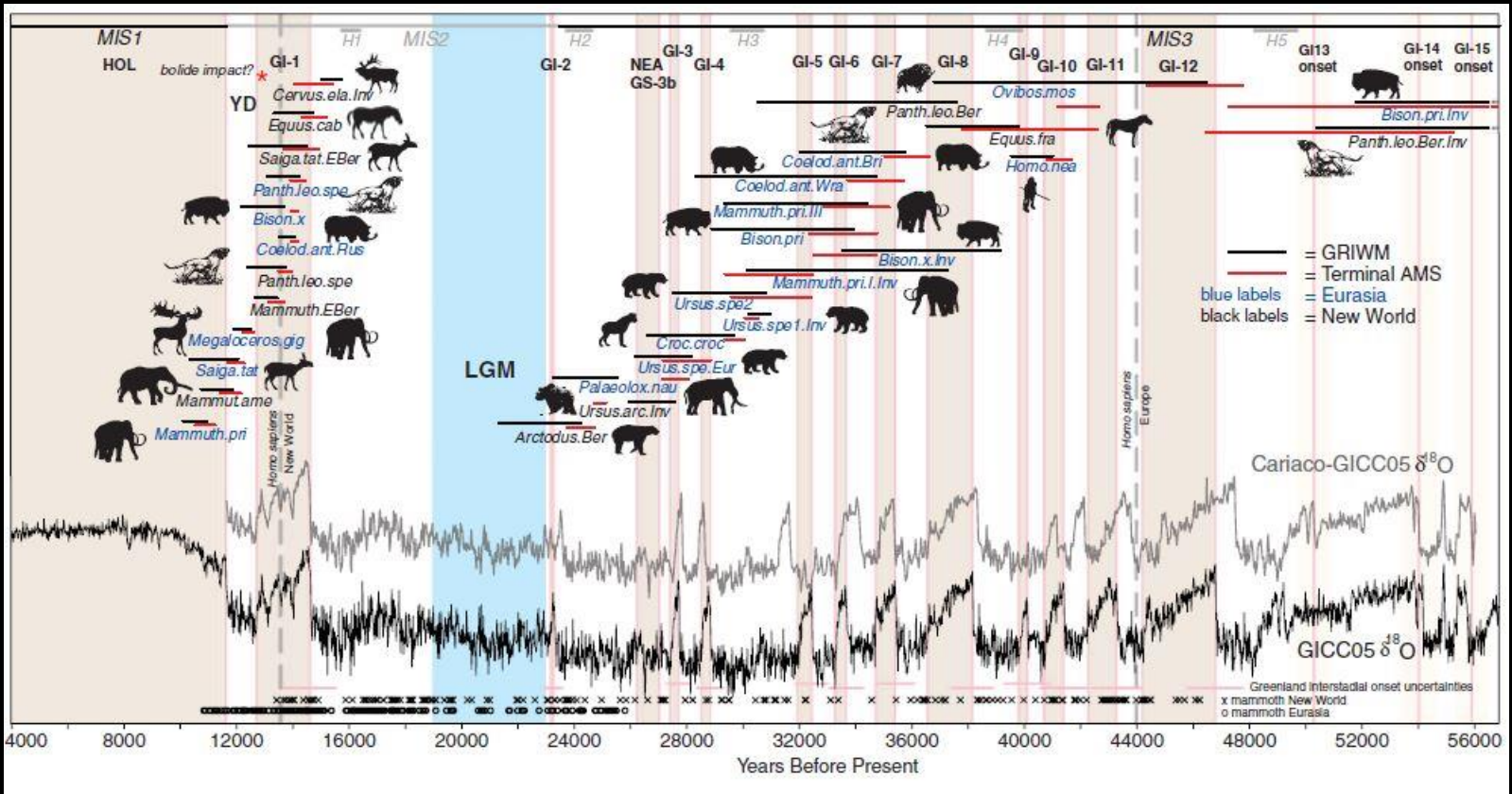
RESEARCH ARTICLES

PALEOECOLOGY

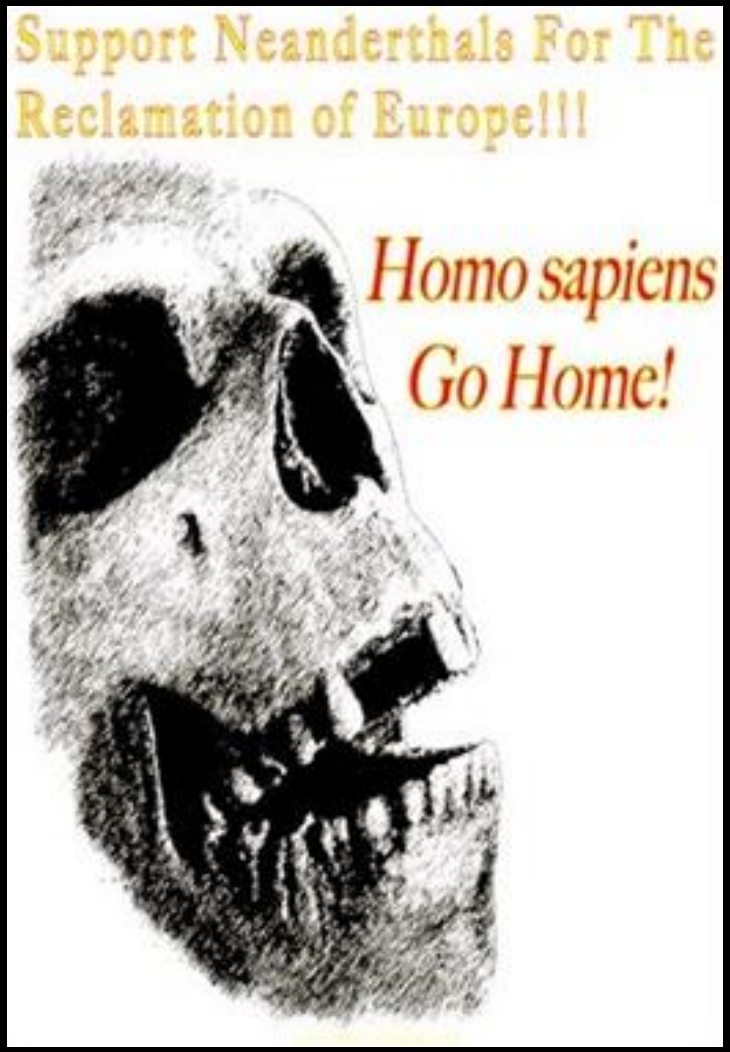
Abrupt warming events drove Late Pleistocene Holarctic megafaunal turnover

Alan Cooper,[1]* Chris Turney,[2]* Konrad A. Hughen,[3] Barry W. Brook,[4,5] H. Gregory McDonald,[6] Corey J. A. Bradshaw[4]

Megafaunal transition events and Late Pleistocene climate records



The presence of many cryptic biotic transitions before the Pleistocene/Holocene boundary revealed by ancient DNA confirms the importance of climate change in megafaunal population extinctions and suggests that metapopulation structures necessary to survive such repeated and rapid climatic shifts were susceptible to human impacts.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Homo sapiens Go Home!