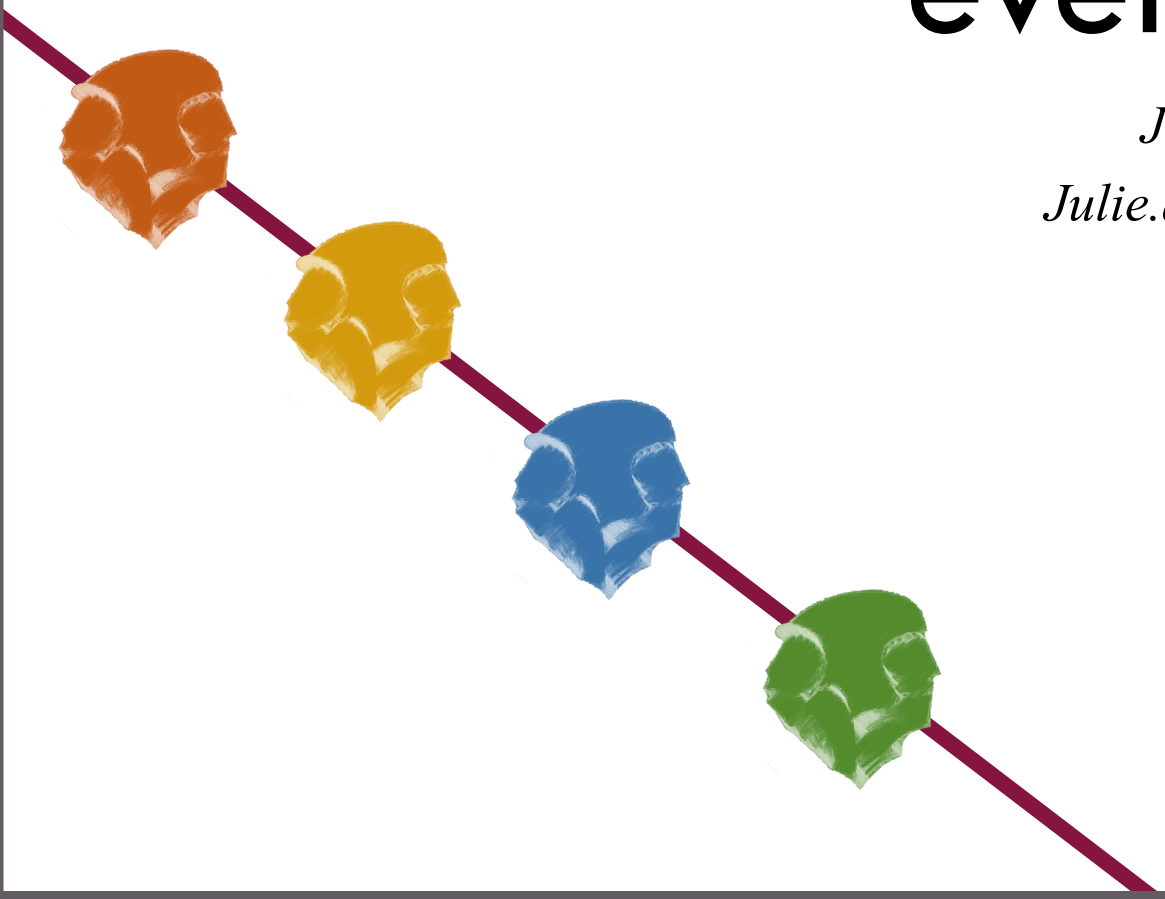
Erasmus+

Laurea Magistrale in Quaternario, Preistoria e Archeologia
International Master in Quaternary and Prehistory

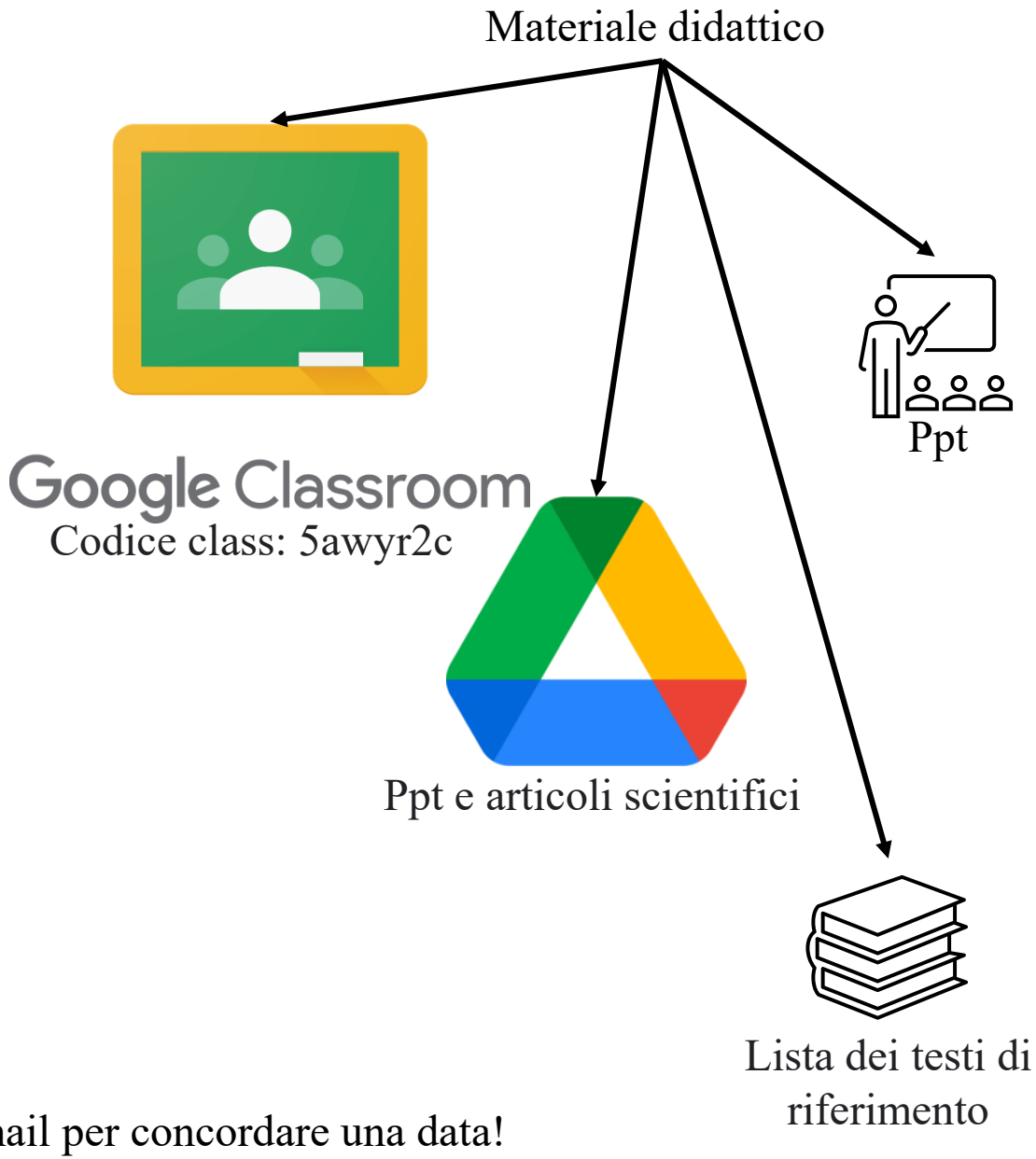
Homo sapiens everywhere

Julie Arnaud
Julie.arnaud@unife.it



Contenuti del corso:

- Lezione introduttive (Prof. ssa Arzarello e Prof. Sala)
- Metodologie di studio in Paleoantropologia
- Primi ominini parte 1 (dal *Sahelanthropus* al *Ardipithecus*)
- Primi ominini parte 2 (le Australopitecine)
- Il genere *Homo* in Africa
- L'out-of-Africa verso l'Asia
- Primo popolamento dell'Europa
- I Neanderthal
- Origine dell'*Homo sapiens*
- Le migrazione dell'*Homo sapiens*



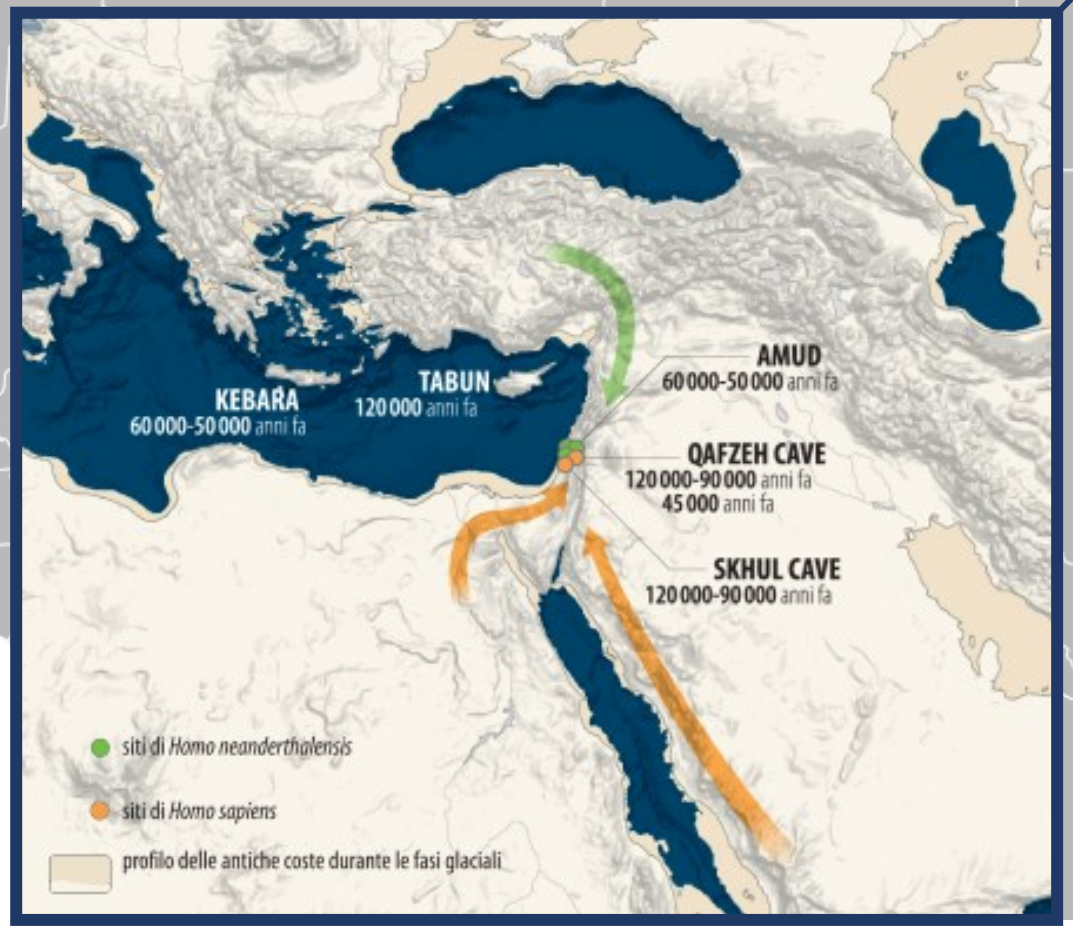
Laboratori (2/12 **O** 9/12 **O** 16/12)**:**

- Cranio (~3ore): anatomia ed evoluzione
- Mandibola (~3ore): anatomia, dimensione ed evoluzione

Esame:

Orale (o scritto se richiesto dall* student*)

L'esame si può fare anche **fuori appelli**, basta scrivermi una mail per concordare una data!


KEBARA
60 000-50 000 anni fa
TABUN
120 000 anni fa
AMUD
60 000-50 000 anni fa
QAFZEH CAVE
120 000-90 000 anni fa
45 000 anni fa
SKHUL CAVE
120 000-90 000 anni fa
siti di Homo neanderthalensis
siti di Homo sapiens
profilo delle antiche coste durante le fasi glaciali

ARTICLE

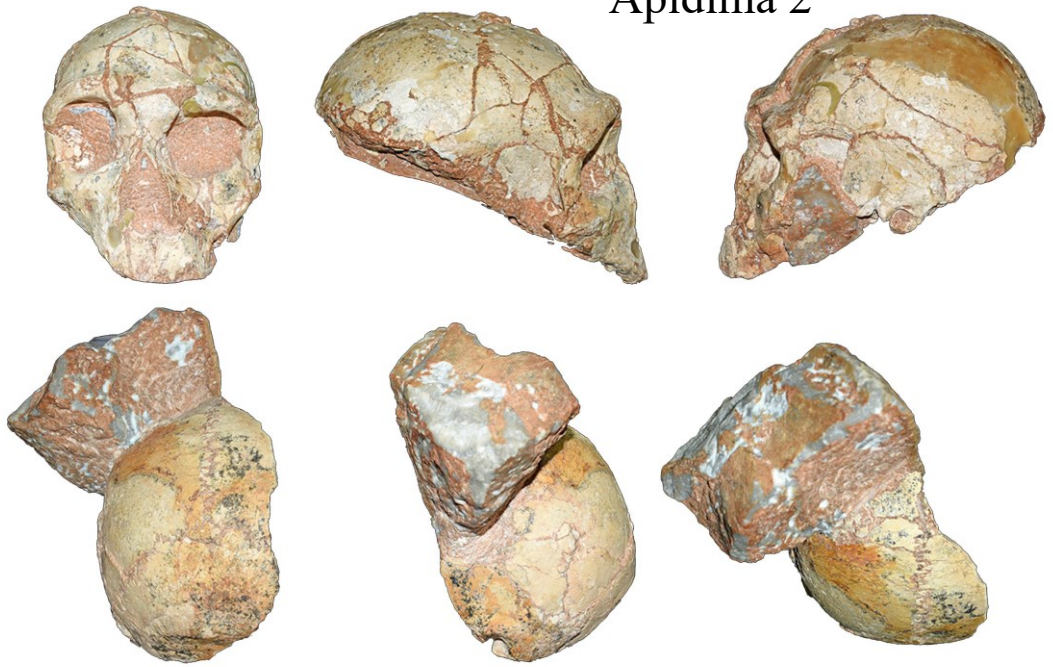
https://doi.org/10.1038/s41586-019-1376-z

Apidima Cave fossils provide earliest evidence of *Homo sapiens* in Eurasia

Katerina Harvati[1,2,3*], Carolin Röding[1], Abel M. Bosman[1,2], Fotios A. Karakostis[1], Rainer Grün[4], Chris Stringer[5], Panagiotis Karkanas[6], Nicholas C. Thompson[1,3], Vassilis Koutoulidis[7], Lia A. Moulopoulos[7], Vassilis G. Gorgoulis[8,9,10*] & Mirsini Kouloukoussa[3,8]

Two fossilized human crania (Apidima 1 and Apidima 2) from Apidima Cave, southern Greece, were discovered in the late 1970s but have remained enigmatic owing to their incomplete nature, taphonomic distortion and lack of archaeological context and chronology. Here we virtually reconstruct both crania, provide detailed comparative descriptions and analyses, and date them using U-series radiometric methods. **Apidima 2 dates to more than 170 thousand years ago** and has a **Neanderthal-like morphological pattern**. By contrast, **Apidima 1 dates to more than 210 thousand years ago and presents a mixture of modern human and primitive features.** These results suggest that **two late Middle Pleistocene human groups were present at this site—an early *Homo sapiens* population, followed by a Neanderthal population.** Our findings support multiple dispersals of early modern humans out of Africa and highlight the complex demographic processes that characterized Pleistocene human evolution and modern human presence in southeast Europe.

Apidima 2



Apidima 1

PALEOANTHROPOLOGY

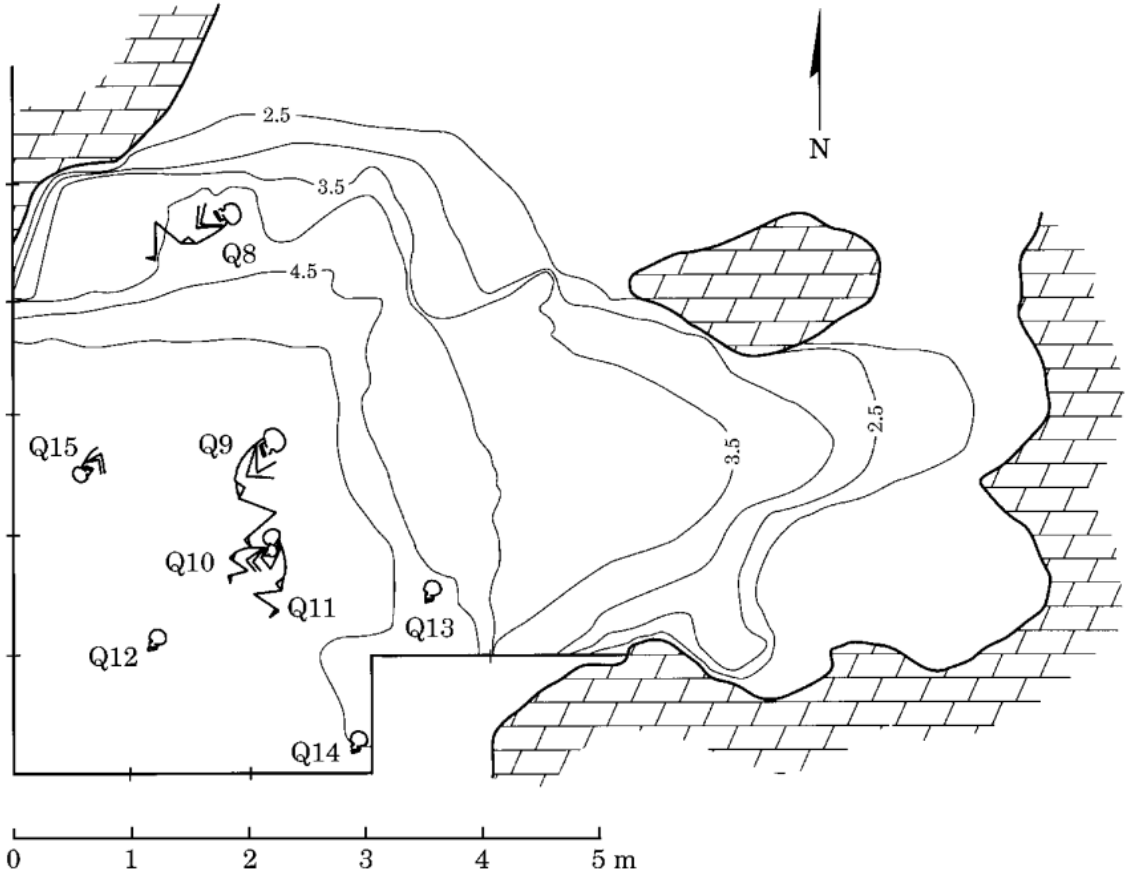
The earliest modern humans outside Africa

Israel Hershkovitz,[1,2*†] Gerhard W. Weber,[3†] Rolf Quam,[4,5,6†] Mathieu Duval,[7,8] Rainer Grün,[7,9] Leslie Kinsley,[9] Avner Ayalon,[10] Miryam Bar-Matthews,[10] Helene Valladas,[11] Norbert Mercier,[12] Juan Luis Arsuaga,[5,13] María Martinón-Torres,[8,14] José María Bermúdez de Castro,[8,14] Cinzia Fornai,[3,15] Laura Martín-Francés,[8,16] Rachel Sarig,[2,17] Hila May,[1,2] Viktoria A. Krenn,[3,15] Viviane Slon,[1] Laura Rodríguez,[5,18,19] Rebeca García,[5,18] Carlos Lorenzo,[20,21] Jose Miguel Carretero,[5,18] Amos Frumkin,[22] Ruth Shahack-Gross,[23] Daniella E. Bar-Yosef Mayer,[24,25] Yaming Cui,[26] Xinzhi Wu,[26] Natan Peled,[27] Iris Groman-Yaroslavski,[28] Lior Weissbrod,[28] Reuven Yeshurun,[28] Alexander Tsatskin,[28] Yossi Zaidner,[28,29] Mina Weinstein-Evron[28]

To date, the earliest modern human fossils found outside of Africa are dated to around 90,000 to 120,000 years ago at the Levantine sites of Skhul and Qafzeh. A maxilla and associated dentition recently discovered at Misliya Cave, Israel, was dated to **177,000 to 194,000** years ago, **suggesting that members of the *Homo sapiens* clade left Africa earlier than previously thought.** This finding changes our view on modern human dispersal and is consistent with recent genetic studies, which have posited the possibility of an earlier dispersal of *Homo sapiens* around 220,000 years ago. The Misliya maxilla is associated with full-fledged Levallois technology in the Levant, suggesting that the emergence of this technology is linked to the appearance of *Homo sapiens* in the region, as has been documented in Africa.

Qafzeh, Israel 90-100 000 y BP

Human remains (NMI 25 individuals)
Mousterian assemblage

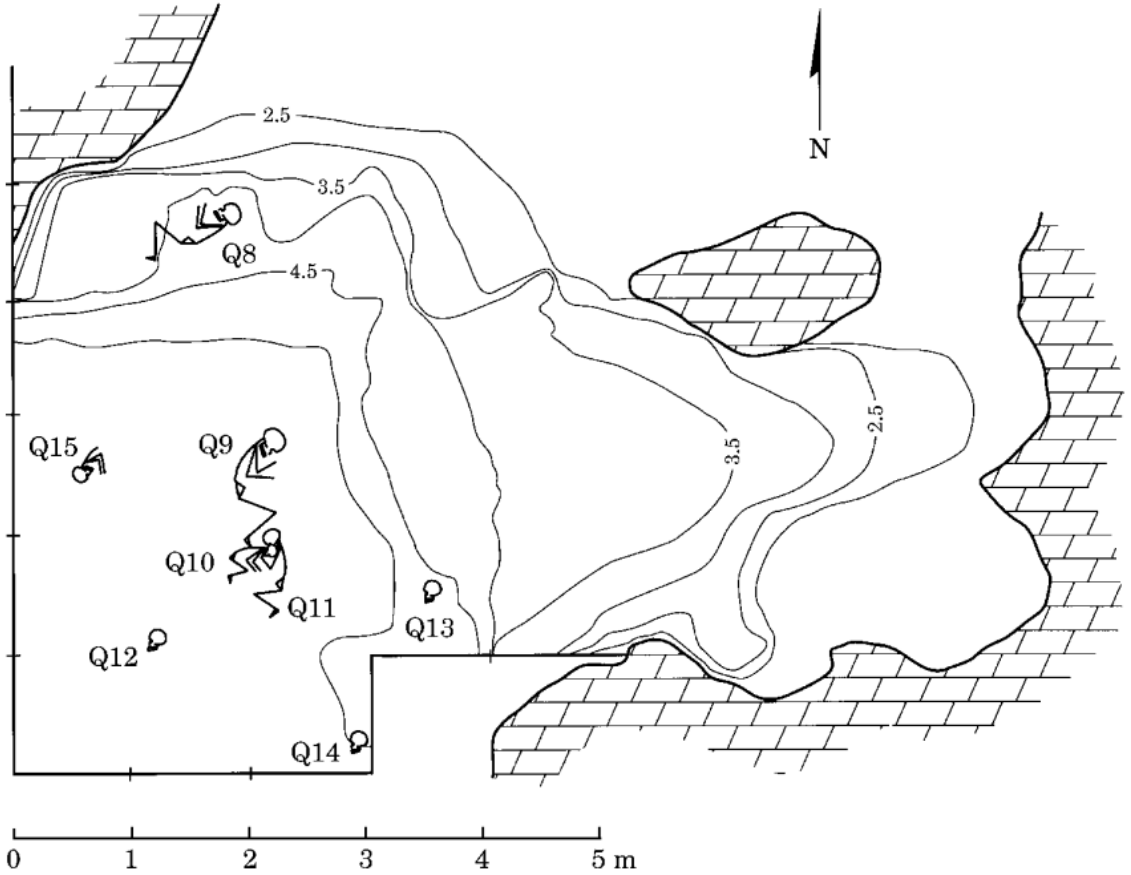


(Vandermeersch, 1981)

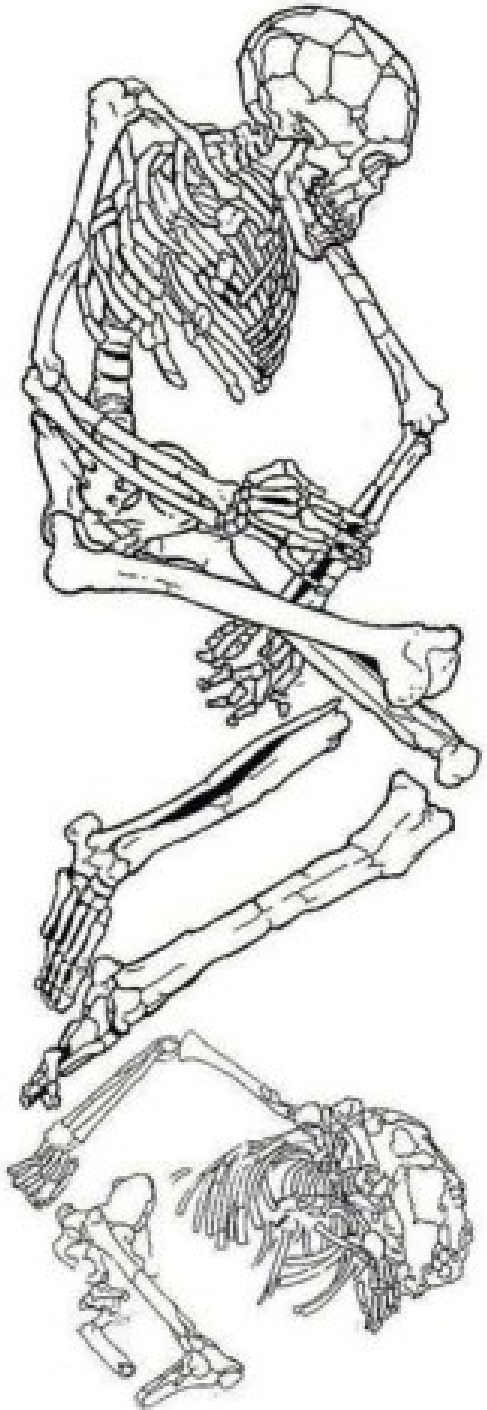
Qafzeh 9

Qafzeh, Israel 90-100 000 y BP

Multiple burial



(Vandermeersch, 1981)

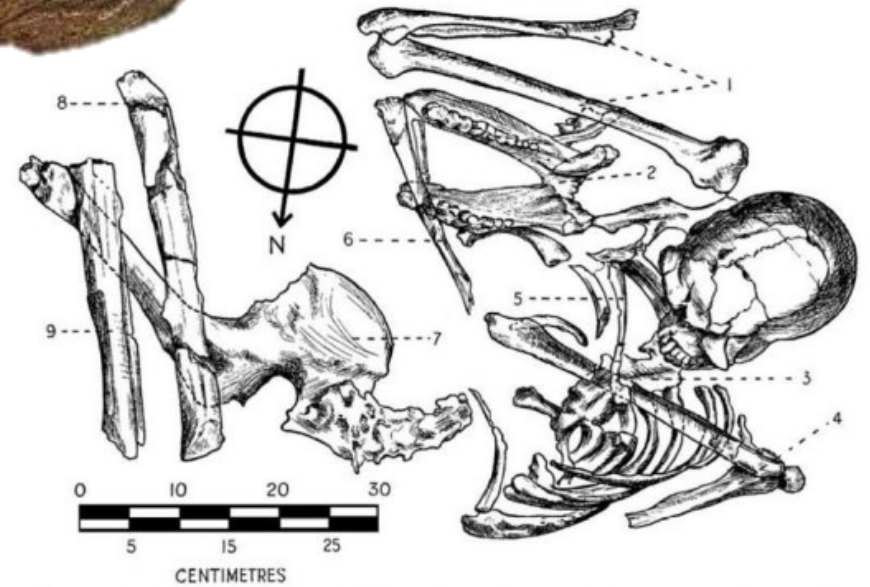


Skhul - Israel (100.000 BP)

- Mousterian lithic industries
-10 complete skeleton
- Archaic morphology (attributed at the beginning to *Homo neanderthalensis*)

Skhul IV

Skhul V, Israel
100 000 y BP

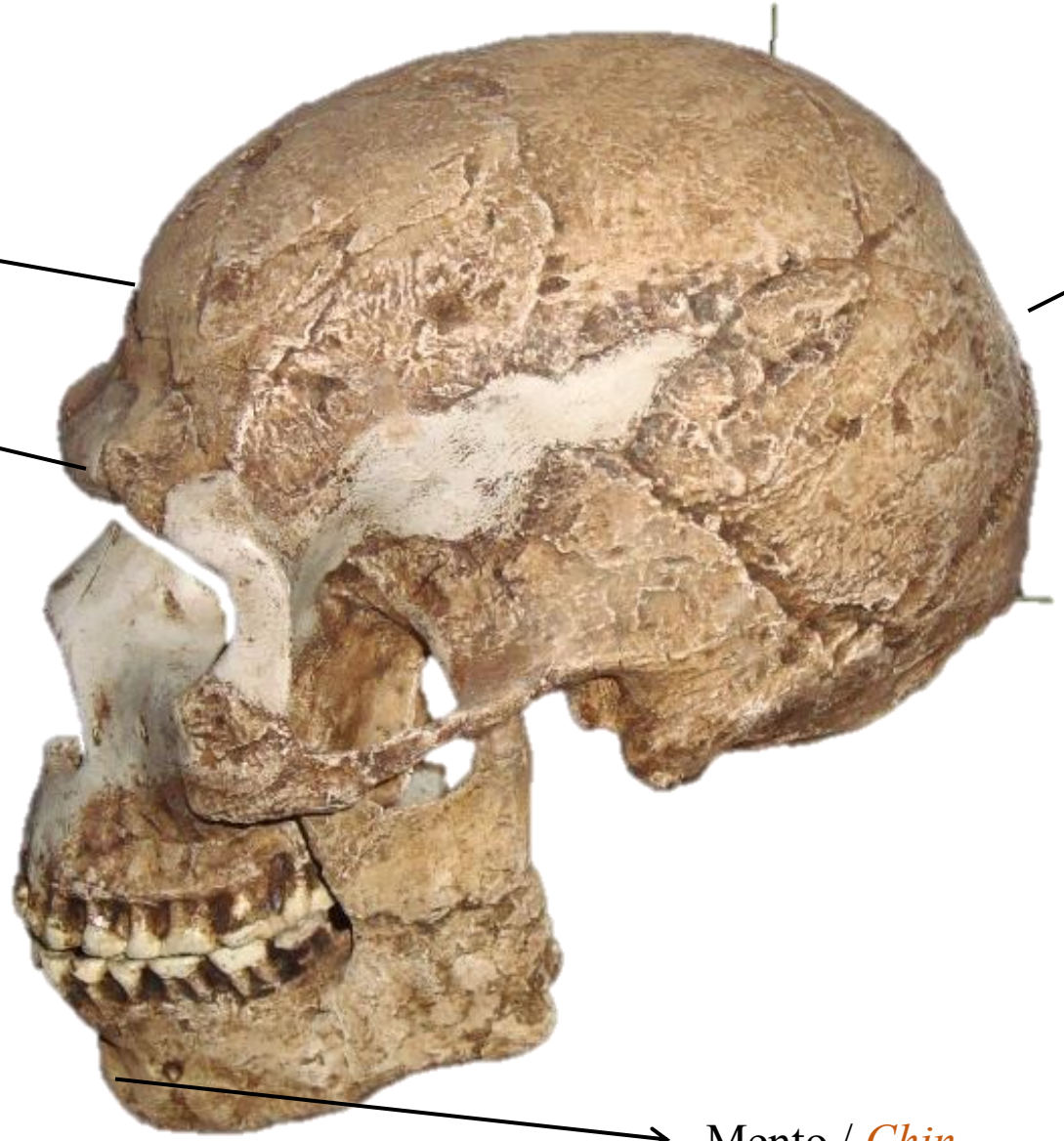


2. Plan of the contracted burial of a tall male, Skhûl V. 1, right arm; 2, Pig's mandible; 3, dorsal vertebrae; 4, left scapula and humerus; 5, left clavicle; 6, left radius; 7, right ilium; 8, left femur; 9, left tibia and fibula.

(Garod & Bate, 1937)

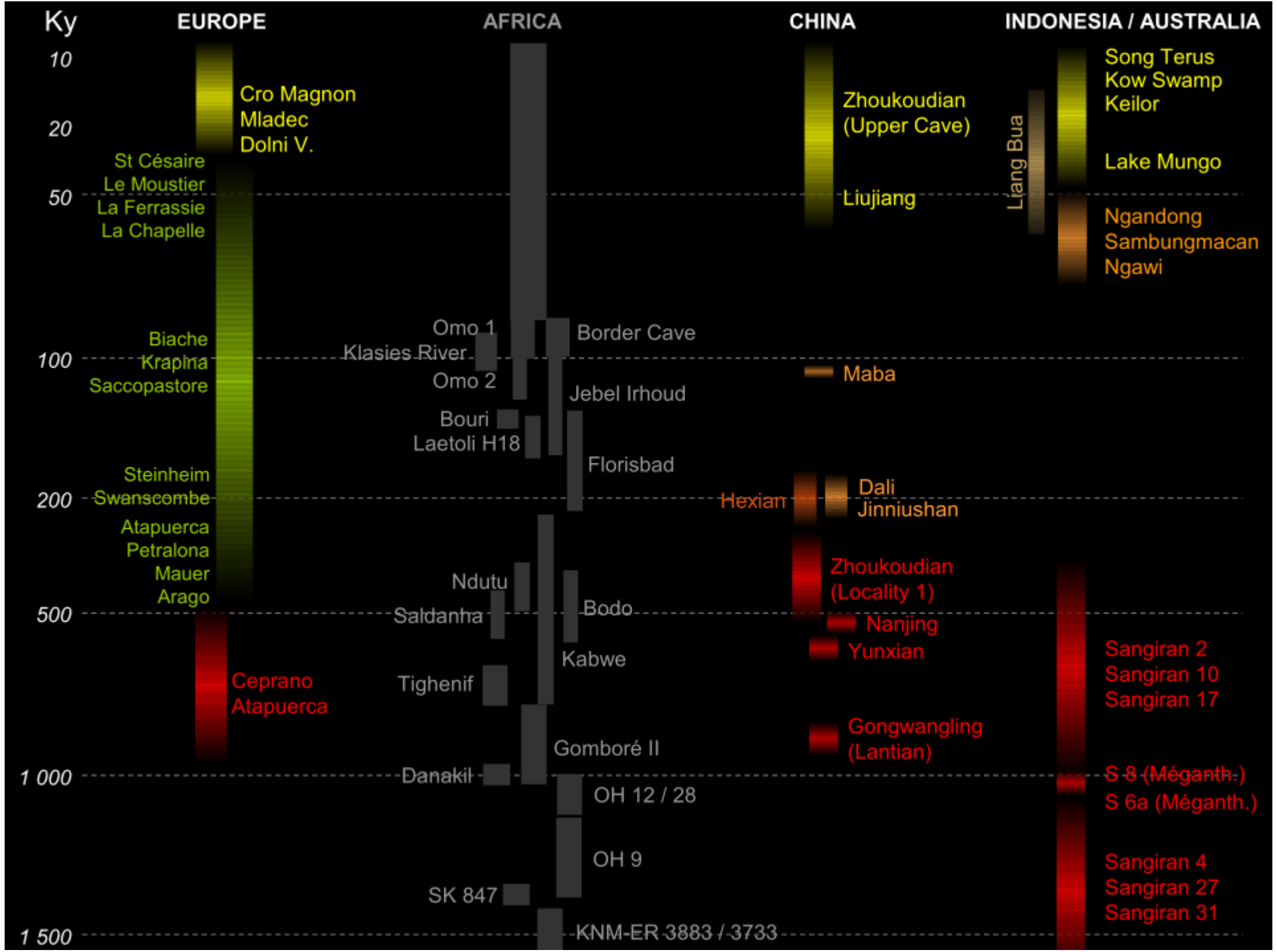
Fronte convessa /
Convexe fronthead

Assenza del toro sopra orbitario /
Lack of supra-orbital torus



Occipitale arrotondato /
Rounded occipital

Mento / *Chin*


Ky
EUROPE
AFRICA
CHINA
INDONESIA / AUSTRALIA
10
20
50
100
200
500
1 000
1 500
Cro Magnon
Mladec
Dolni V.
St Césaire
Le Moustier
La Ferrassie
La Chapelle
Biache
Krapina
Saccopastore
Steinheim
Swanscombe
Atapuerca
Petralona
Mauer
Arago
Ceprano
Atapuerca
Omo 1
Klasies River
Omo 2
Border Cave
Jebel Irhoud
Bouri
Laetoli H18
Florisbad
Ndutu
Saldanha
Bodo
Kabwe
Tighenif
Gomboré II
Danakil
OH 12 / 28
OH 9
SK 847
KNM-ER 3883 / 3733
Zhoukoudian
(Upper Cave)
Liujiang
Maba
Hexian
Dali
Jinniushan
Zhoukoudian
(Locality 1)
Nanjing
Yunxian
Gongwangling
(Lantian)
Liang Bua
Song Terus
Kow Swamp
Keilor
Lake Mungo
Ngandong
Sambungmacan
Ngawi
Sangiran 2
Sangiran 10
Sangiran 17
S 8 (Méganth.)
S 6a (Méganth.)
Sangiran 4
Sangiran 27
Sangiran 31

Fossil record

Homo erectus

East Asia (China)

Southeast Asia

mainland

insular (Java)

H. erectus /archaic *H. sapiens*

East Asia (China)

Southeast Asia

insular (Java)

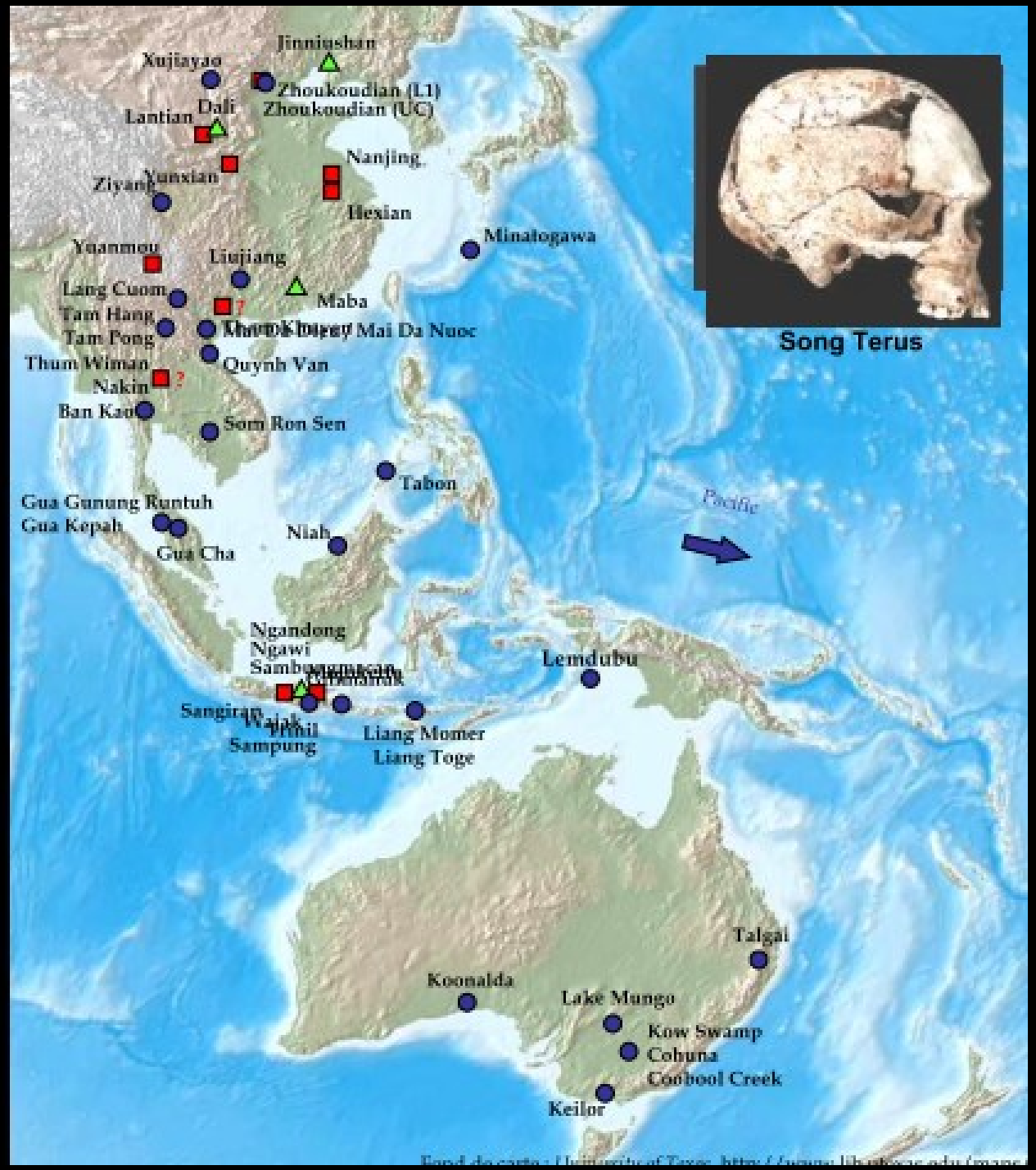
fossil *Homo sapiens*

East Asia

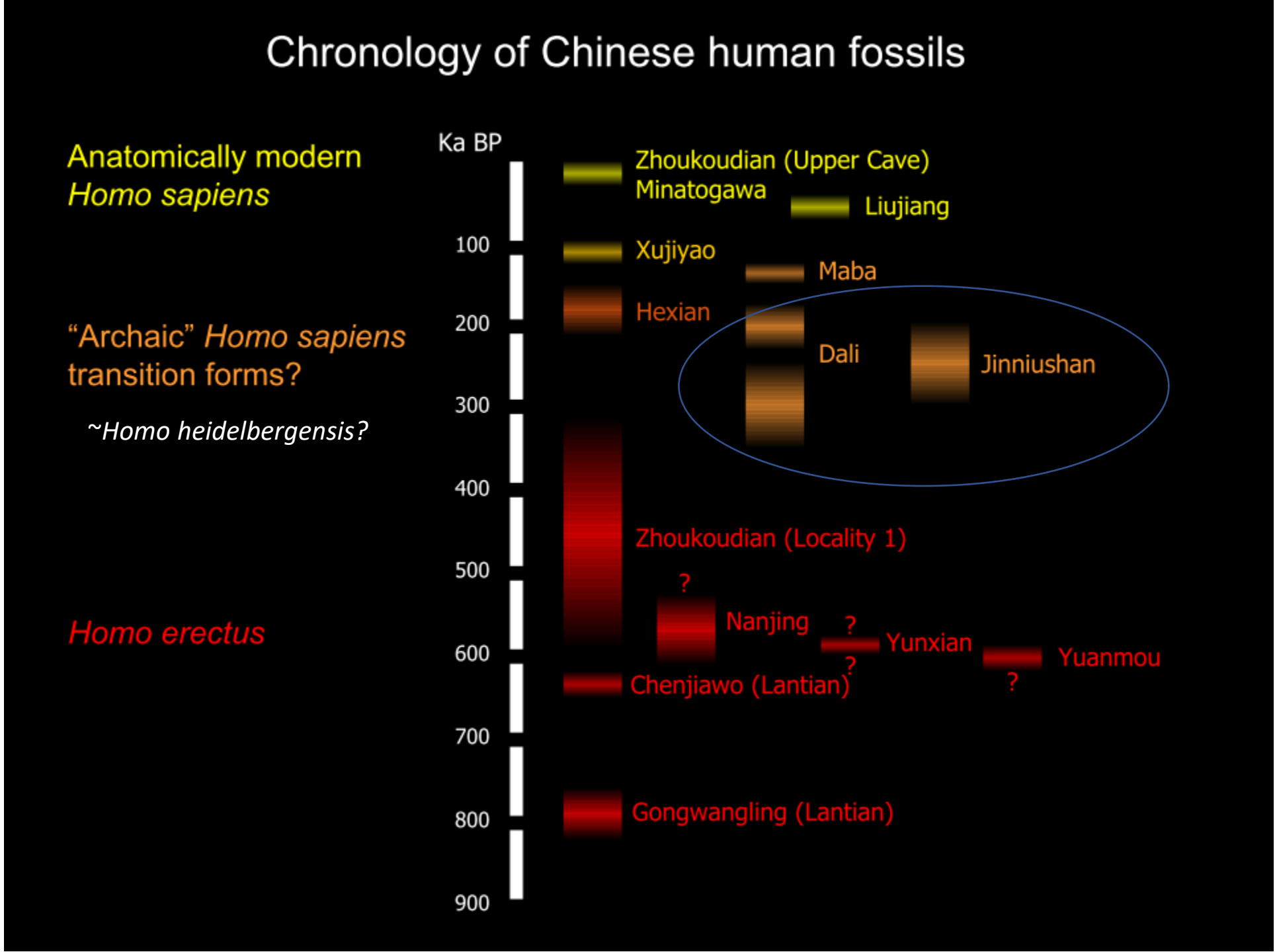
Southeast Asia

Australia

Pacific



Chronology of Chinese human fossils



Dali, China

180 – 230 ky BP (U-Th on tooth)
250-350 ky BP (ESR – U-Th on tooth)
~550 ky BP (Geomorphology, Hu et al., 2020)

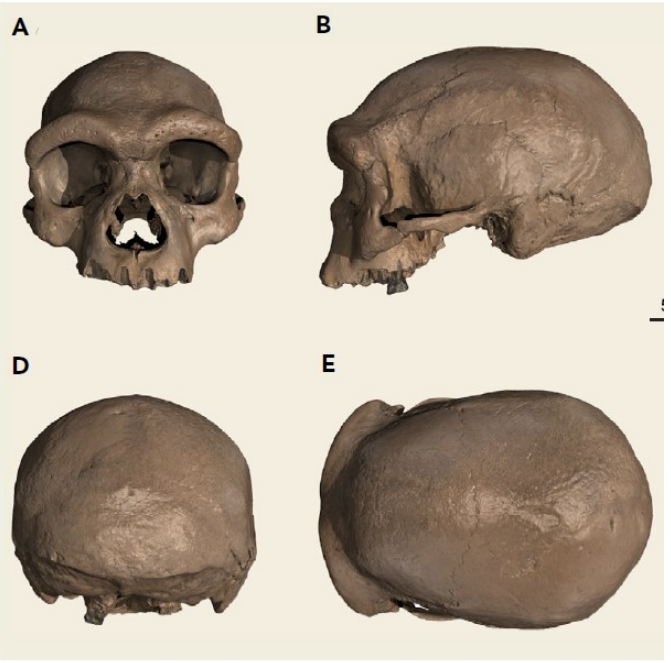
Jinniushan, China

260 000 y B.P.

(Rosenberg et al., 2006)

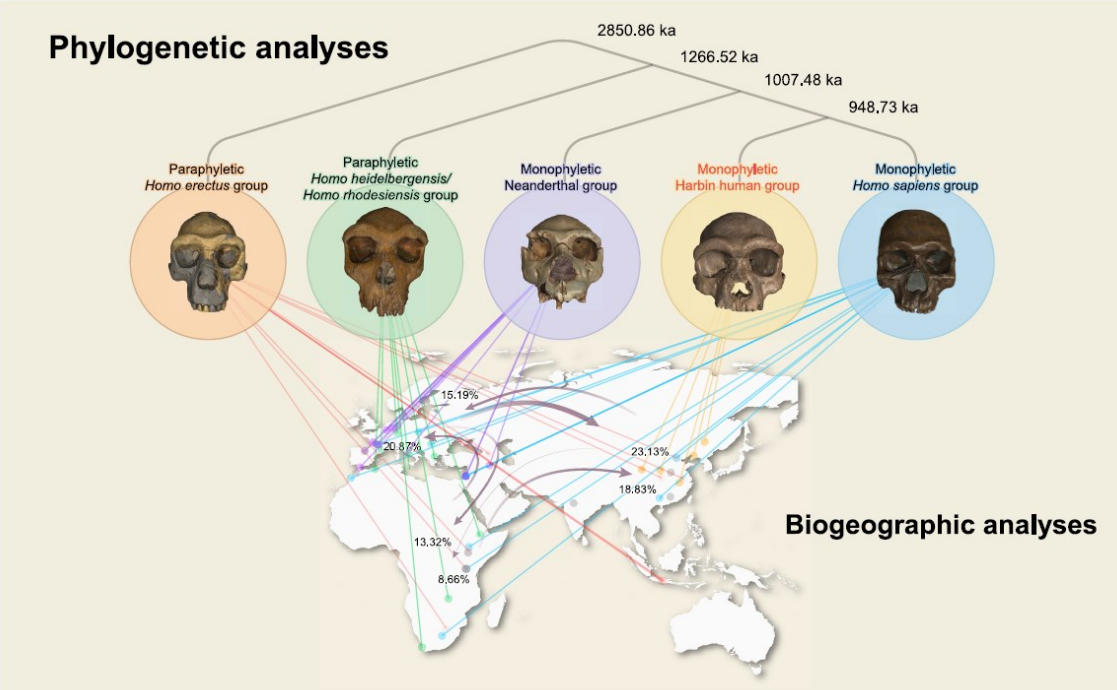
Harbin, China

146 000 y B.P.



Mosaic of *H. erectus* and *H. sapiens* features
« archaic » *H. sapiens = H. rhodesiensis, H. heidelbergensis?*

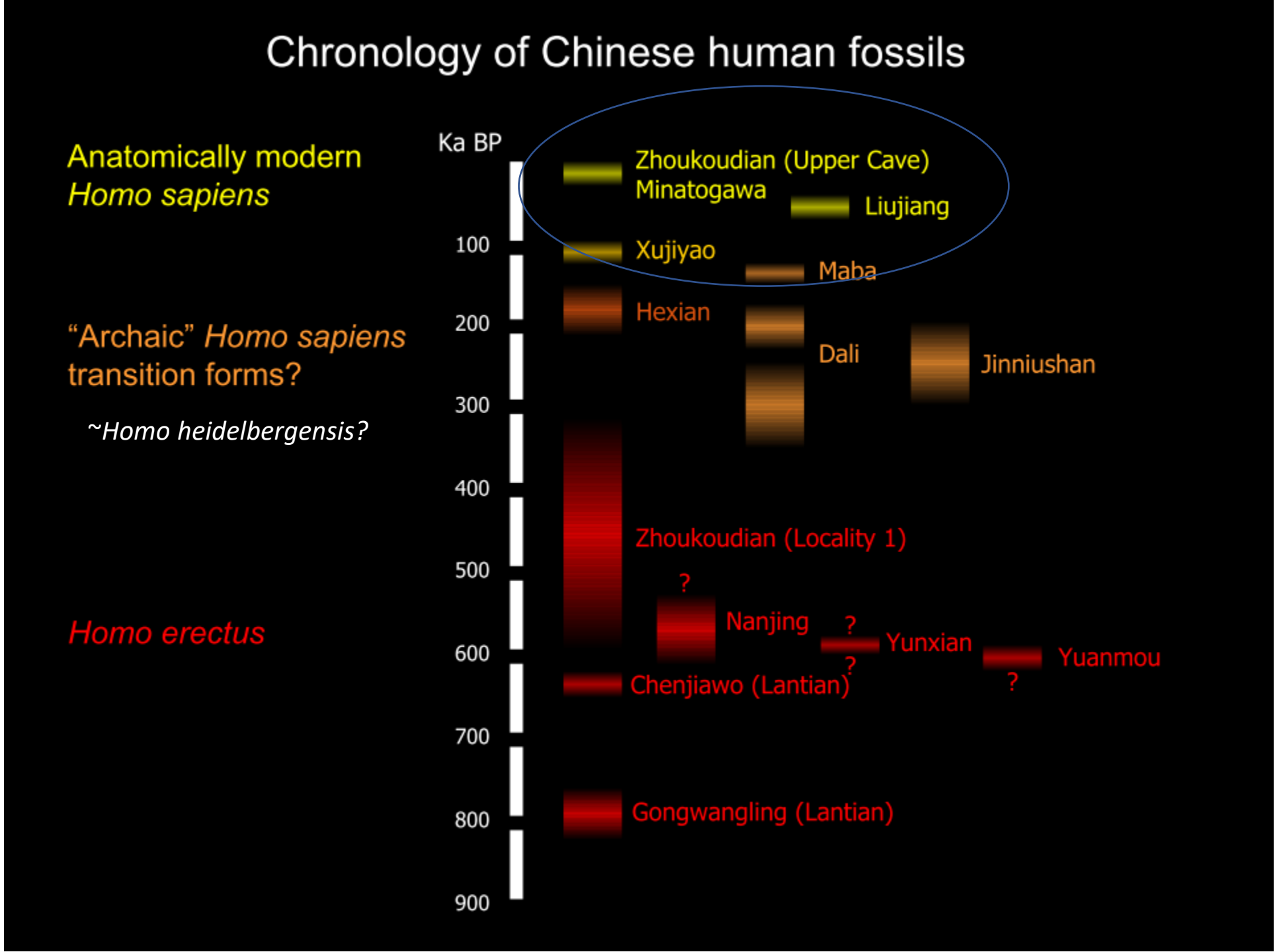
Graphical abstract



It differs from all the other named Homo species by presenting a combination of features, such as long and low cranial vault, a wide and low face, large and almost square orbits, gently curved but massively developed supra- orbital torus, flat and low cheekbones with a shallow canine fossa, and a shallow palate with thick alveolar bone supporting very large molars. The excellent preservation of the Harbin cranium advances our understanding of several less-complete late Middle Pleistocene fossils from China, which have been interpreted as local evolutionary intermediates between the earlier species *Homo erectus* and later *H. sapiens*. Phylogenetic analyses based on parsimony criteria and Bayesian tip-dating suggest that the **Harbin cranium and some other Middle Pleistocene human fossils from China, such as those from Dali and Xiahe, form a third East Asian lineage, which is a part of the sister group of the *H. sapiens* lineage**. Our analyses of such morphologically distinctive archaic human lineages from Asia, Europe, and Africa suggest that the diversification of the *Homo* genus may have had a much deeper timescale than previously presumed. **Sympatric isolation of small populations combined with stochastic long-distance dispersals is the best fitting biogeographical model**

Ni et al. 2021

Chronology of Chinese human fossils



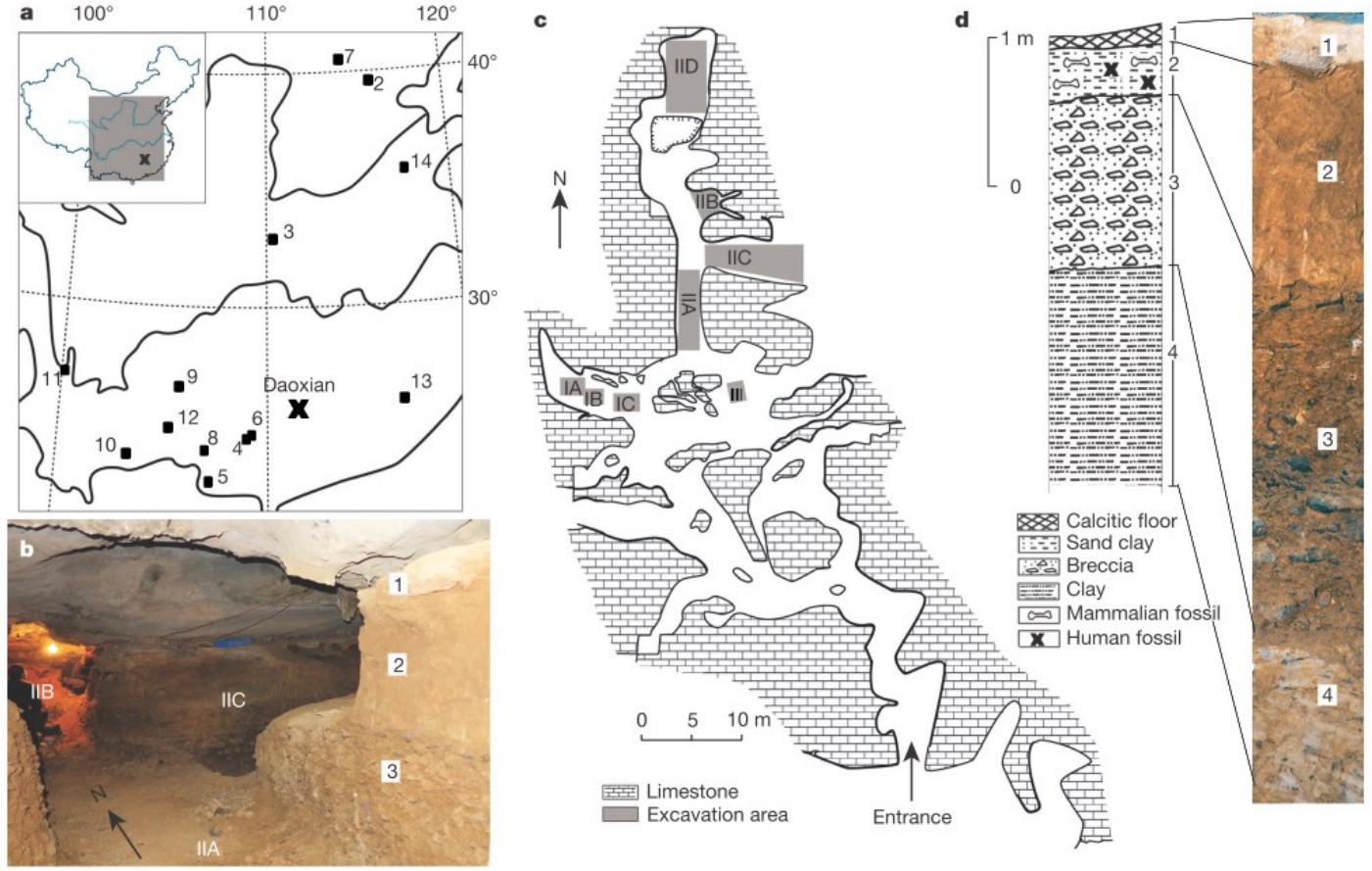
LETTER

doi:10.1038/nature15696

The earliest unequivocally modern humans in southern China

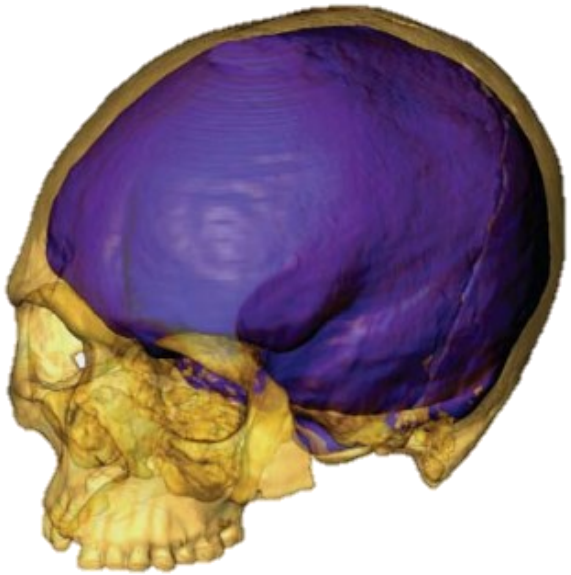
Wu Liu[1]*, María Martinón-Torres[2,3,4]*, Yan-jun Cai[5], Song Xing[1], Hao-wen Tong[1], Shu-wen Pei[1], Mark Jan Sier[4,6,7], Xiao-hong Wu[8], R. Lawrence Edwards[9], Hai Cheng[10], Yi-yuan Li[11], Xiong-xin Yang[12], José María Bermúdez de Castro[2,4] & Xiu-jie Wu[1]*

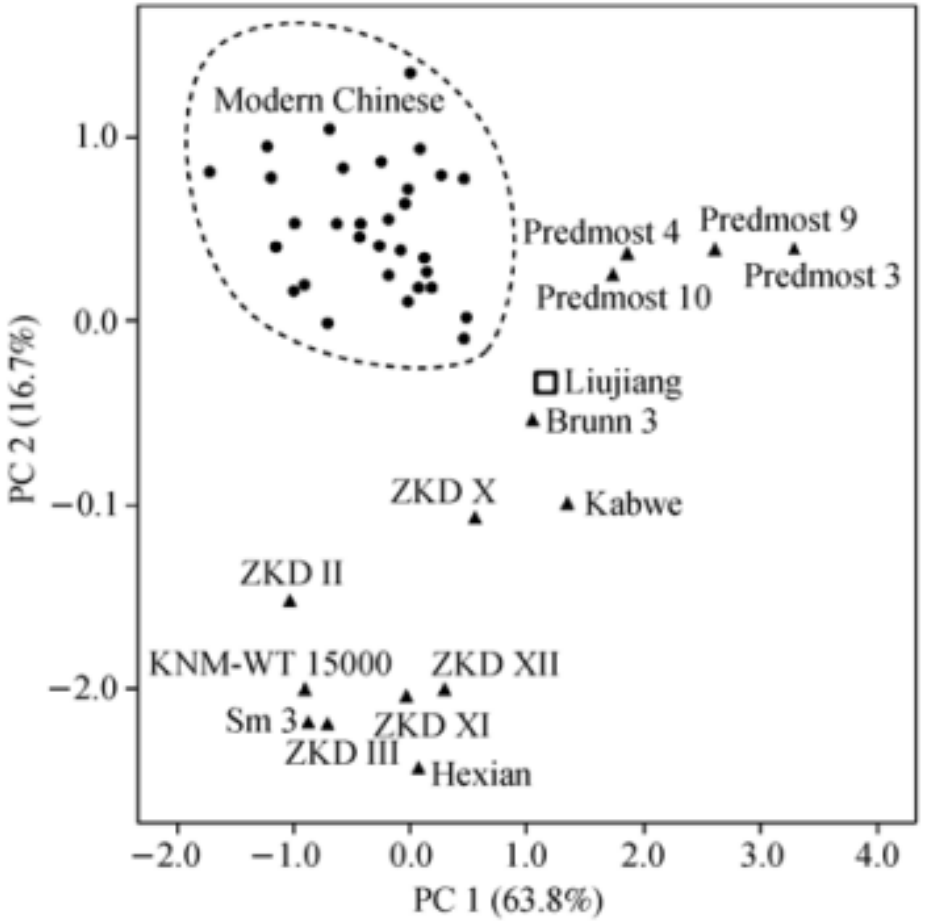
Fuyan Cave in Daoxian
47 denti umane
80 – 120 000 y BP
Più derivati che tutti i altri umani anatomicamente moderni, similarietà con il umani del Pleistocene medio, superiore e anche di tempi moderni.



"I risultati sono rilevanti per l'indagine sulle ragioni della relativamente tardiva entrata di *H. sapiens* in Europa. Degli umani moderni "completi" erano già presenti in Cina almeno 80.000 anni fa, non ci sono però evidenze dell'entrata in Europa prima di 45.000 anni fa. Questo potrebbe indicare che *H. neanderthalensis* fosse stato un'ulteriore **barriera ecologica** per gli uomini moderni, che sono potuti entrare in Europa solo quando la scomparsa dei Neanderthals era già iniziata".

Liujiang, China
60 – 100 000 y BP?





(Wu et al., 2008)

Zhoukoudian Upper Cave, China
20 – 30 000 y BP

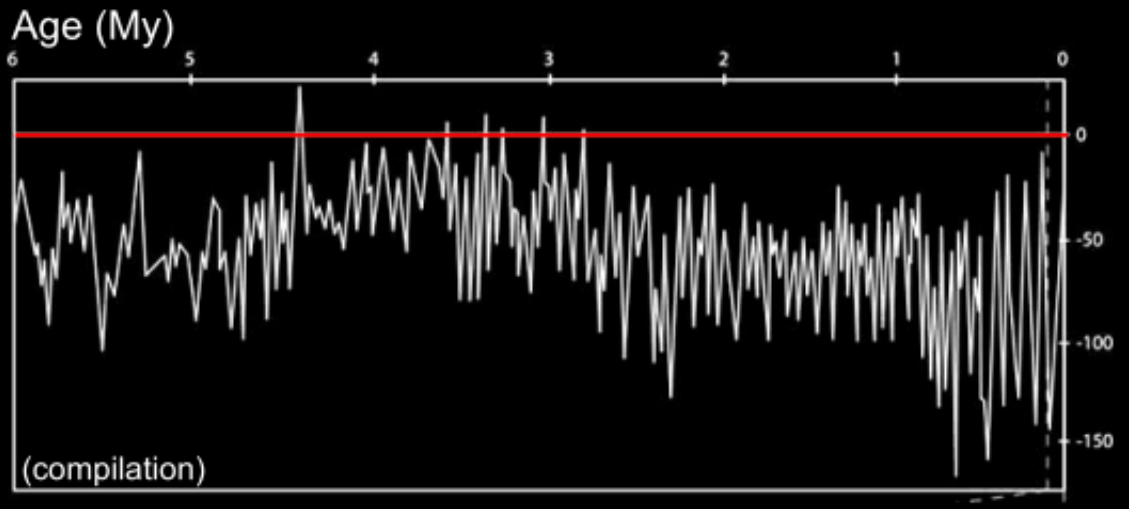
Toward Southeast Asia and Australia

How did they arrive ?

Homo erectus

Glacial / interglacial
=> Sea level changes

- insular periods



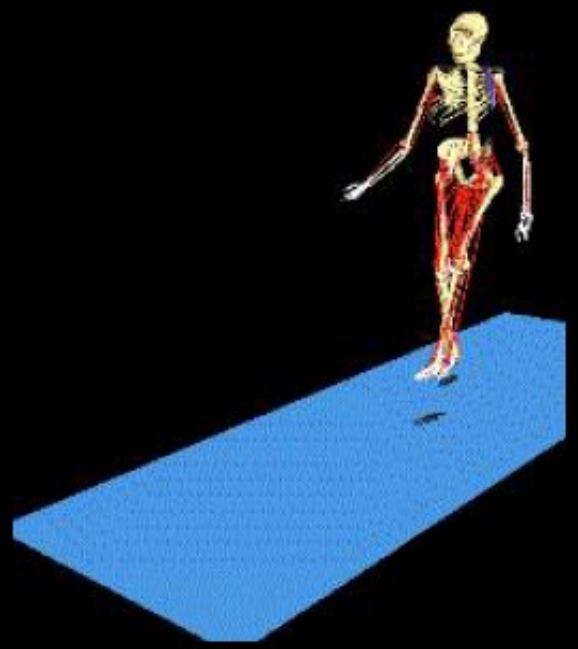
How did they arrive ?

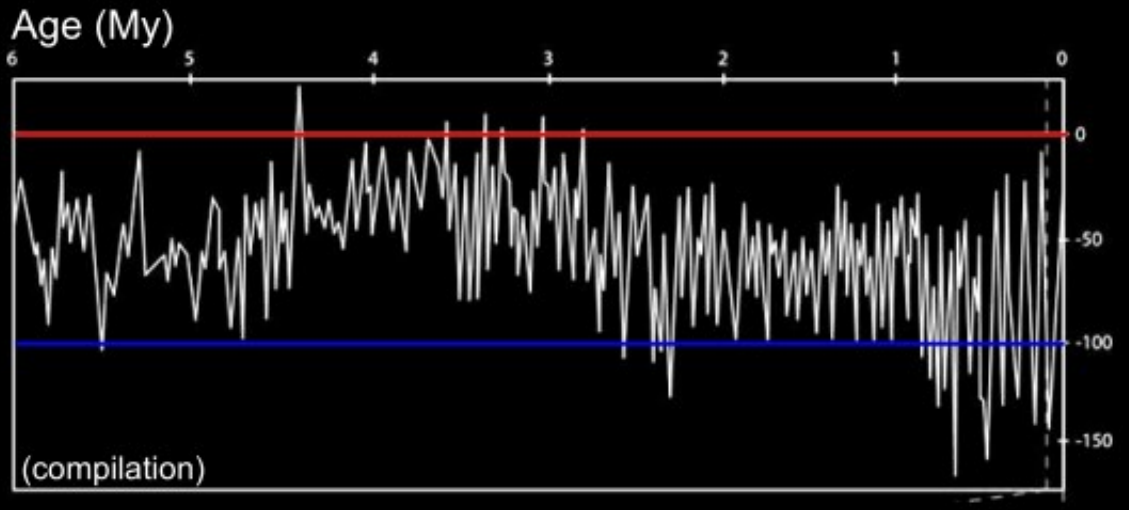
Homo erectus

Glacial / interglacial
=> Sea level changes

- insular periods

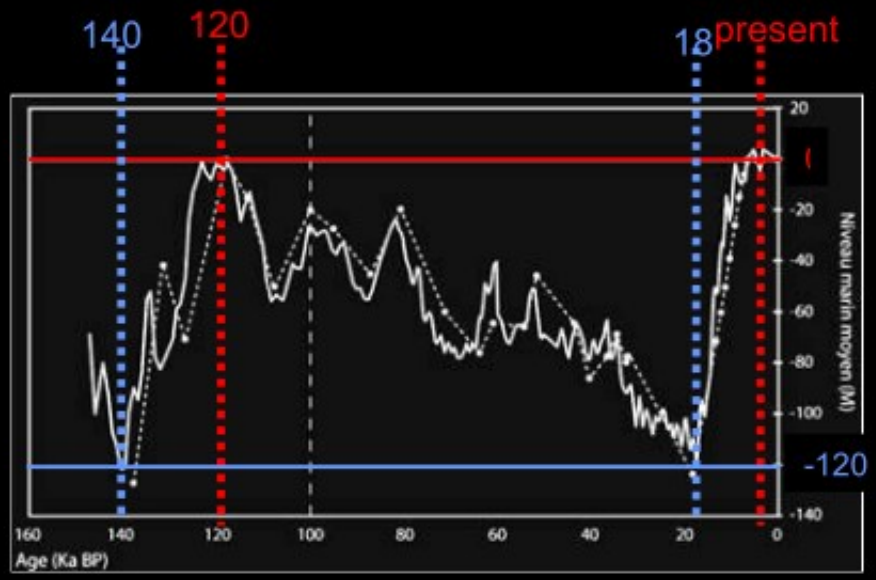
- continental periods



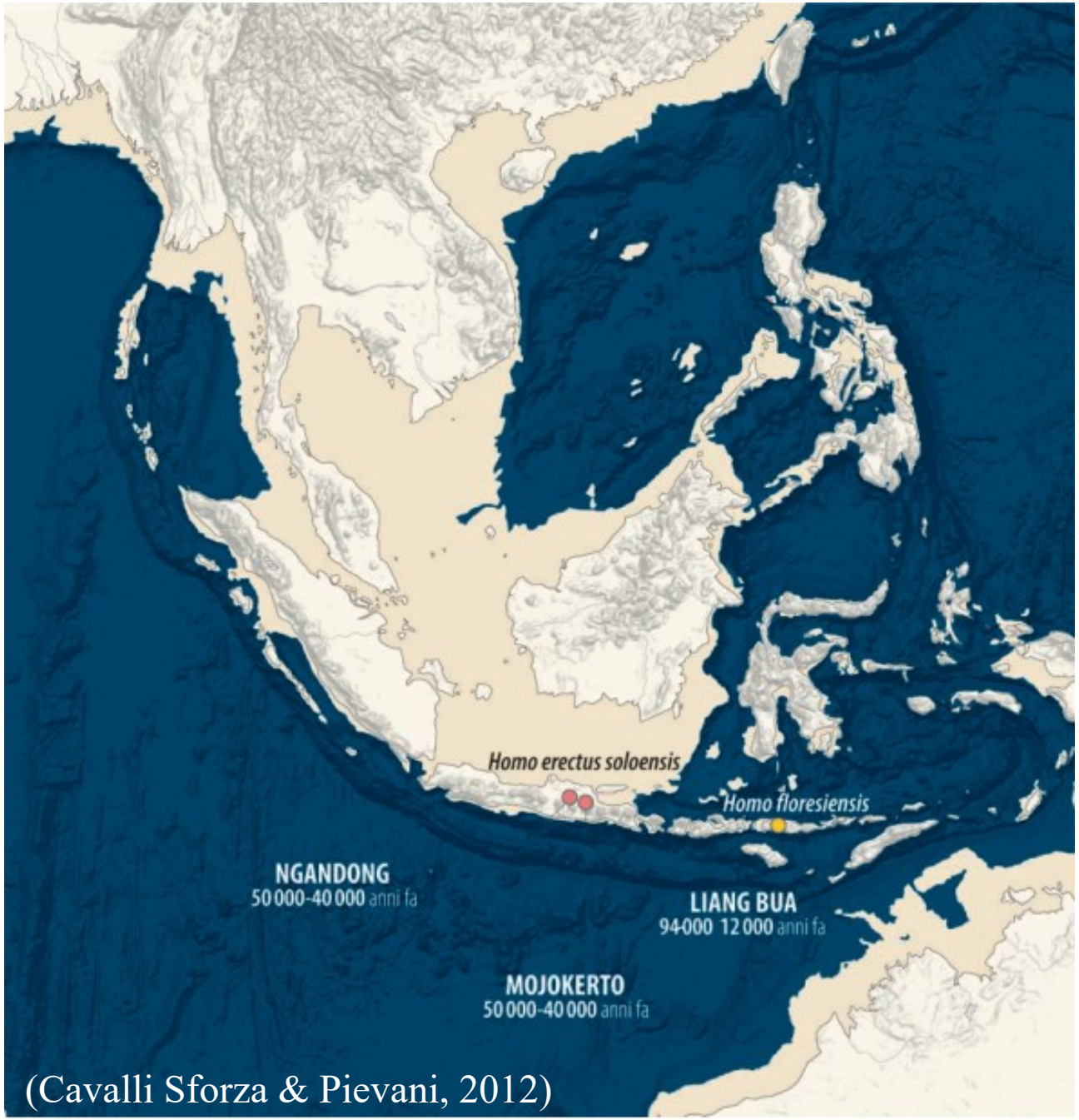


(Voris, 2000)

Homo sapiens is able to navigate for at least 60 000 years



d'après Chappell *et al.* (1996) ; Pillans *et al.* (1998) et Voris (2002)



(Cavalli Sforza & Pievani, 2012)

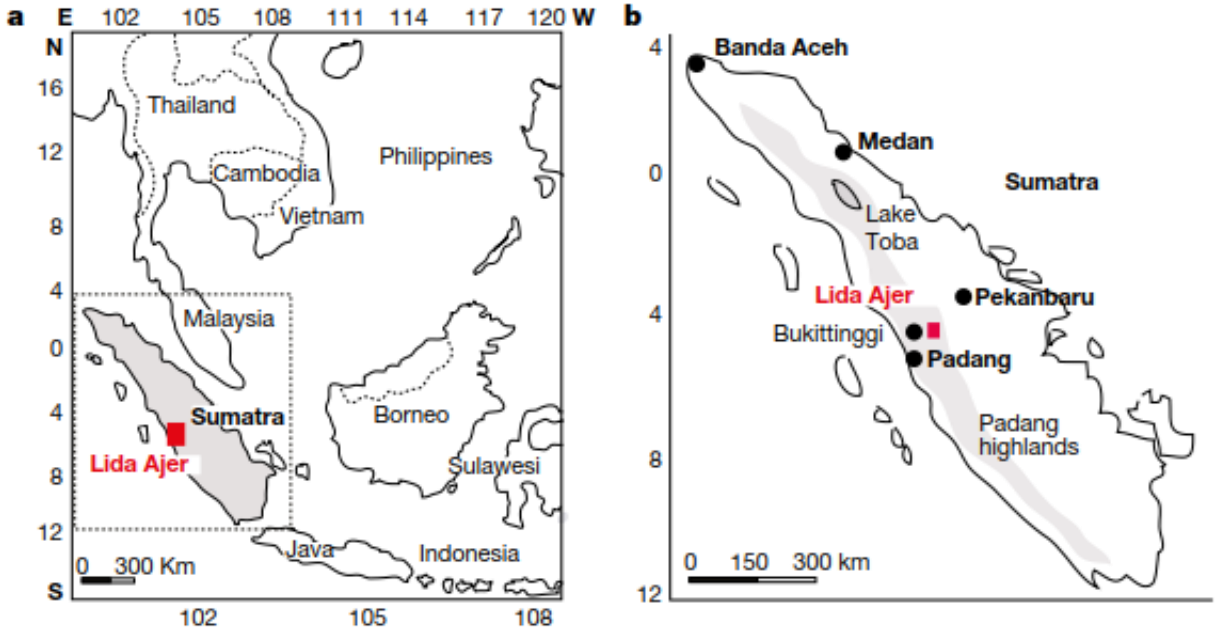
Homo species in Indonesia before the arrival of *Homo sapiens*

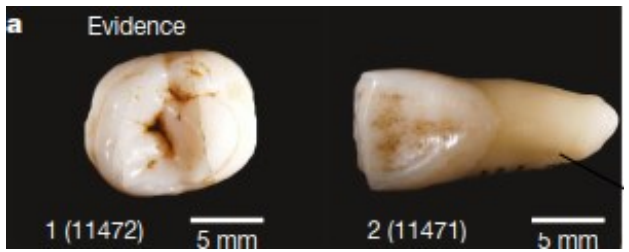
LETTER

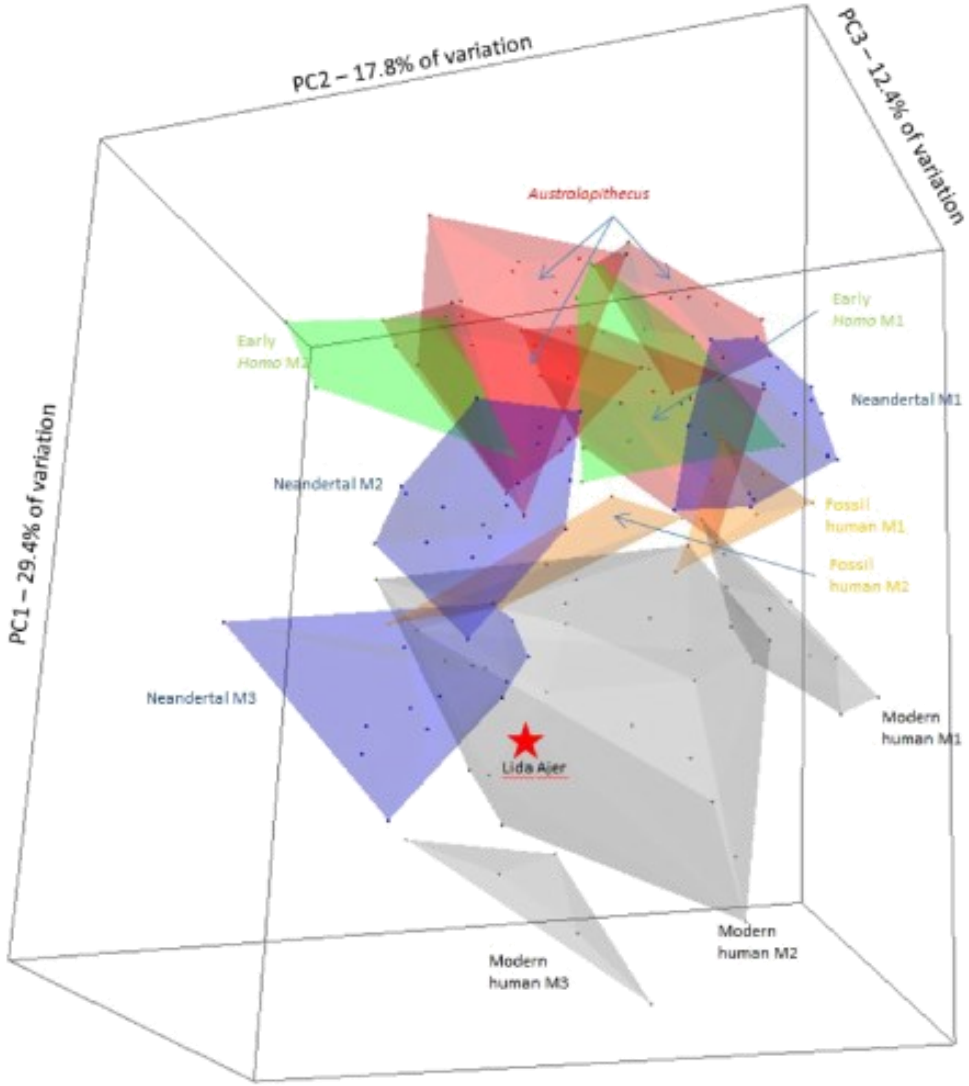
doi:10.1038/nature23452

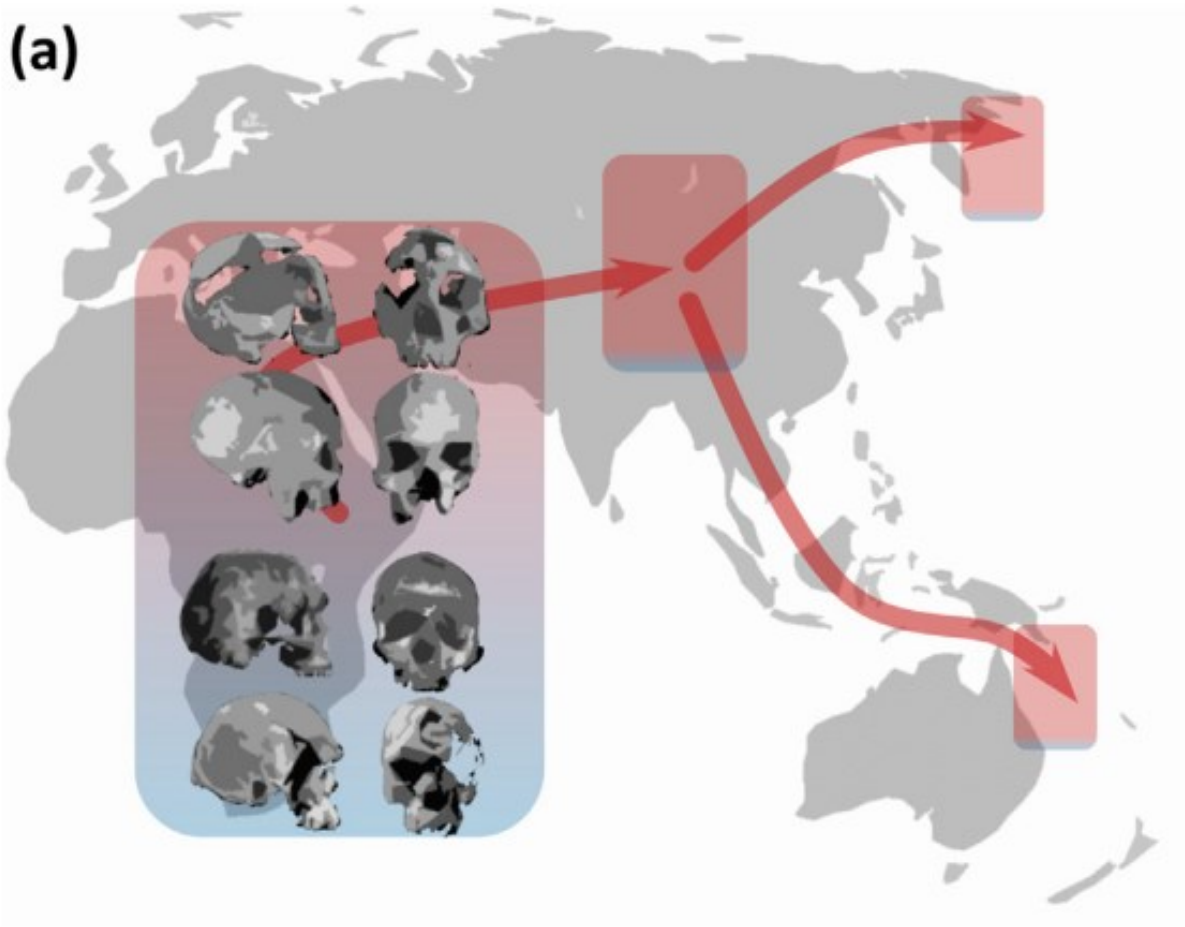
An early modern human presence in Sumatra 73,000–63,000 years ago

K. E. Westaway[1], J. Louys[2], R. Due Awe[3]‡, M. J. Morwood[4]‡, G. J. Price[5], J.-x. Zhao[5], M. Aubert[6], R. Joannes-Boyau[7], T. M. Smith[8,9], M. M. Skinner[10,11], T. Compton[12], R. M. Bailey[13], G. D. van den Bergh[4], J. de Vos[14], A. W. G. Pike[15], C. Stringer[12], E. W. Saptomo[3], Y. Rizal[16], J. Zaim[16], W. D. Santoso[16], A. Trihascaryo[16], L. Kinsley[17] & B. Sulistyanto[3]

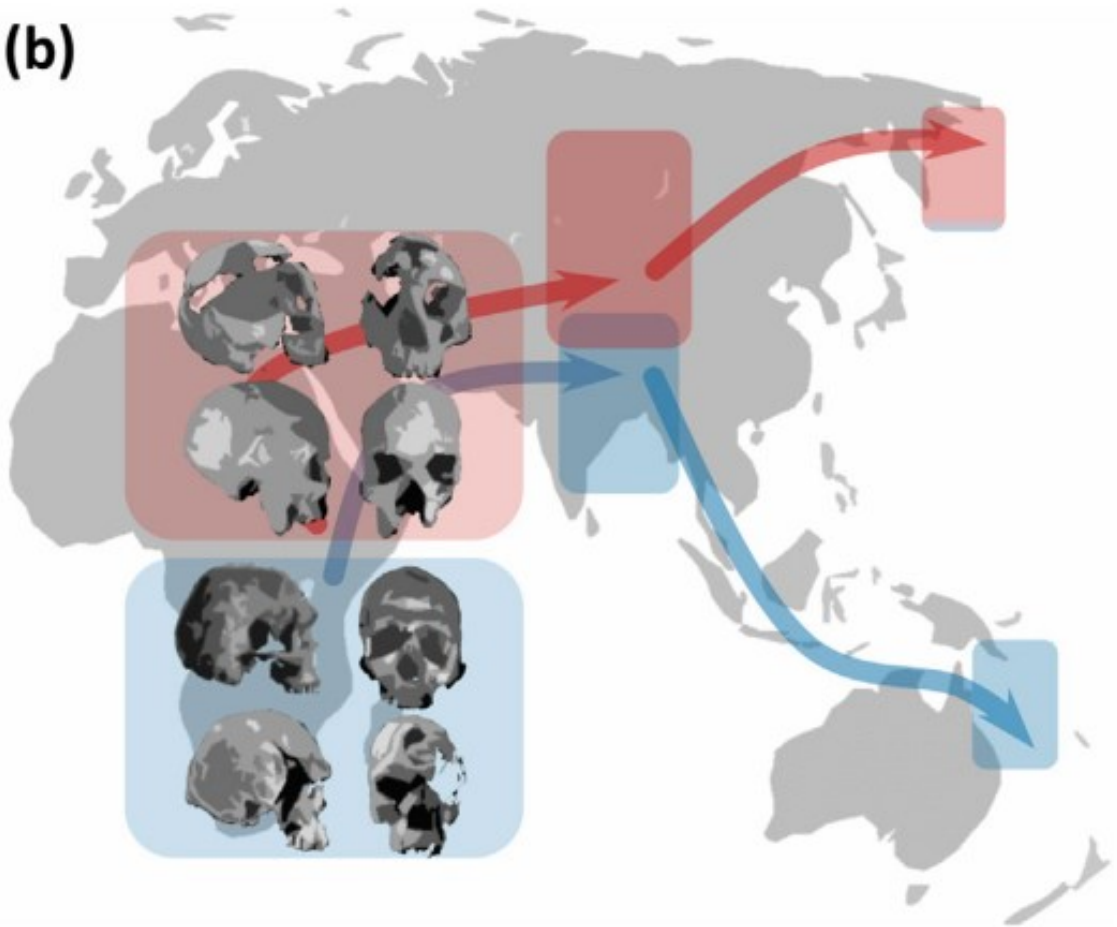








Single dispersal



Multiple dispersal

(Reyes-Centeno et al., 2014)

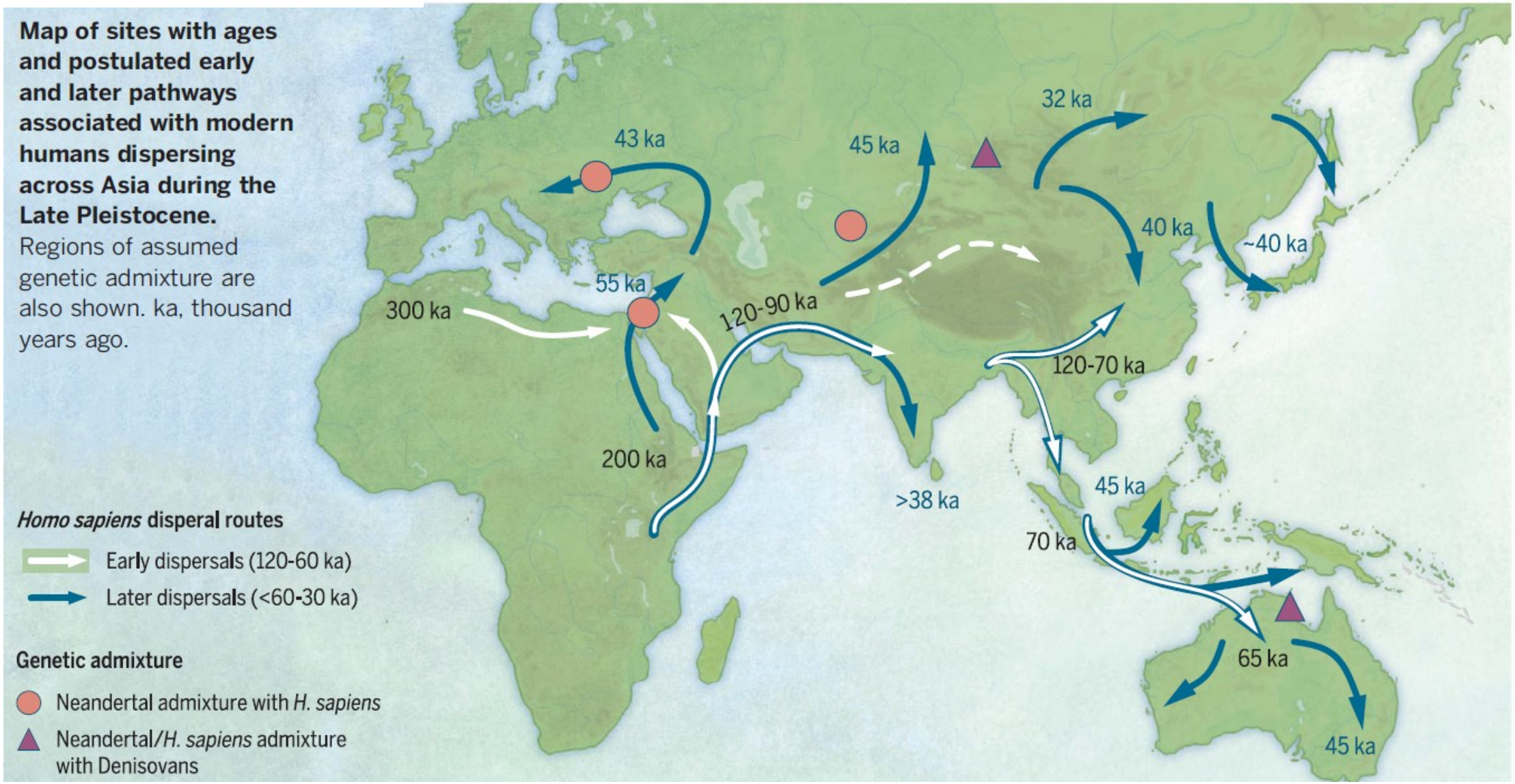
Recent genetic studies and accumulating archaeological and paleontological evidence suggest a « southern route » dispersal into Asia in the late Middle Pleistocene, followed by a separate dispersal into northern Eurasia. Australo-Melanesian populations are descendants of an early dispersal whereas other Asian populations are descended from, or highly admixed with, members of a subsequent migration event.

(Reyes-Centeno et al., 2014)

(Cavalli Sforza & Pievani, 2012)

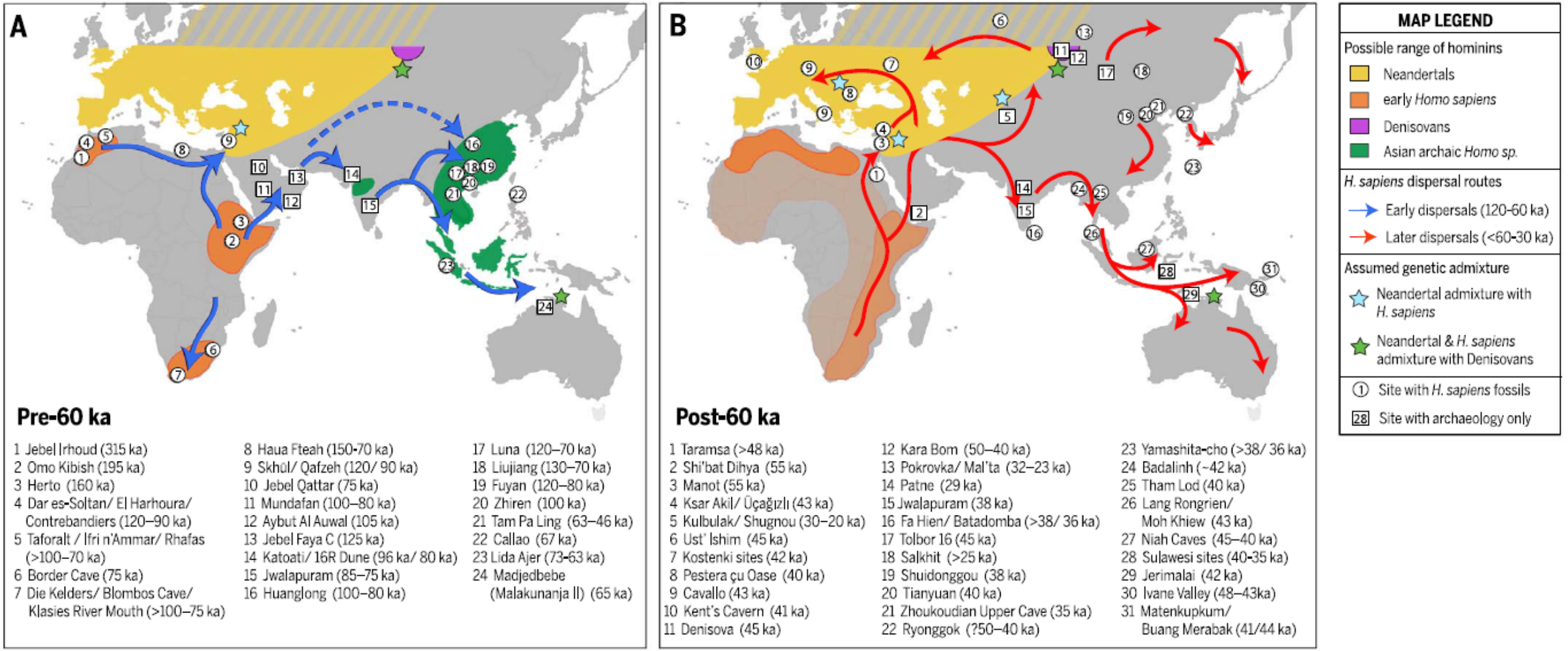
On the origin of modern humans: Asian perspectives

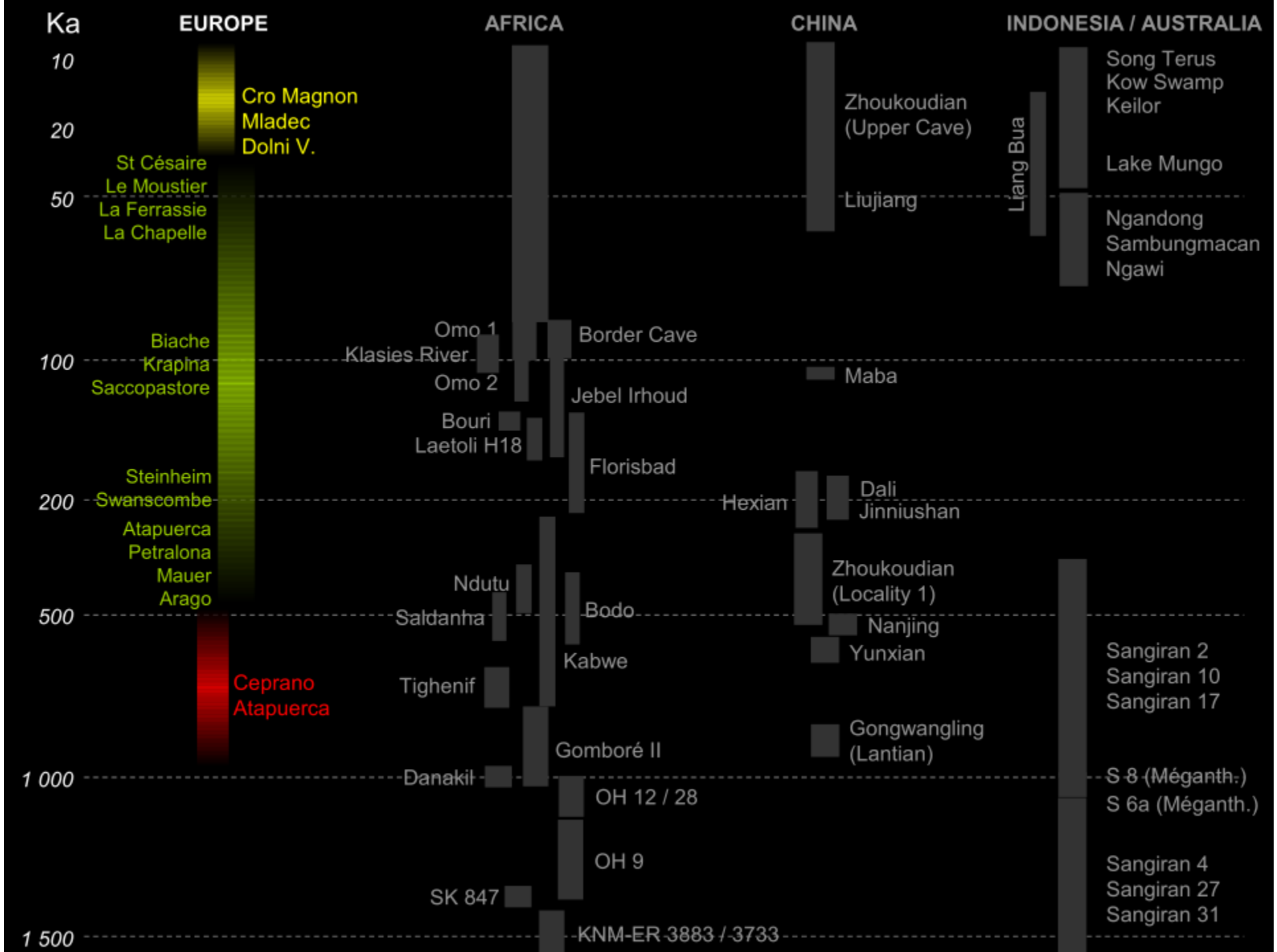
Christopher J. Bae,[1]* Katerina Douka,[2,3]* Michael D. Petraglia[2,4]*



On the origin of modern humans: Asian perspectives

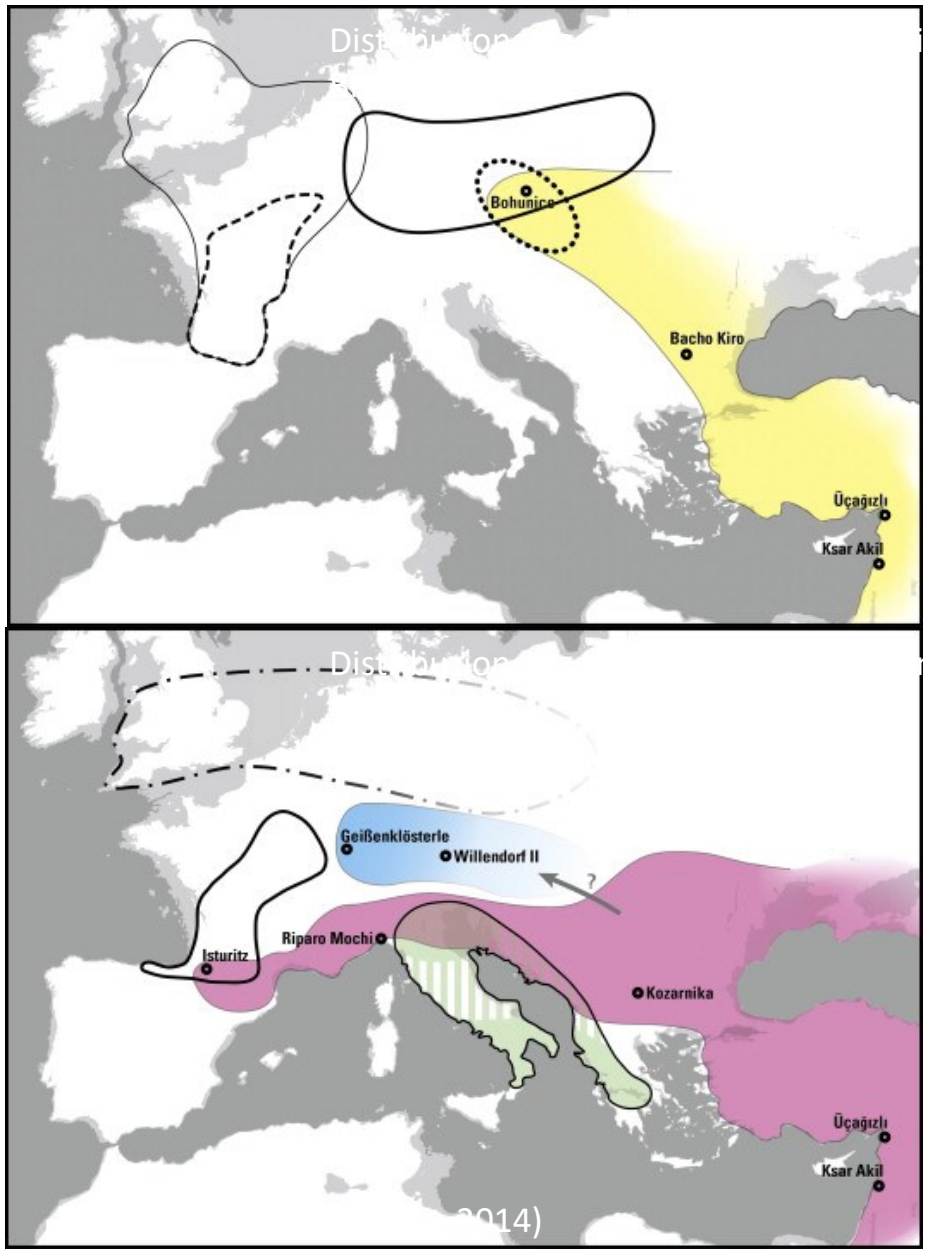
Christopher J. Bae,[1]* Katerina Douka,[2,3]* Michael D. Petraglia[2,4]*




Ka
EUROPE
AFRICA
CHINA
INDONESIA / AUSTRALIA
10
20
50
100
200
500
1 000
1 500
Cro Magnon
Mladec
Dolni V.
St Césaire
Le Moustier
La Ferrassie
La Chapelle
Biache
Krapina
Saccopastore
Steinheim
Swanscombe
Atapuerca
Petralona
Mauer
Arago
Ceprano
Atapuerca
Omo 1
Klasies River
Omo 2
Border Cave
Jebel Irhoud
Bouri
Laetoli H18
Florisbad
Ndutu
Saldanha
Bodo
Kabwe
Tighenif
Gomboré II
Danakil
OH 12 / 28
OH 9
SK 847
KNM-ER 3883 / 3733
Zhoukoudian
(Upper Cave)
Liujiang
Maba
Hexian
Dali
Jinniushan
Zhoukoudian
(Locality 1)
Nanjing
Yunxian
Gongwangling
(Lantian)
Liang Bua
Song Terus
Kow Swamp
Keilor
Lake Mungo
Ngandong
Sambungmacan
Ngawi
Sangiran 2
Sangiran 10
Sangiran 17
S 8 (Méganth.)
S 6a (Méganth.)
Sangiran 4
Sangiran 27
Sangiran 31


Estensione massima dei ghiacci
41 000-42 000 anni fa
Homo sapiens
41 000
anni fa
41 000-42 000
anni fa
Homo sapiens
41 000
anni fa
45 000-47 000
anni fa
prima ondata 120 000-100 000 anni fa
Homo sapiens
seconda ondata 50 000-45 000 anni fa
Homo sapiens
siti di Homo neanderthalensis
diffusione di Homo sapiens

The first modern human in Europe



Bacho Kiro (Bulgaria) (Aurignacian) – 45-43.000 y

Grotta del Cavallo (Italy) (Uluzzian) – 45-43.000 y

Kents Cavern (UK) – 44-41 000 y

El Castillo (Spain) (Aurignacian) – 37.000- 34.000 y

Mladec (Czech Republic) – 32.000 y

Dolni Vestonice, Pavlov (Czech Republic) – 25.000 y

Cro Magnon (France) – 30.000 y

Pestera cu Oase (Grotta degli orsi, Romania) – 34-36.000 y


Kents Cavern
Mladec
Brno
Predmost
Fontéchevade
Lagar Velho
La Ferrassie
Cro-Magnon
Isturitz
La Crouzade
Bacho Kiro
Homo sapiens (a.m.)
Néandertaliens

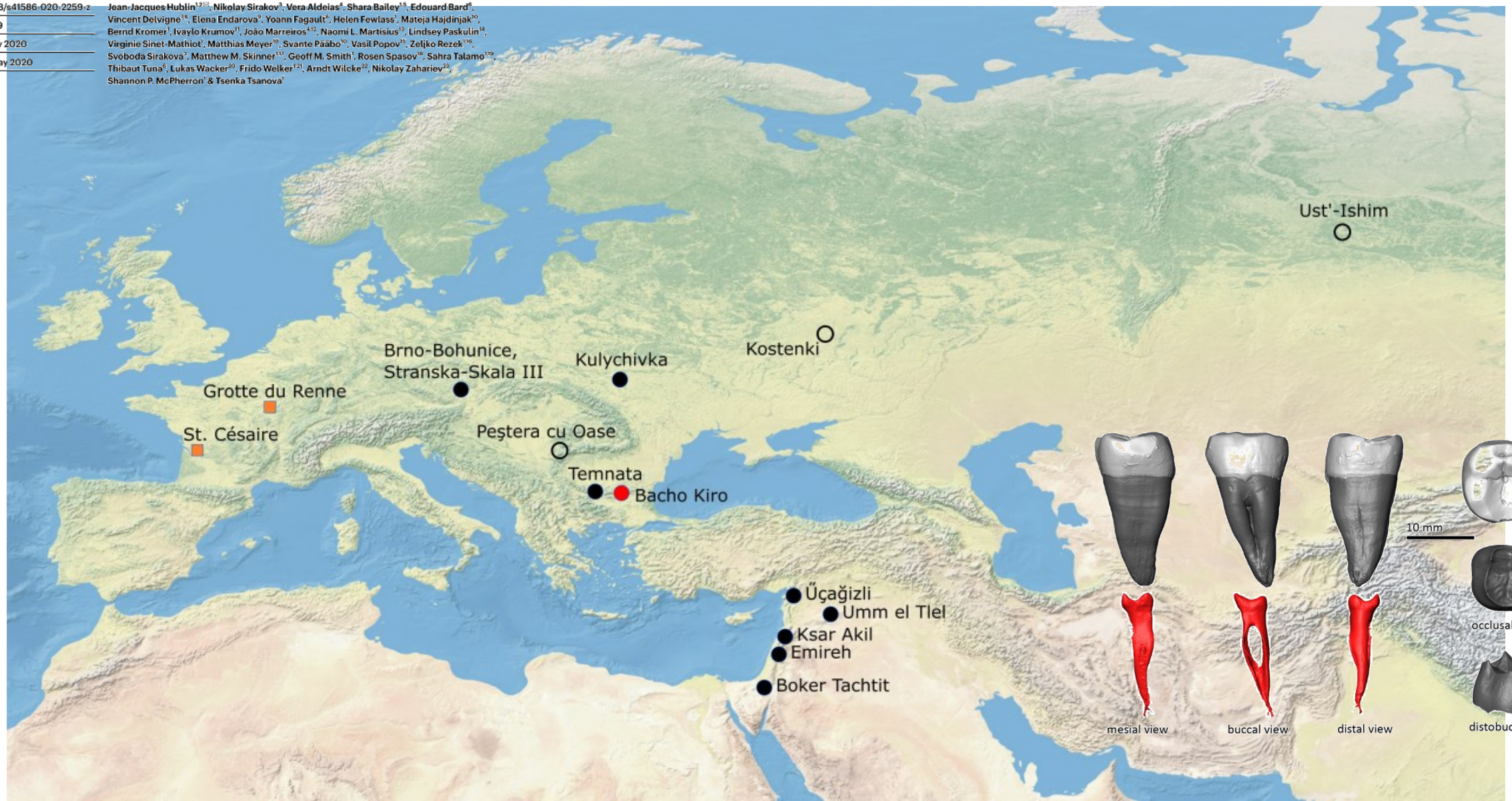
Article

Initial Upper Palaeolithic *Homo sapiens* from Bacho Kiro Cave, Bulgaria

https://doi.org/10.1038/s41586-020-2259-z
Received: 30 July 2019
Accepted: 24 February 2020
Published online: 11 May 2020
Check for updates

Jean-Jacques Hublin[1,2]✉, Nikolay Sirakov[3], Vera Aldeias[4], Shara Bailey[1,5], Edouard Bard[6], Vincent Delvigne[1,8], Elena Endarova[9], Yoann Fagault[6], Helen Fewlass[1], Mateja Hajdinjak[10], Bernd Kromer[1], Ivaylo Krumov[11], João Marreiros[4,12], Naomi L. Martisius[13], Lindsey Paskulin[14], Virginie Sinet-Mathiot[1], Matthias Meyer[10], Svante Pääbo[10], Vasil Popov[15], Zeljko Rezek[1,16], Svoboda Sirakova[7], Matthew M. Skinner[1,17], Geoff M. Smith[1], Rosen Spasov[15], Sahra Talamo[1,18], Thibaut Tuna[6], Lukas Wacker[20], Frido Welker[1,21], Arndt Wilcke[22], Nikolay Zahariev[23], Shannon P. McPherron[1] & Tsenka Tsanova[1]

● Initial Upper Palaeolithic sites
○ Directly dated early *H. sapiens* predating 37 ka cal. BP
■ Directly dated late Neanderthals associated with Châtelperronian

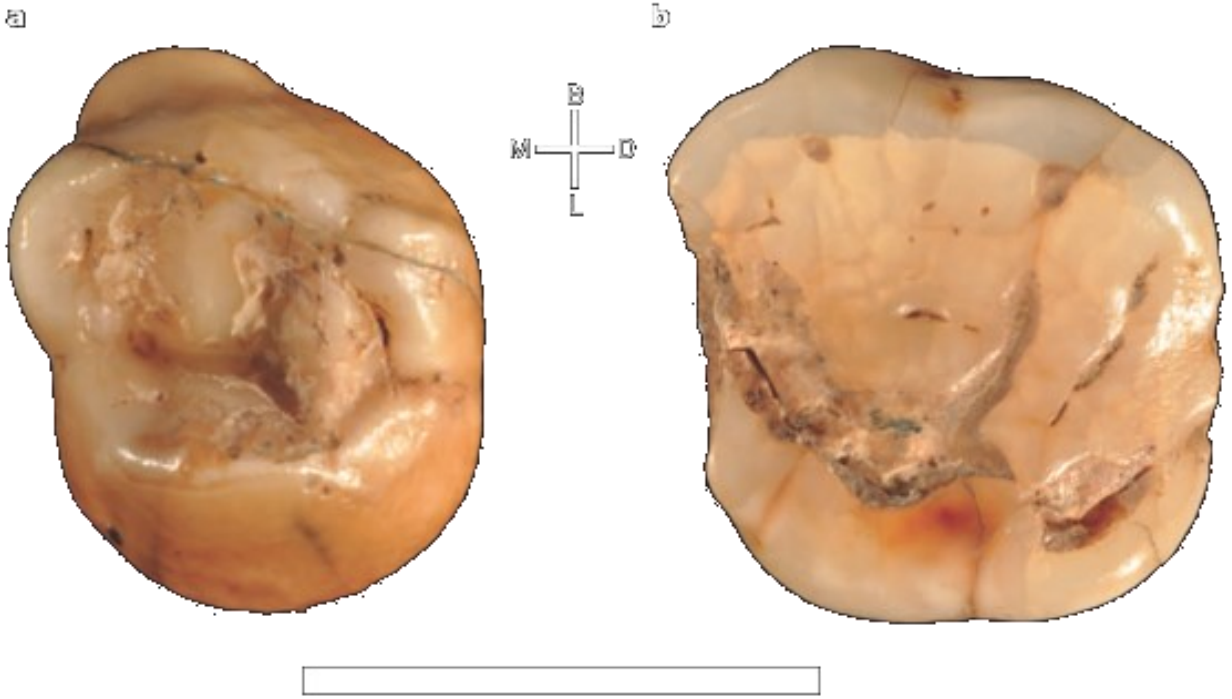


LETTER

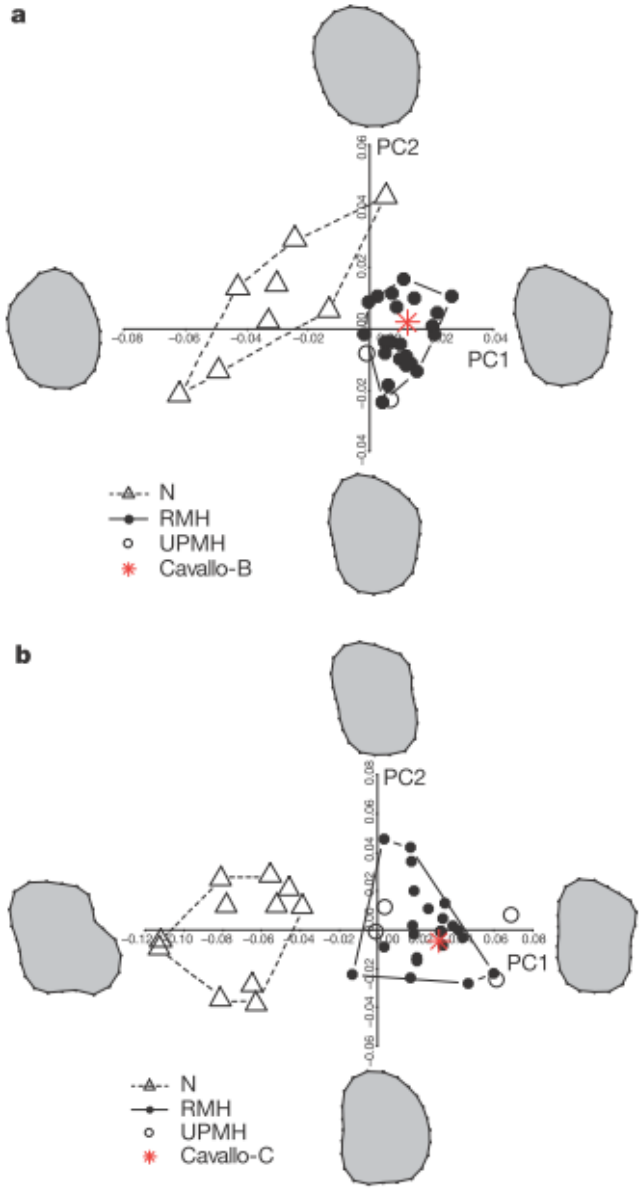
doi:10.1038/nature10617

Early dispersal of modern humans in Europe and implications for Neanderthal behaviour

Stefano Benazzi[1], Katerina Douka[2], Cinzia Fornai[1], Catherine C. Bauer[3], Ottmar Kullmer[4], Jiří Svoboda[5,6], Ildikó Pap[7], Francesco Mallegni[8], Priscilla Bayle[9], Michael Coquerelle[10], Silvana Condemi[11], Annamaria Ronchitelli[12], Katerina Harvati[3,13] & Gerhard W. Weber[1]



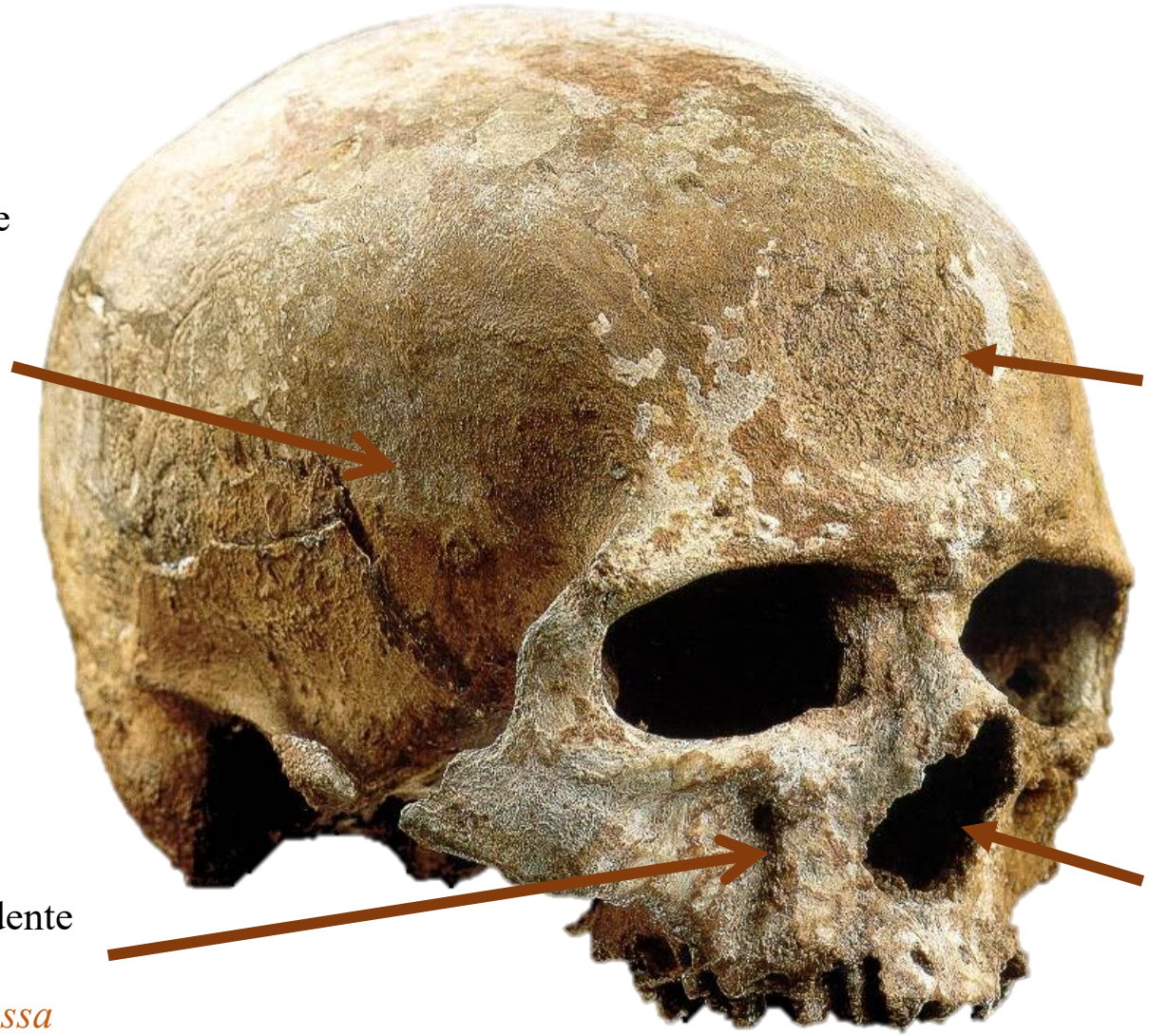
Grotta del Cavallo, Italia (45 000 – 43 000 y BP)



Cro-Magnon, France
27 680 +/- 270 BP (Henry-Gambier et al, 2002)

Cro-Magnon 1

Cro-Magnon 2



Parietali espansi e occipitale arrotondato / *Parietals expanded and rounded occipitals*

Fronte verticale / *Vertical frontal bone*

Fossa canina evidente / *Evident canine fossa*

Faccia piccola e piatta / *Short and flat face*

H. sapiens, Cro-Magnon

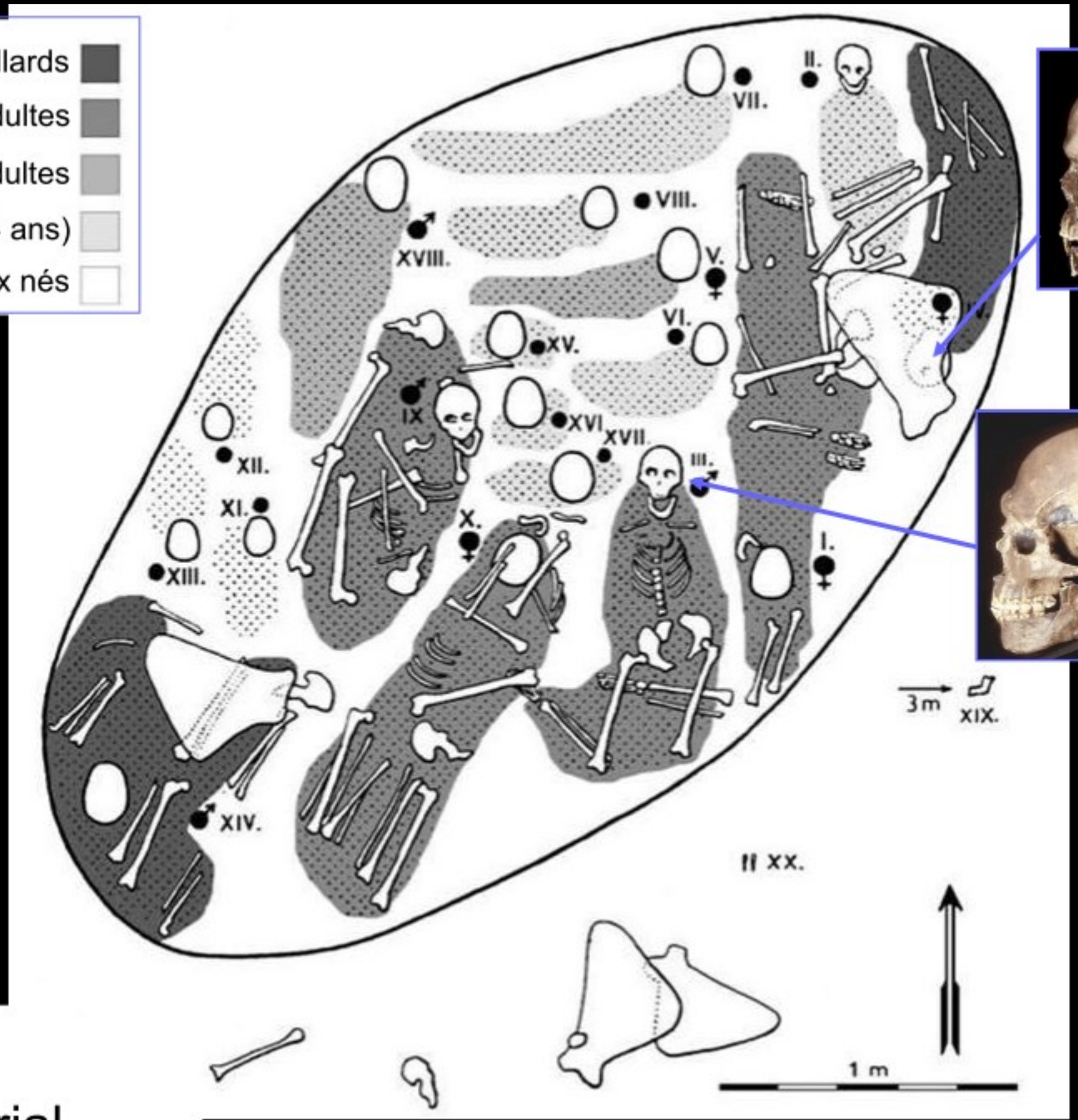

Mladec
Brno
Predmost
Fontéchevade
La Ferrassie
Lagar Velho
Cro-Magnon
Isturitz
La Crouzade
Homo sapiens (a.m.)
Néandertaliens

Mladec V, Czech Republic
34-35 000 y BP?

Triple burial (Mladec 5, 6 and 46)

Predmost III, Czech Republic
28 – 20 000 y BP

2 vieillards
2 “couples” adultes
2 jeunes adultes
7 enfants (2-14 ans)
3 nouveaux nés



Predmost
Multiple burial

(d’après Klima, 1991; *in* Trinkaus & Zilhao, 2002)

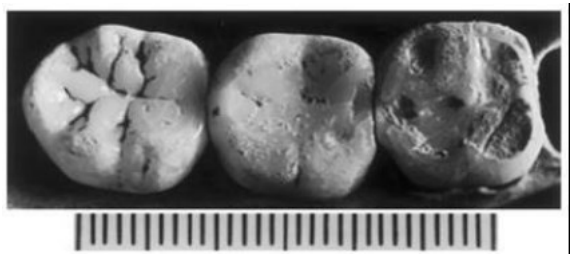

Mladec
Brno
Predmost
Fontéchevade
La Ferrassie
Lagar Velho
Cro-Magnon
Isturitz
La Crouzade
Pestera Cu Oase
Homo sapiens (a.m.)
Néandertaliens

Pestera cu Oase, Romania
34 290 +/- 900 BP

Conclusion

The 2002 discovery of a human mandible at the Peştera cu Oase in southwestern Romania indicates that the earliest "modern" Europeans combined a variety of archaic *Homo*, derived early modern human, and possibly Neandertal features in their cranio-facial skeletal and dental morphology. Although compatible with some degree of admixture between regional Neandertal populations and in-dispersing early modern humans, the Oase 1 mandible is particularly relevant for emphasizing the degree to which early modern humans were not particularly modern.

(Trinkaus, 2003)



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Journal of Human Evolution 45 (2003) 245–253

News and Views

Early modern human cranial remains from the Peştera cu Oase, Romania

Erik Trinkaus[a]*, Ştefan Milota[b], Ricardo Rodrigo[c], Gherase Mircea[b], Oana Moldovan[d]

[a] *Department of Anthropology, Campus Box 1114, Washington University, St. Louis, MO 63130, USA*
[b] *PRO ACVA GRUP, Str. Surduc 1, 1900 Timişoara, Romania*
[c] *Centro Nacional da Arqueologia Náutica e Subaquática, Instituto Português de Arqueologia, Avenida da India 136, 1300 Lisboa, Portugal*
[d] *Institutul de Speologie "Emil Racoviţă," Clinicilor 5, P.O. Box 58, 3400 Cluj, Romania*

Keywords: Human paleontology; Early modern humans; Europe; Late Pleistocene

Pestera cu Oase, Romania
34 290 +/- 900 BP

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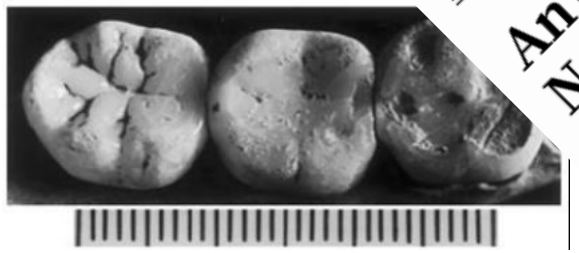

LETTER

doi:10.1038/nature14558

An early modern human from Romania with a recent Neanderthal ancestor

Qiaomei Fu[1,2,3]*, Mateja Hajdinjak[3]*, Oana Teodora Moldovan[4], Silviu Constantin[5], Swapan Mallick[2,6,7], Pontus Skoglund[2], Nick Patterson[6], Nadin Rohland[2], Iosif Lazaridis[2], Birgit Nickel[3], Bence Viola[3,7,8], Kay Prüfer[3], Matthias Meyer[3], Janet Kelso[3], David Reich[2,6,9] & Svante Pääbo[3]

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Evolution 45 (2003) 245–253

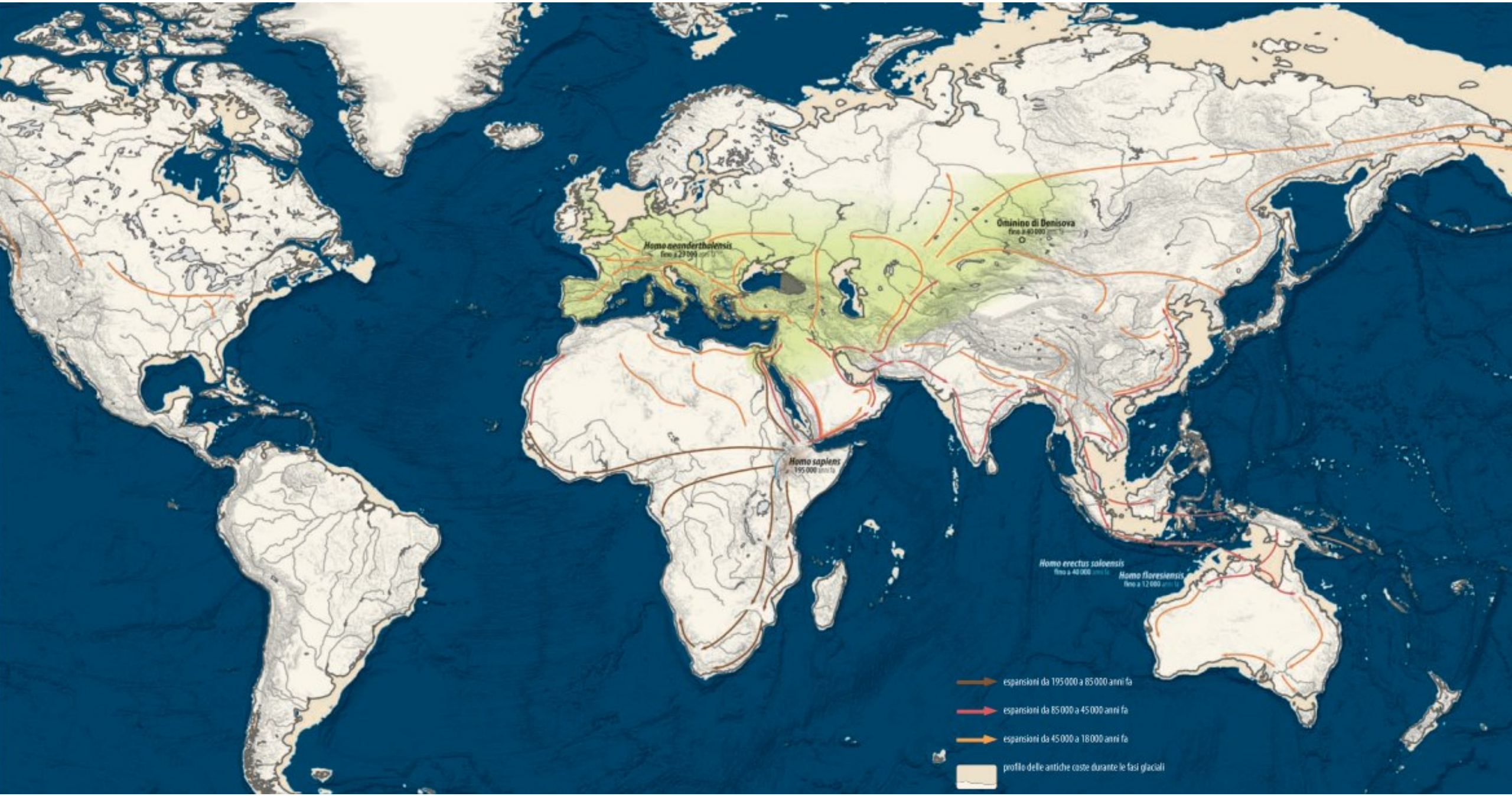
Views

ins from the Peştera cu

odrigo[c], Gherase Mircea[b],
n[d]

ington University, St. Louis, MO 63130, USA
c 1, 1900 Timişoara, Romania
., Instituto Português de Arqueologia, Avenida da India 136,
sboa, Portugal
ţă," Clinicilor 5, P.O. Box 58, 3400 Cluj, Romania

ans; Europe; Late Pleistocene


Homo neanderthalensis
fino a 29 000 anni fa
Ominino di Denisova
fino a 40 000 anni fa
Homo sapiens
195 000 anni fa
Homo erectus soloensis
fino a 40 000 anni fa
Homo floresiensis
fino a 12 000 anni fa
espansioni da 195 000 a 85 000 anni fa
espansioni da 85 000 a 45 000 anni fa
espansioni da 45 000 a 18 000 anni fa
profilo delle antiche coste durante le fasi glaciali


Estensione massima dei ghiacci
Estensione massima dei ghiacci
41 000-42 000 anni fa
Homo sapiens
41 000
anni fa
41 000
anni fa
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anni fa
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prima ondata 120 000-100 000 anni fa
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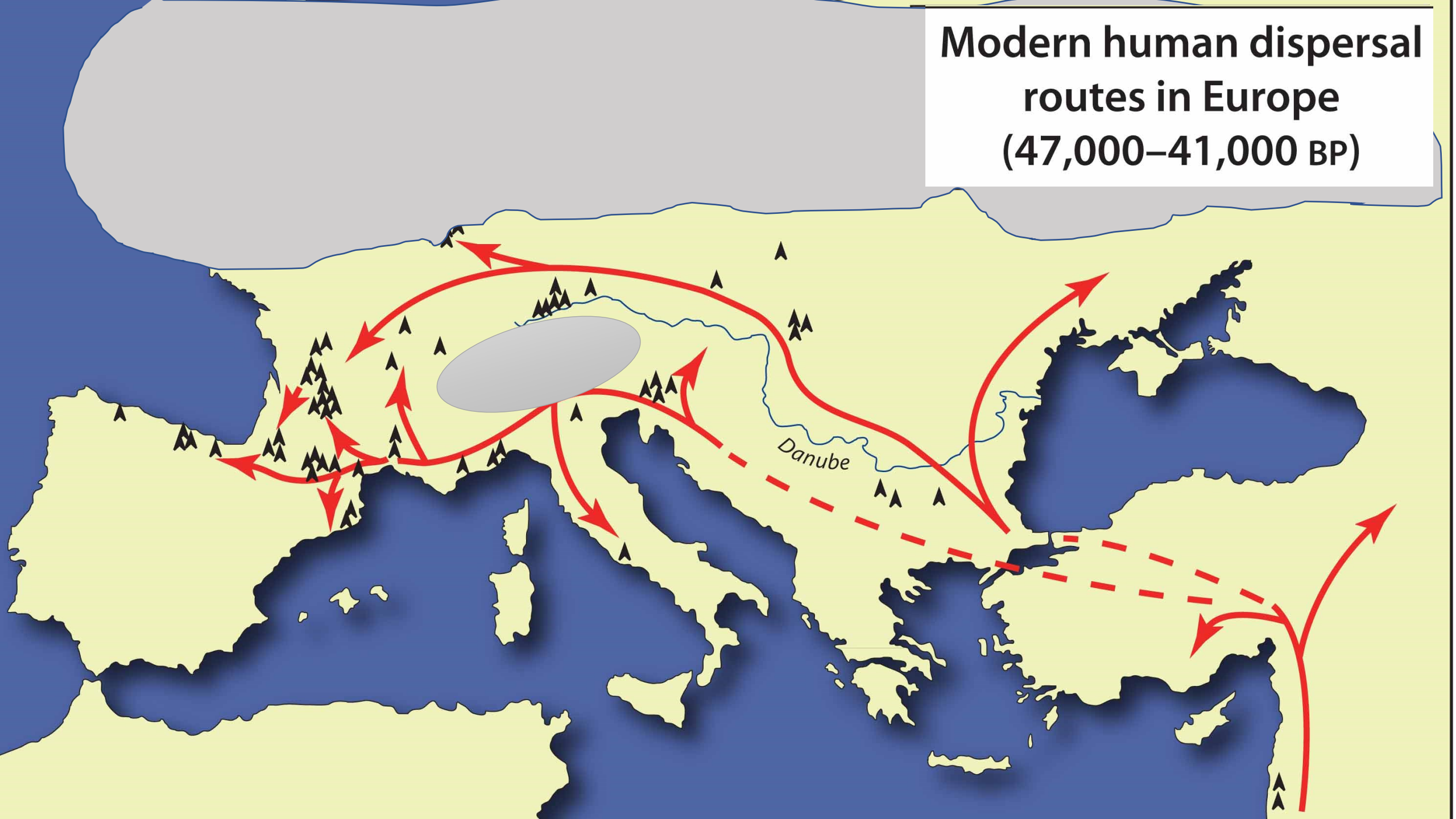
seconda ondata 50 000-45 000 anni fa
Homo sapiens
siti di Homo neanderthalensis
diffusione di Homo sapiens
profilo delle antiche coste durante le fasi glaciali

Modern human dispersal routes in Europe (47,000–41,000 BP)



Homo sapiens dispersal toward America

Article | Published: 22 July 2020

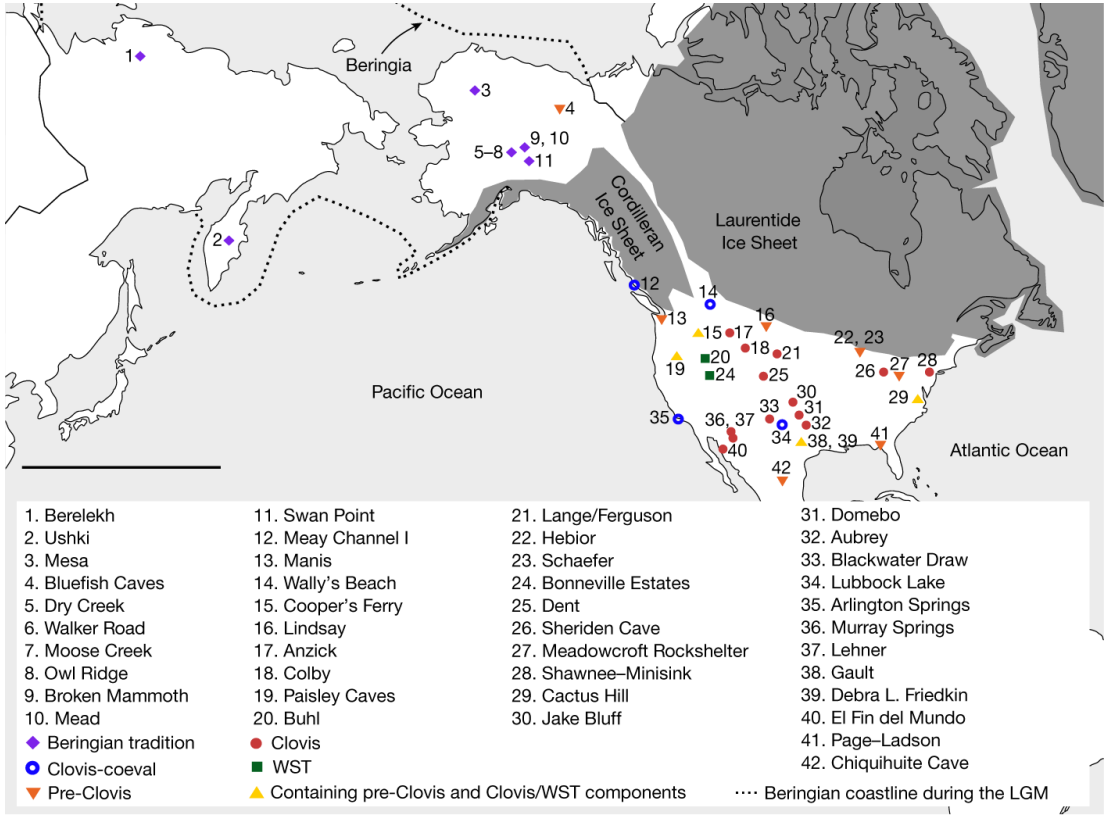
The timing and effect of the earliest human arrivals in North America

Lorena Becerra-Valdivia & Thomas Higham

Nature **584**, 93–97 (2020) | Cite this article

Questions regarding the timing and mechanisms of this dispersal remain, and the previously accepted model (termed 'Clovis-first')—**suggesting that the first inhabitants of the Americas were linked with the Clovis tradition**, a complex marked by distinctive fluted lithic points[1]—**has been effectively refuted**

The data obtained show that **humans were probably present before, during and immediately after the Last Glacial Maximum (about 26.5–19 thousand years ago)** but that m**ore widespread occupation began during a period of abrupt warming, Greenland Interstadial 1 (about 14.7–12.9 thousand years before AD 2000)**. We also identify the near-synchronous commencement of Beringian, Clovis and Western Stemmed cultural traditions, and an overlap of each with the last dates for the appearance of 18 now-extinct faunal genera. Our analysis suggests that the widespread expansion of humans through North America was a key factor in the extinction of large terrestrial mammals.




espansioni da 195 000 a 85 000 anni fa
espansioni da 85 000 a 45 000 anni fa
espansioni da 45 000 a 18 000 anni fa
espansioni da 18 000 anni fa e recenti
profilo delle antiche coste durante le fasi glaciali
CRO-MAGNON
CLOVIS
MEADOWCROFT
CACTUS HILL
TAIMA TAIMA
MONTE VERDE
YÁMANA
GAFZEH CAVE, SKHUL
ABDUR
HEXTO BOURI
OMO VALLEY
KLASIES RIVER CAVE
BLOMBOS CAVE
ERUZIONE DEL TOBA
ZHOUKOUDIAN
DYUKTAI
JOMON
SARAWAK
BOBONGARA
MUNGO LAKE