The first hominins
part 2

Julie Arnaud
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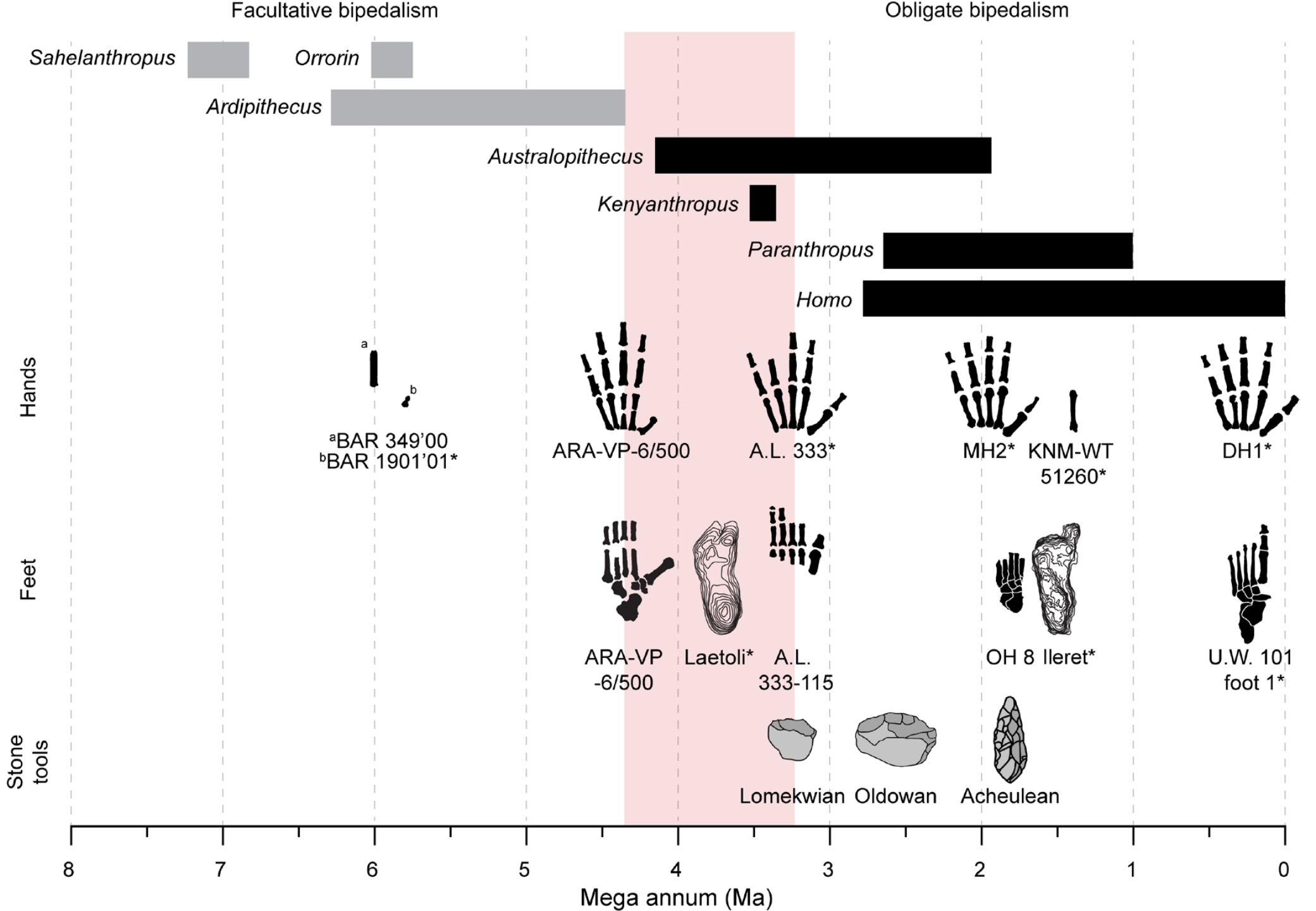
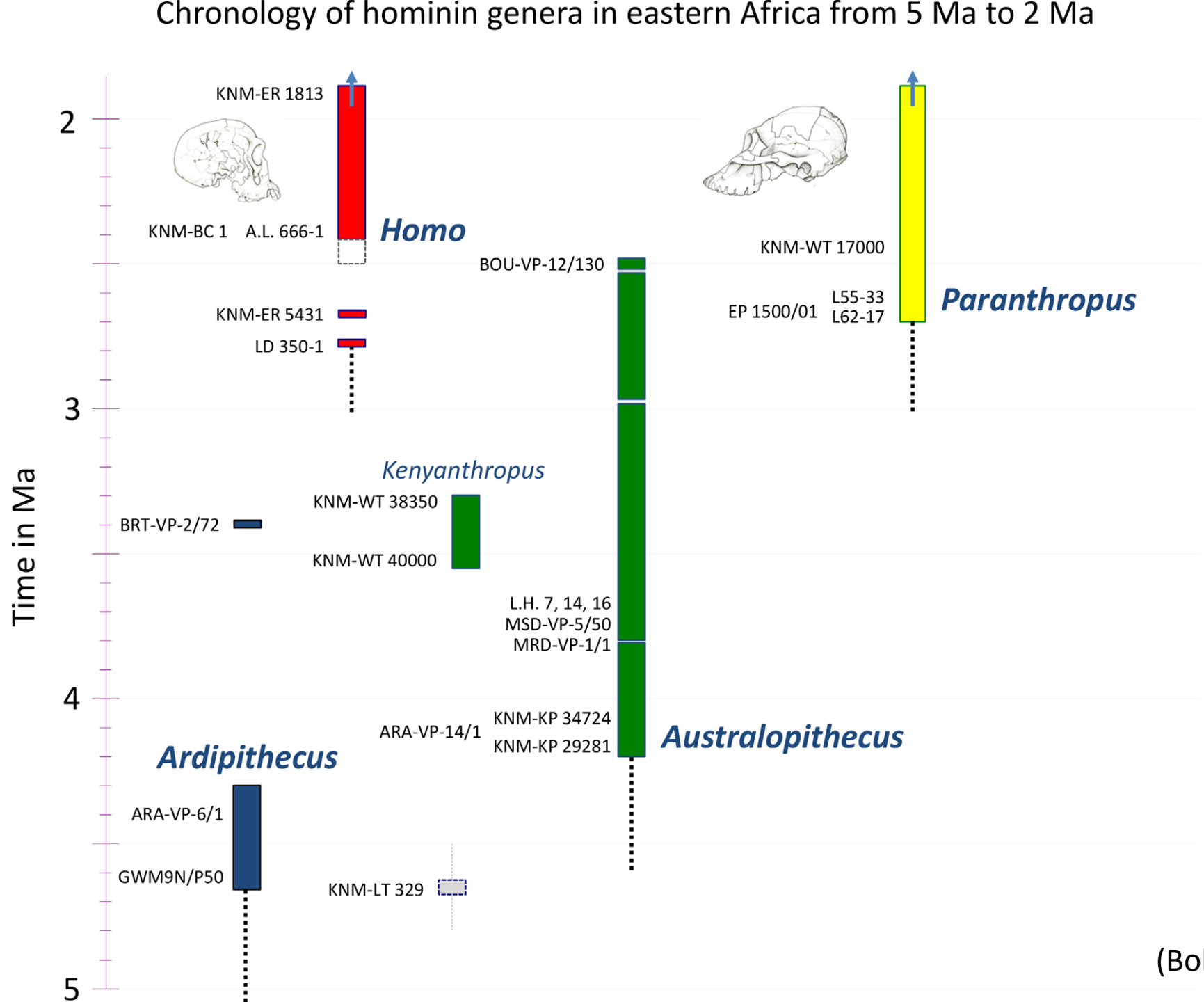
The evolution of hominin hands and feet reflects an evolutionary shift toward enhanced manipulative capabilities and obligate bipedalism, respectively (Prang et al. 2021)





(Bobe and Wood, 2021)

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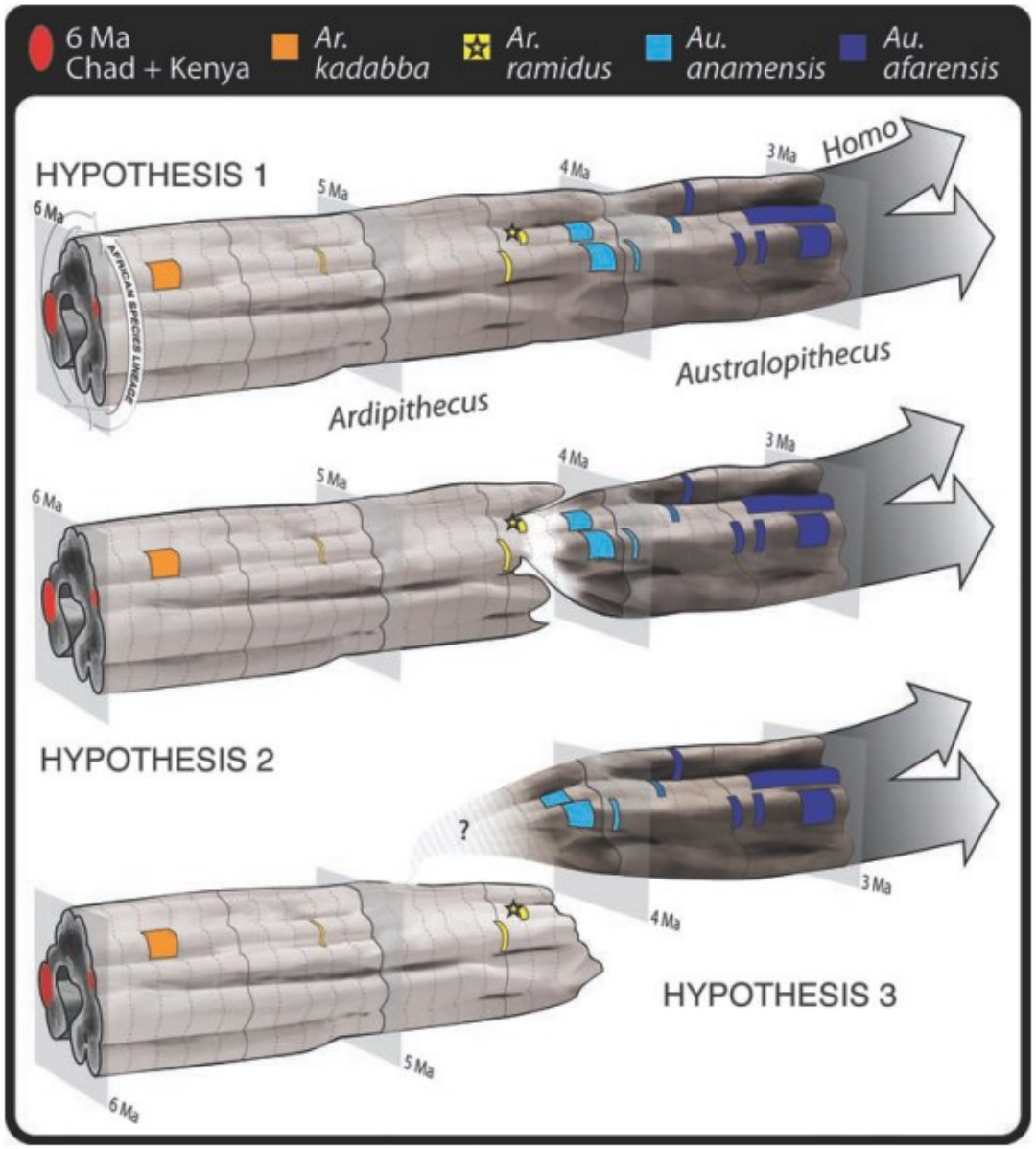

1 ipotesi: tutte le evidenze conosciute rappresentano un unica linea evolutiva

2 ipotesi; raffigura la stessa evidenza di una transizione diretta tra *Ardipithecus* e *Australopithecus* (speciazione) accaduta tra 4,5 e 4,2 Ma in un gruppo di popolazione regionale (o locale) che potrebbe avere incluso I rift dell'Afar e Turkana.

3 ipotesi: consente una speciazione allopatrica (cladogenesi attraverso una microevoluzione accumulata in una popolazione periferica isolata che è diventata separata al livello riproduttivo.

Hypothesis 1: *interprets all known evidence to represent a species lineage evolving phyletically across its entire range.*

Hypothesis 2: *depicts the same evidence in an Ardipithecus-to-Australopithecus transition (speciation) occurring between ~4.5 and ~4.2 Ma in a regional (or local) group of populations that might have included either or both the Afar and Turkana rifts.*

Hypothesis 3: *accommodates the same evidence to an alternative, much earlier peripheral allopatric "rectangular" speciation model (cladogenesis through microevolution accumulated in a peripheral isolate population, becoming reproductively separated).*

Autralopithecus

Australopithecus africanus Dart 1925

Holotype : Crâne de Taung (Afrique du Sud)

Synonymies :
- *Australopithecus transvaalensis* Broom, 1936 Sterkfontein, fgt de maxillaire TM 1511 (S1)
- *Plesianthropus transvaalensis* (Broom et Schepers, 1946) Sterkfontein, fgt mandibule TM 1516 et crâne Sts 5
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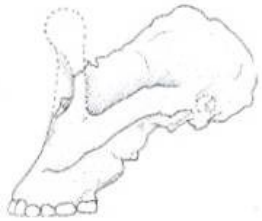

Paranthropus robustus Broom 1938

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Holotype : Mandibule KT 12/H1 (Koro Toro, Tchad)

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Holotype : Mandibule KNM-KP 29 281 (Kanapoi, Kenya)

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Holotype : Bou-VP-12/130 (Bouri, Middle Awash, Ethiopie)

Kenyanthropus platyops Leakey *et al.* 2001

Holotype : Crâne KNM-WT 40000 (Lomekwi, Ouest-Turkana, Kenya)

Histoire d'ancetres- Grimaud *et al.*, 2005

Autralopithecus

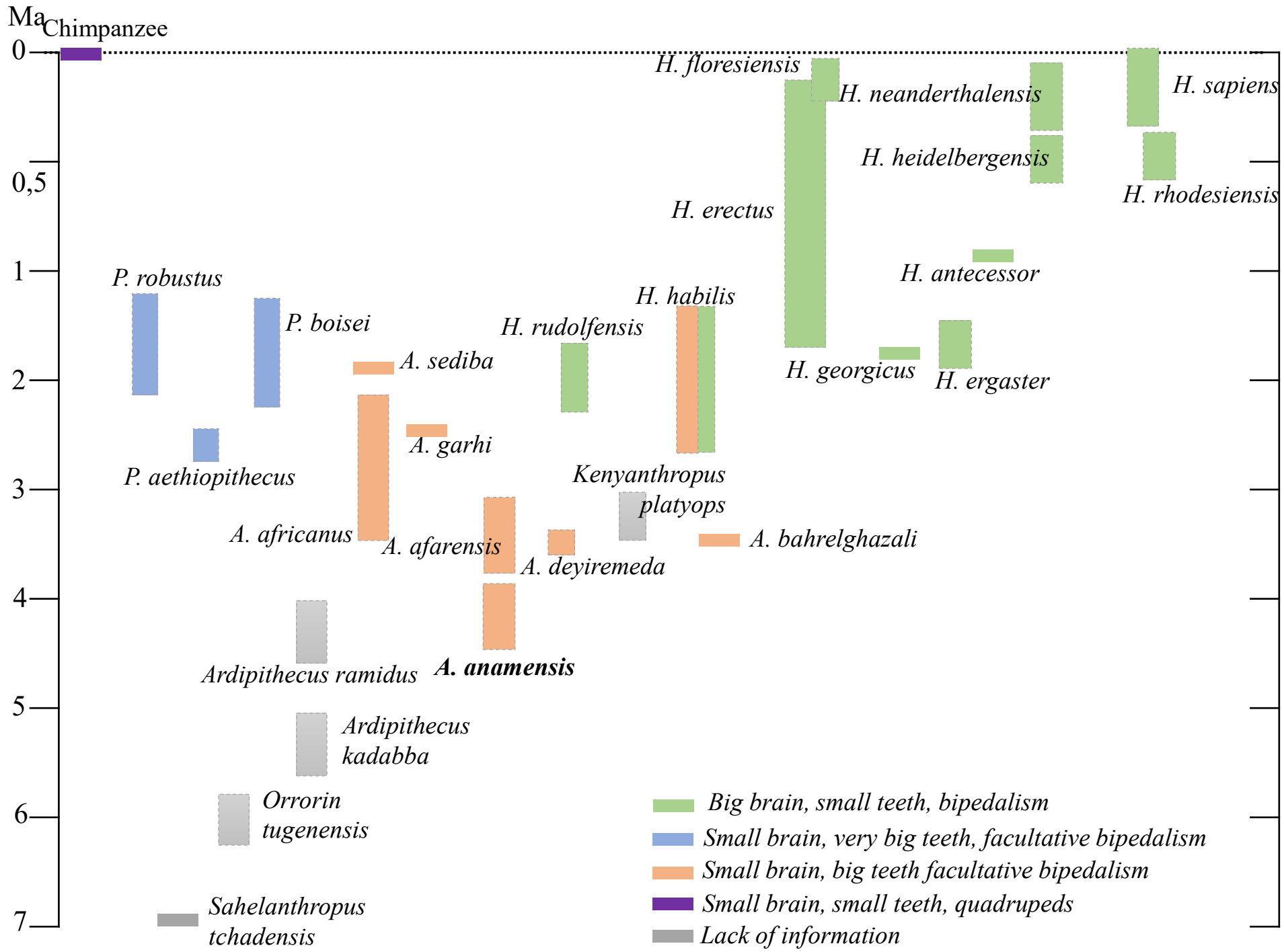
Caratteristiche condivise dalle Australopitecine

1. Dimensione del cervello ± scimpanzé (ca. 375-550 cm^3)
2. Parte mesio-facciale verticale e corta inferio-superiormente con una regione zigomaticomascellare massiccia e un forte prognatismo subnasale
3. Basicranio corto con un foramen magnum posizionato anteriormente
4. Canini ridotti e non affilati
5. Premolari e molari grandi (in rapporto alla taglia del corpo) con smalto spesso
6. Corpo mandibolare spesso trasversalmente e rami alti

Autralopithecus

Features shared by the Australopiths

1. Brain dimension ± chimpanzee (ca. 375-550 cm^3)
2. Vertical and short mesofacial area with a thick zigomaticomaxillary complex and an important subnasal prognatism
3. Short basicranium with a foramen magnum situated anteriorly
4. Reduced unsharped canines
5. Large premolars and molars (in relation to body size) with thick enamel
6. Thick mandibular corpus with high ramus


Ma
Chimpanzee
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0,5
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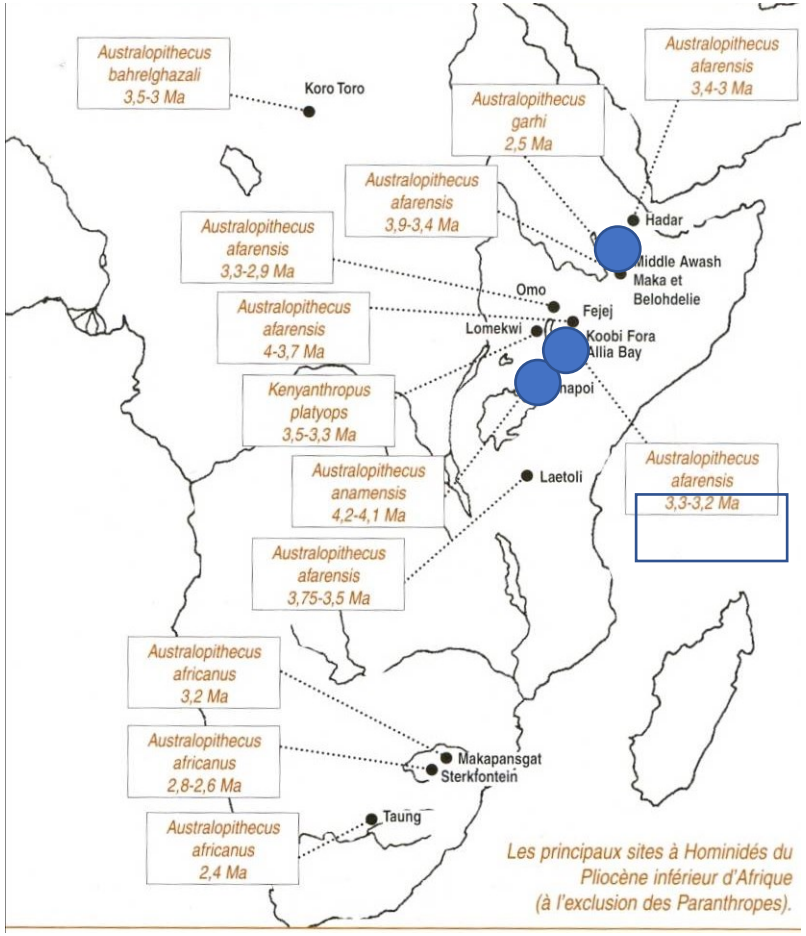
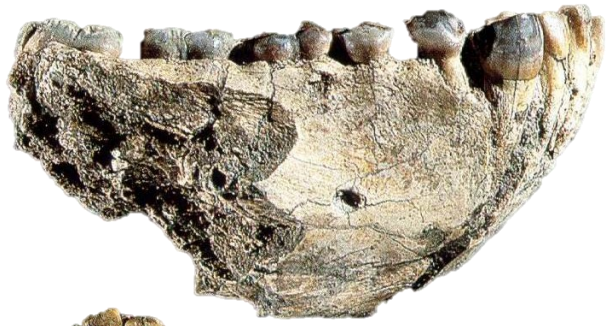
7
H. floresiensis
H. neanderthalensis
H. sapiens
H. heidelbergensis
H. rhodesiensis
H. erectus
H. antecessor
P. robustus
P. boisei
H. habilis
H. rudolfensis
A. sediba
H. georgicus
H. ergaster
A. garhi
P. aethiopithecus
Kenyanthropus platyops
A. africanus
A. afarensis
A. bahrelghazali
A. deyiremeda
A. anamensis
Ardipithecus ramidus
Ardipithecus kadabba
Orrorin tugenensis
Sahelanthropus tchadensis
Big brain, small teeth, bipedalism
Small brain, very big teeth, facultative bipedalism
Small brain, big teeth facultative bipedalism
Small brain, small teeth, quadrupeds
Lack of information

Autralopithecus anamensis



Da Histoire d'ancetres- Grimaud *et al.*, 2005



KNM-KP 29 281 4,1 Ma

Discovery: Kanapoi and Allia bay, Kenya (Turkana Lake), Woranso-Mille (Ethiopia)

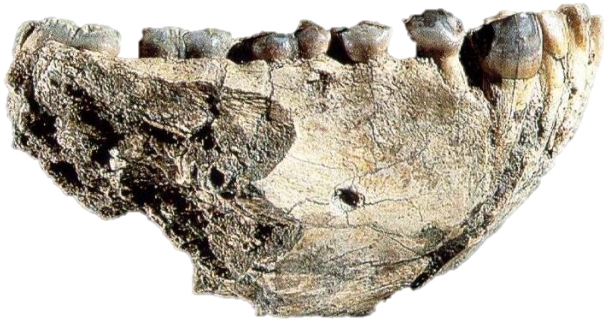
Age: 4,2-4,1 Ma for Kanapoi and 3,9 Ma for Allia Bay, 3,8 Ma Woranso-Mille

- Mandibola stretta con corpo mandibolare quasi parallele

Narrow mandible with almost parallel corpus

- Spessore dello smalto > *Ar. ramidus*

Enamel thickness > Ar. ramidus



KNM-KP 29 281 4,1 Ma

≠ scimmie esistente e gli omini del Mio-Pliocene
(*Ardipithecus* e *Sahelanthropus)*
- Premolari più complessi
- Smalto dei denti iugali più spesso
- Canini meno *ape-like*

≠ australopitecine successive
Morfologia della dentizione, particolarmente nella arcata anteriore

≠ extant African apes and Mio-Pliocene hominins
*(*Ardipithecus *and* Sahelanthropus)
- *More complex premolars*
- *Ticker cheek-tooth enamel*
- *Canines less apelike*

≠ later australopiths
Morphology of the dentition, mostly in the anterior arcade.

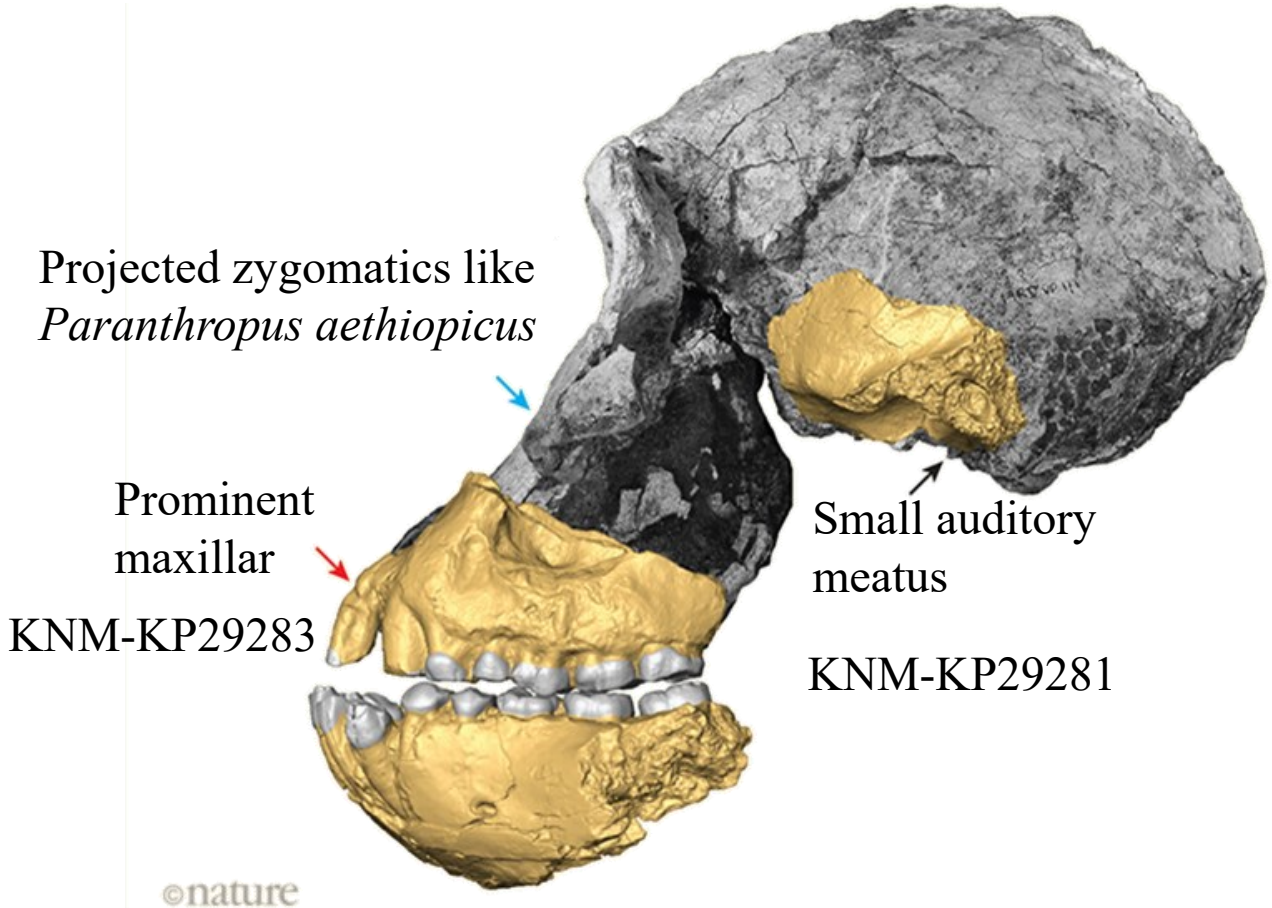
ARTICLE

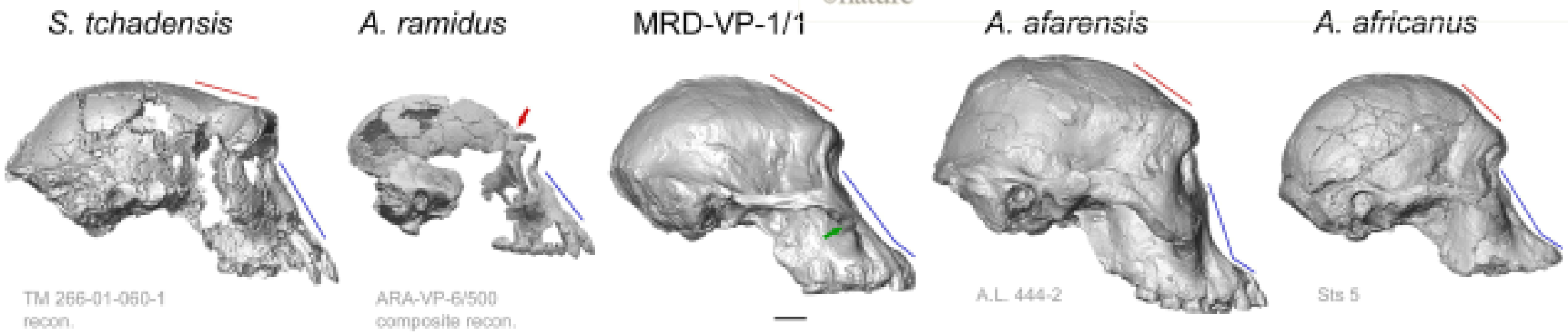
https://doi.org/10.1038/s41586-019-1513-8

A 3.8-million-year-old hominin cranium from Woranso-Mille, Ethiopia

Yohannes Haile-Selassie[1,5*], Stephanie M. Melillo[2,5*], Antonino Vazzana[3], Stefano Benazzi[3] & Timothy M. Ryan[4]

The cranial morphology of the earliest known hominins in the genus *Australopithecus* remains unclear. The oldest species in this genus (*Australopithecus anamensis*, specimens of which have been dated to 4.2–3.9 million years ago) is known primarily from jaws and teeth, whereas younger species (dated to 3.5–2.0 million years ago) are typically represented by multiple skulls. Here we describe a nearly complete hominin cranium from Woranso-Mille (Ethiopia) that we date to 3.8 million years ago. We assign this cranium to *A. anamensis* on the basis of the taxonomically and phylogenetically informative morphology of the canine, maxilla and temporal bone. This specimen thus provides the first glimpse of the entire craniofacial morphology of the earliest known members of the genus *Australopithecus*. We further demonstrate that *A. anamensis* and *Australopithecus afarensis* differ more than previously recognized and that these two species overlapped for at least 100,000 years—contradicting the widely accepted hypothesis of anagenesis.





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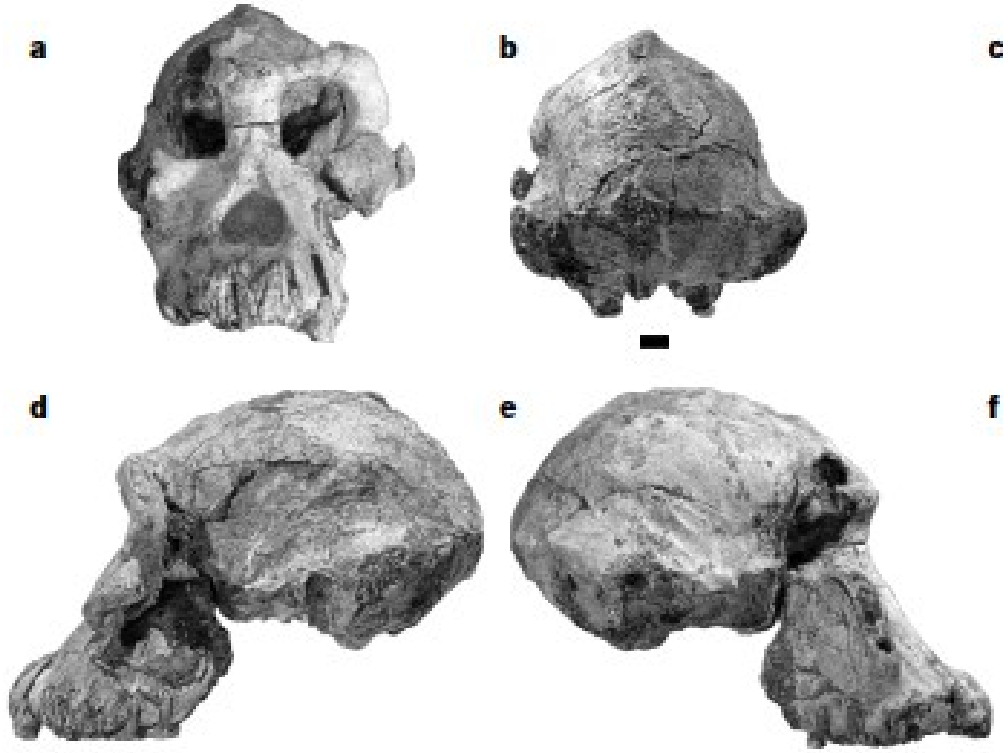

« In summary, although MRD and other discoveries from Woranso-Mille **do not falsify the proposed ancestor–descendant relationship between *A. anamensis* and *A. afarensis*, they indicate that *A. afarensis* may not have evolved from a single ancestral population.** Most importantly, MRD shows that despite the widely accepted hypothesis of anagenesis, ***A. afarensis* did not appear as a result of phyletic transformation**. It also shows that at least **two related hominin species co-existed in eastern Africa around 3.8 Myr ago**, further lending support to mid-Pliocene hominin diversity. »

Autralopithecus afarensis

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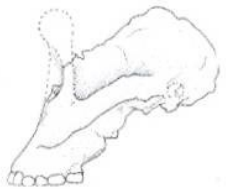

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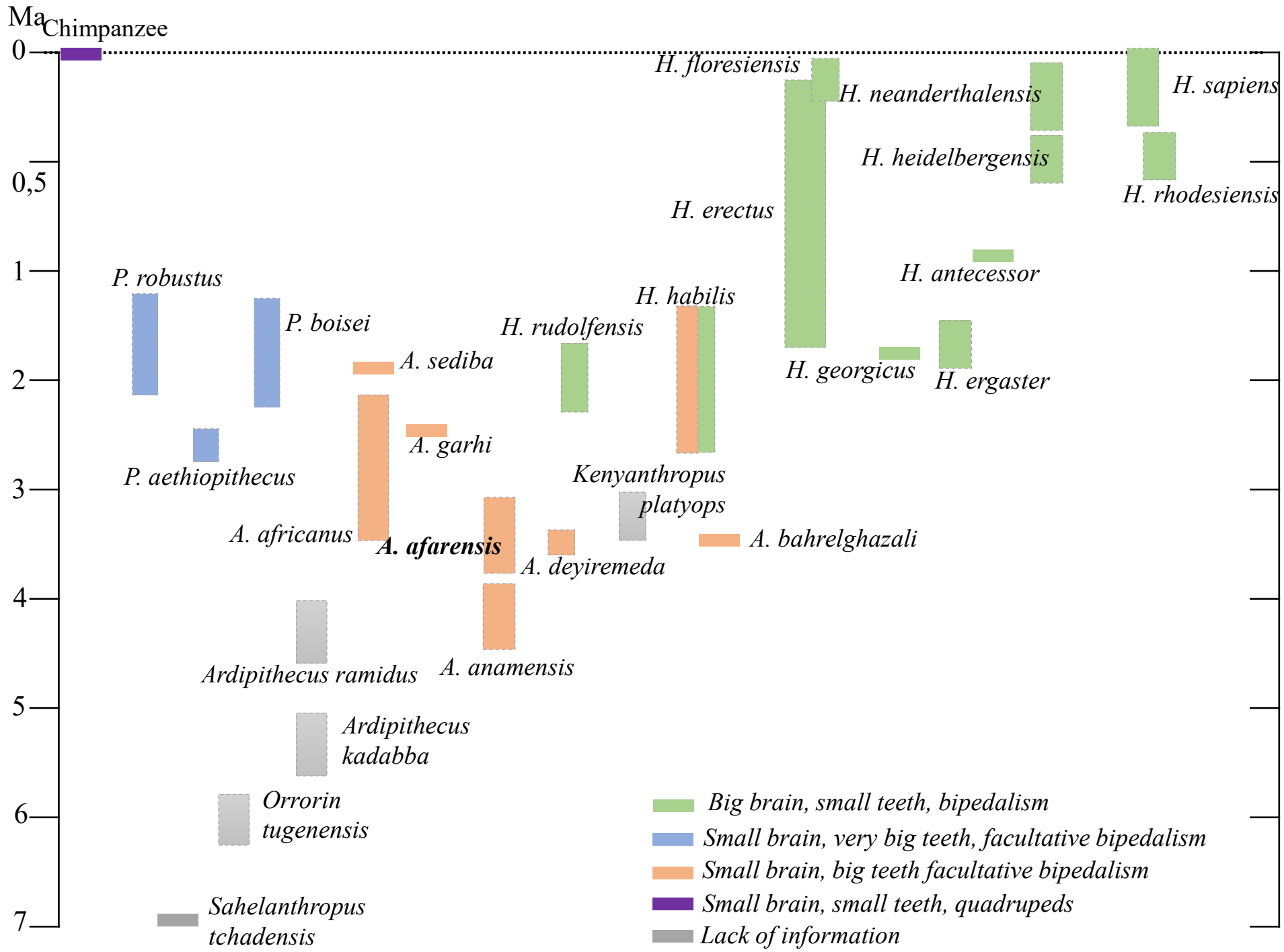
Da Histoire d'ancetres- Grimaud *et al*., 2005


Ma
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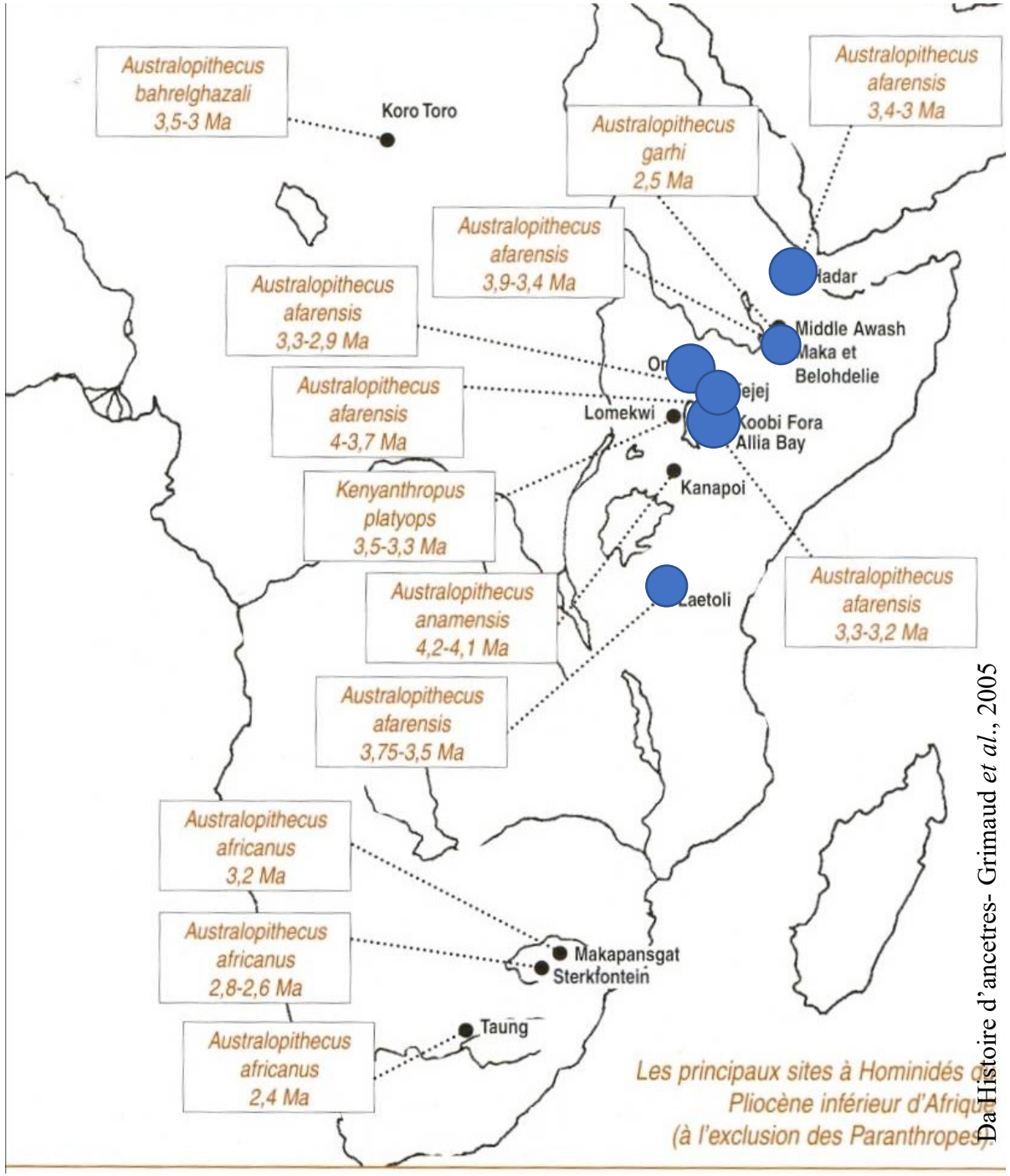
Lack of information

Autralopithecus afarensis



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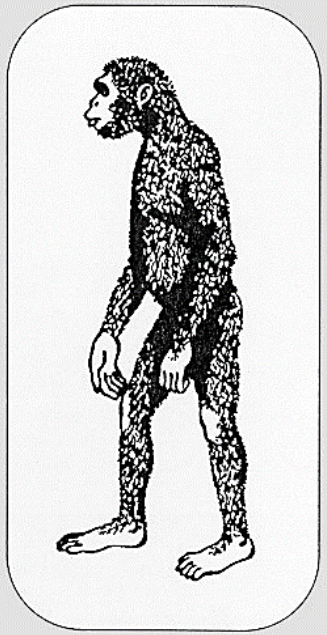


Nom : *Australopithecus afarensis*

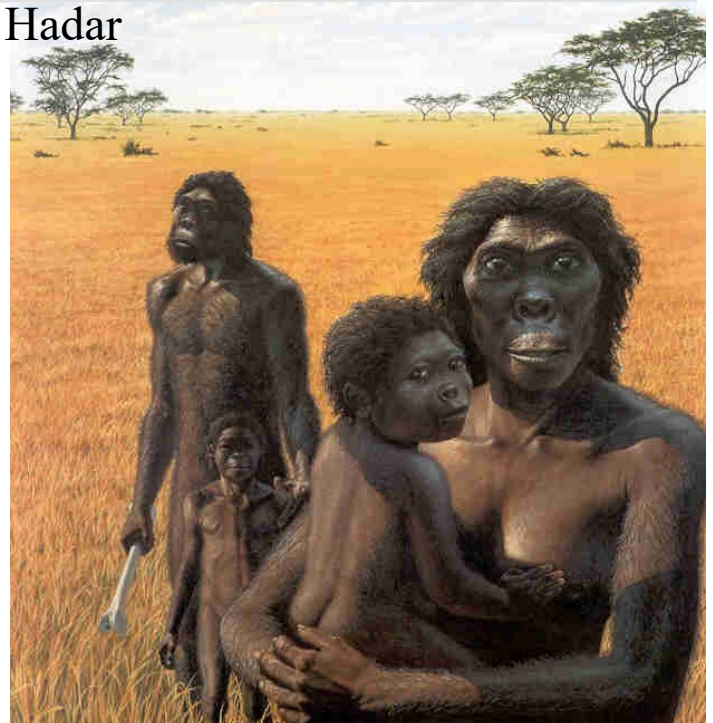
Origine : Afrique de l'Est (Hadar, Laetoli, Maka, Belohdelie, Chemeron, Omo, Koobi Fora)

Dat 3,9? à 3 MA

Cerveau : 300 à 400 cm^3

Taille : 1,10 m

Hadar



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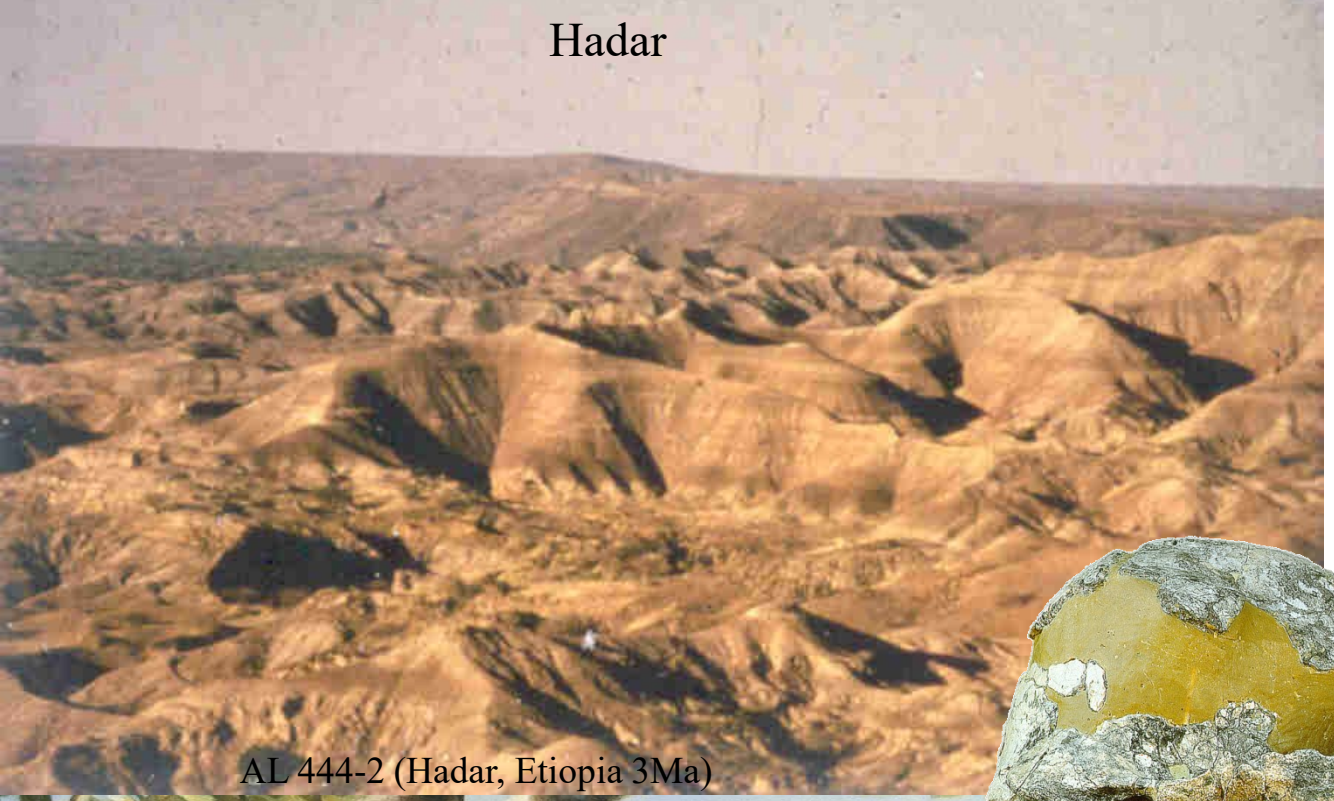
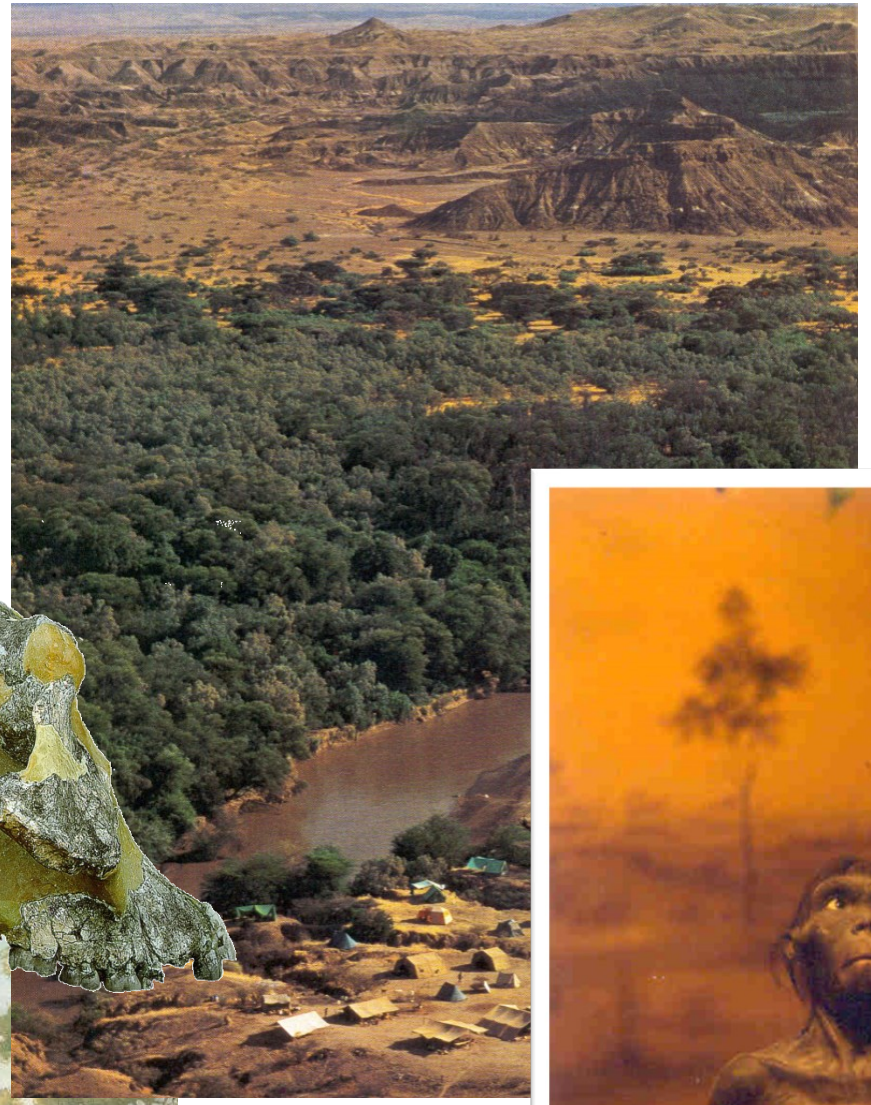
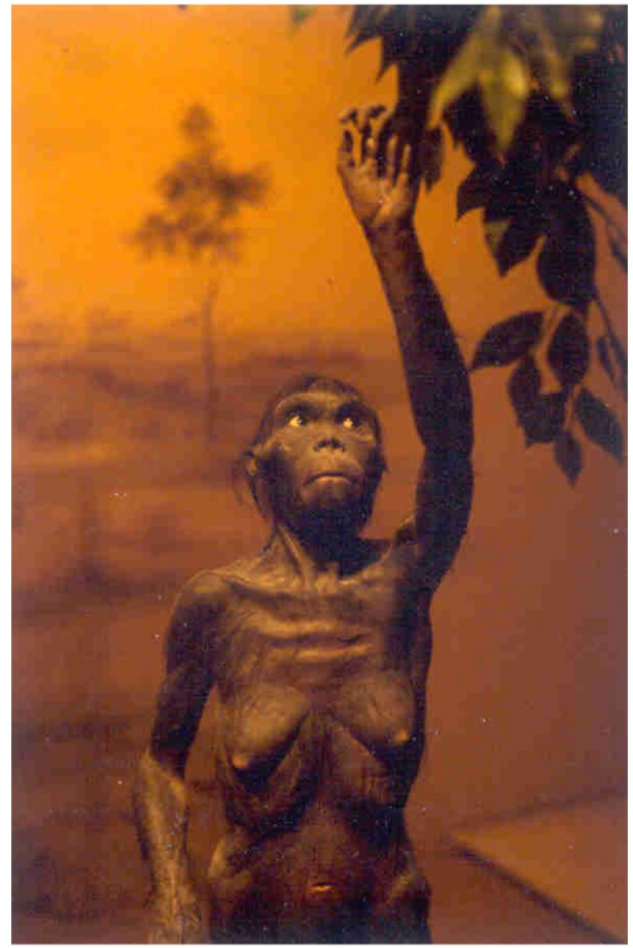


AL 444-2 (Hadar, Etiopia 3Ma)



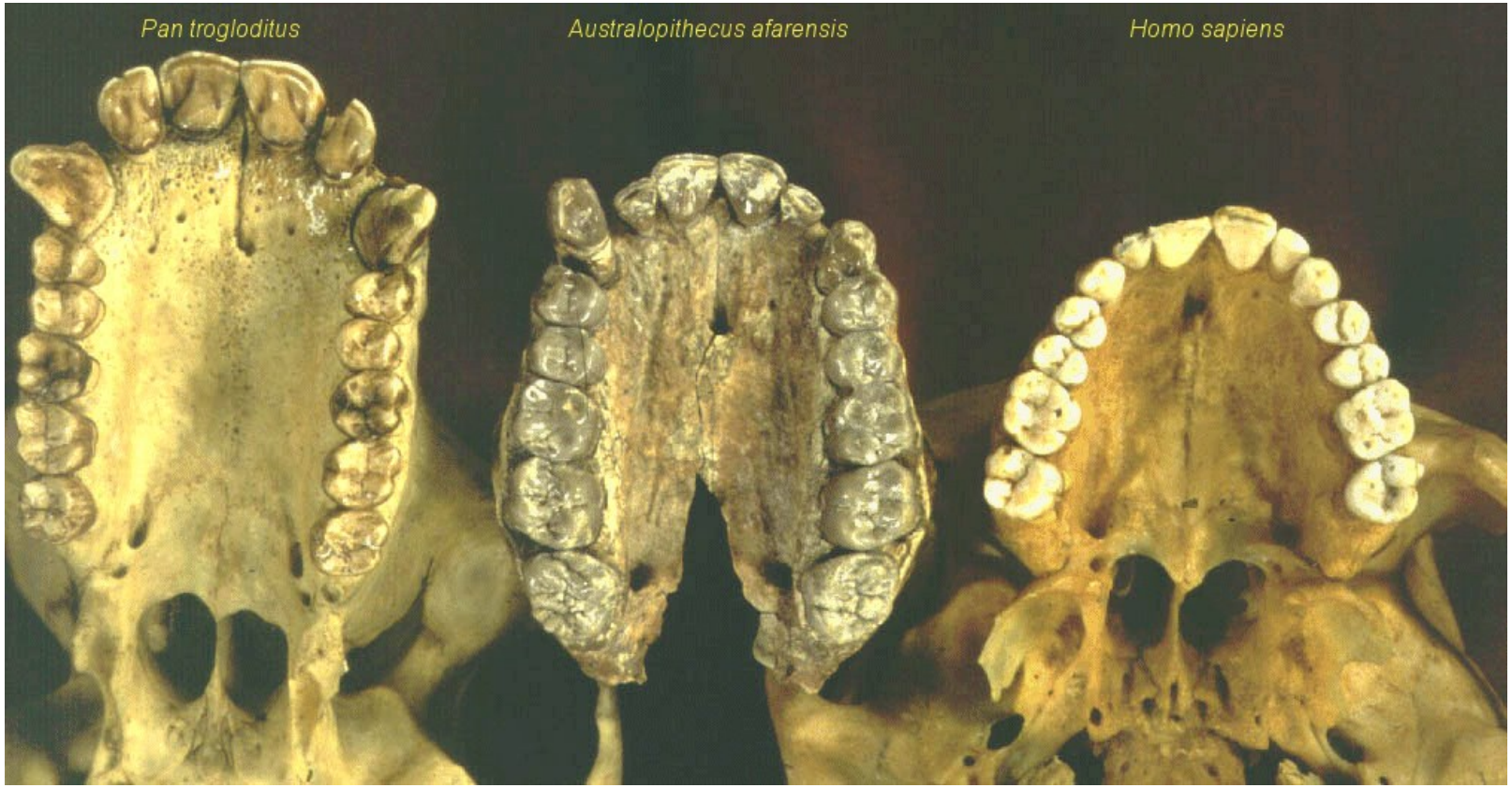


Lucy, 3,2 Ma –AL2881

- Important sexual dimorphism
- Small skull
- Large and prognathic face
- Canine and incisor reduced
- Frequent presence of diastema

Elevata competizione tra i maschi

- Facultative bipedalism (bambina di DIKIKA Afar) : Glenoid fossa of the scapula is shallow implying an important movement of the humerus : advantage for arboreal locomotion



≠ con *Au. anamensis* (condizione derivata)

- P3 e dm1 più molarizzati
- Palato più largo relativamente alla sua lunghezza
- Apertura nasale definita da margini laterali affilati
- Meato auditivo più largo

≠ con gli altri australopitecine

Anatomia del cranio e dei denti prevalentemente plesiomorfa

Larghezza delle aperture nasale e orbitale strette che contrasta una regione zigomatica massiccia

Per gli individui più grandi: mandibola a U

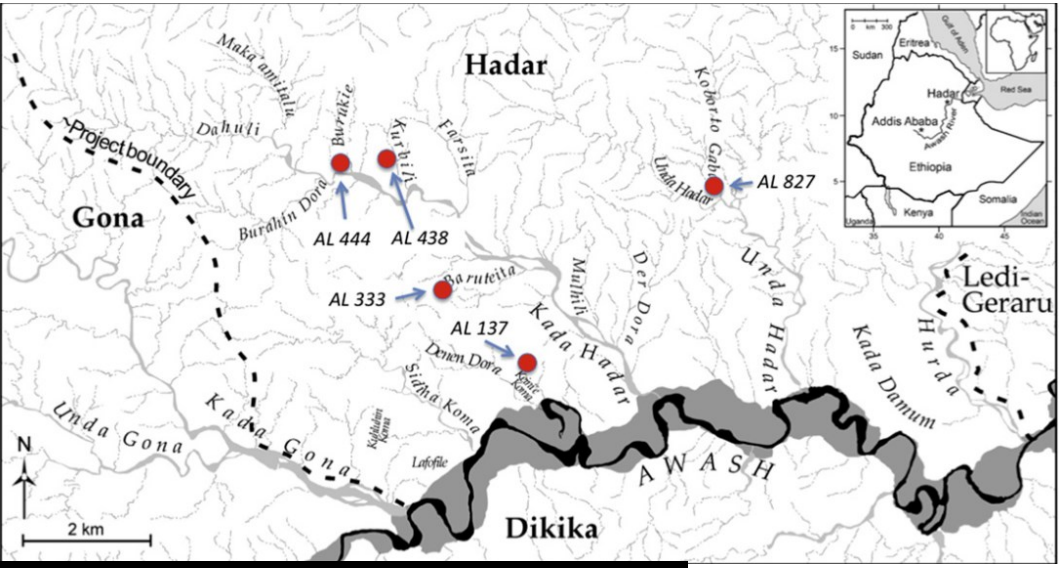
Canine e premolari in una «transizione evolutiva».

P3 meno molarizzati

AL 444-2 (Hadar, Etiopia 3Ma)

Note: Grande variazioni nella forma del cranio

- Dimorfismo sessuale (taglia e forma)
- Tendenze anagenetiche nella morfologia craniodentale durante la prima meta (3,5 – 3,0 Ma) della speciazione *anamensis-afarensis*



AK 333-140 e 142 Distal and proximal portion of subadult femora

37-50 Right humerus, JHE 2012

I arti inferiori confermano che *Au. afarensis* iniziava abitualmente ad essere occasionalmente bipede durante la loro ontogenesi.

The lower limb remains confirm that Au. afarensis *individuals habitually engaged in upright terrestrial bipedality throughout their ontogeny*

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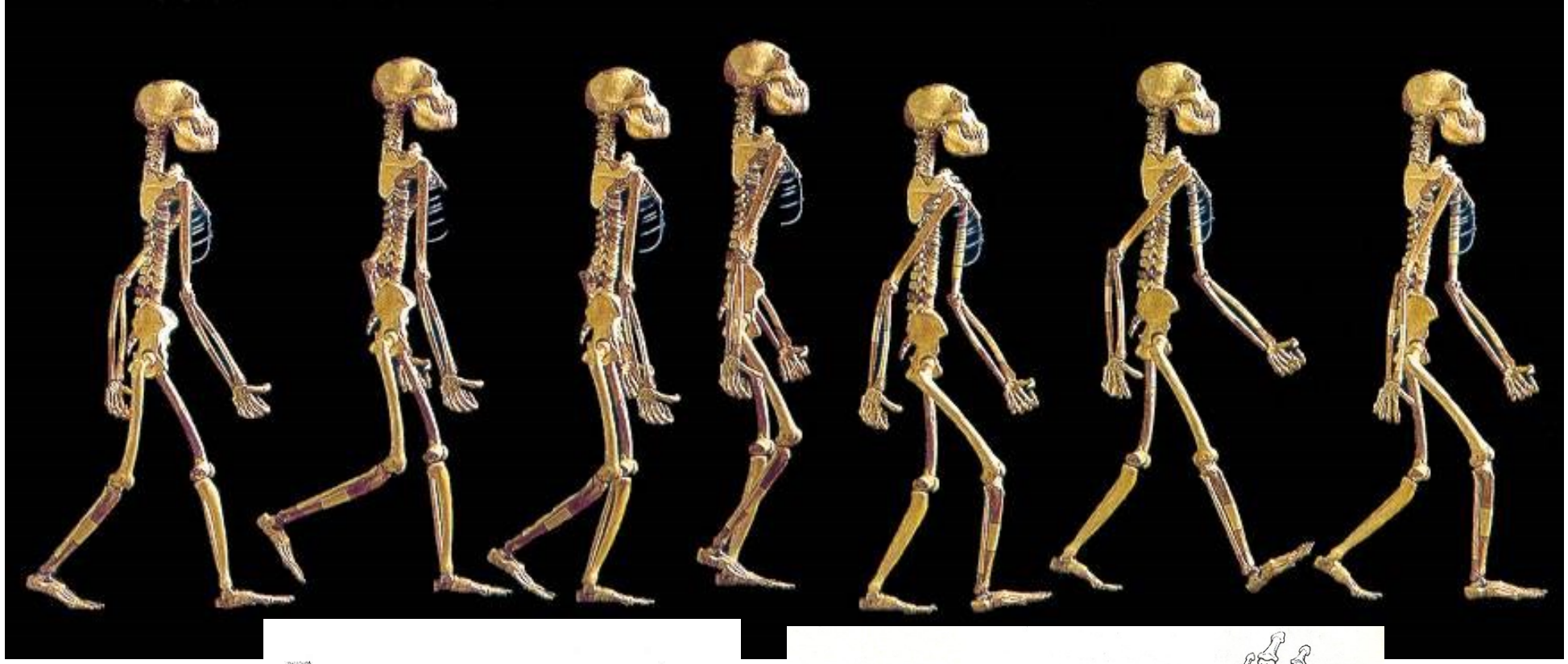
journal homepage: www.elsevier.com/locate/jhevol

New postcranial fossils of *Australopithecus afarensis* from Hadar, Ethiopia (1990–2007)

Carol V. Ward [a,*], William H. Kimbel [b], Elizabeth H. Harmon [c,1], Donald C. Johanson [b]

[a] Department of Pathology and Anatomical Sciences, M263 Medical Sciences Building, One Hospital Drive, University of Missouri, Columbia, MO 65212, USA
[b] Institute of Human Origins, School of Human Evolution and Social Change, PO Box 874101, Arizona State University, Tempe, AZ 85287-4101, USA
[c] Department of Anthropology, Hunter College, CUNY, 695 Park Avenue, NY 10065, USA



femore umano

femore dell'australopiteco

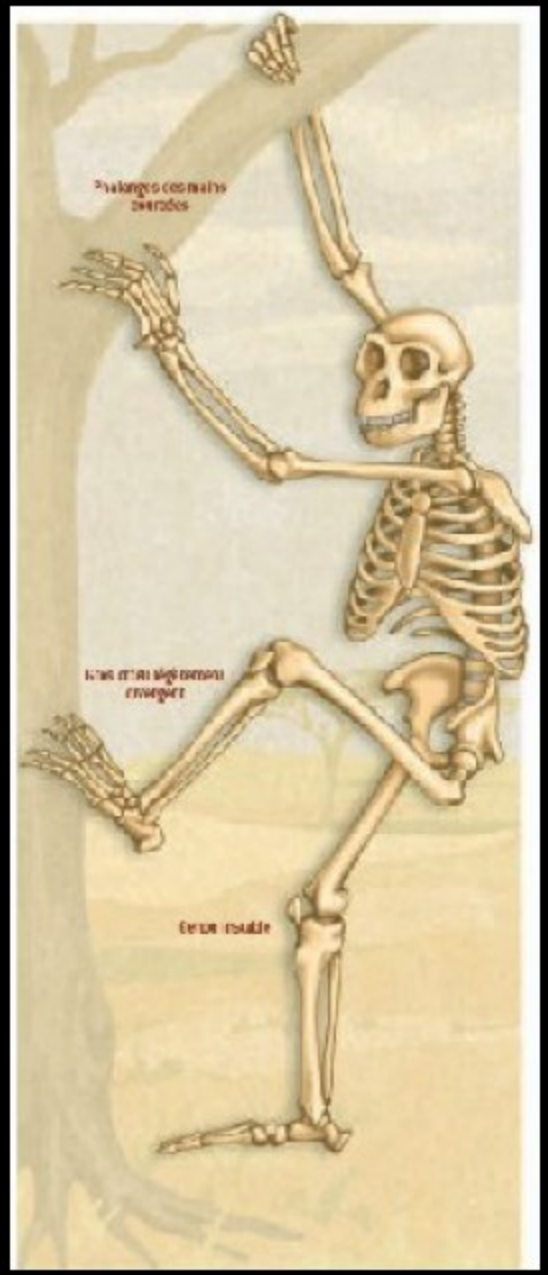
ossa delle dita

uomo

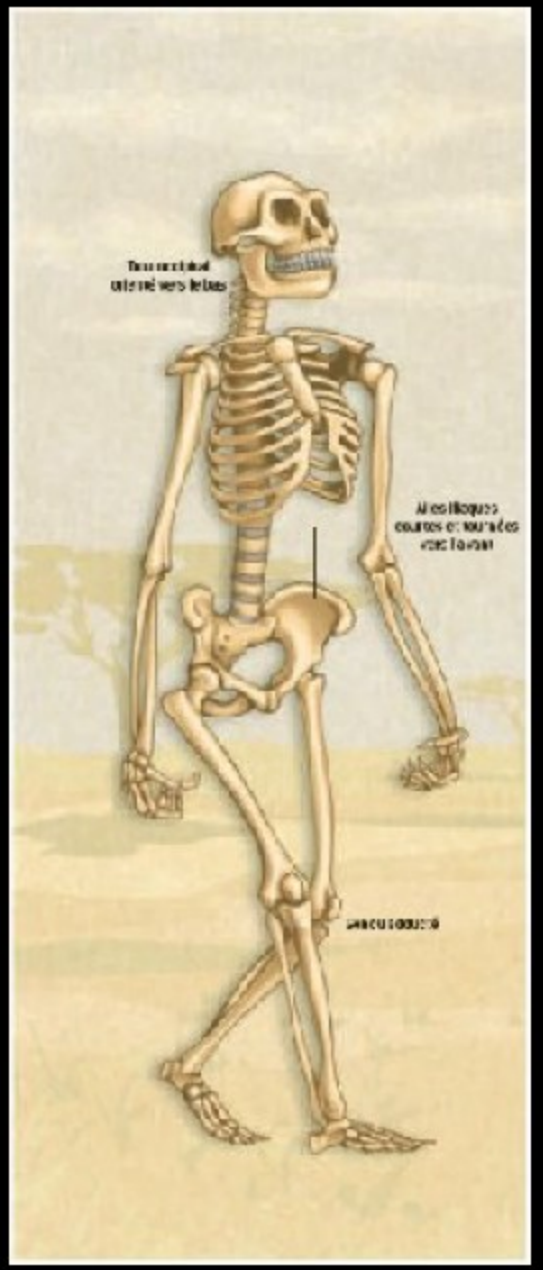
Piede di australopiteco basato sulle ossa del piede e dell'alluce provenienti da Gola di Olduvai, Tanzania

gorilla

Les bipédies des *Australopithecus*



The bipedalisms of the *Australopithecus*



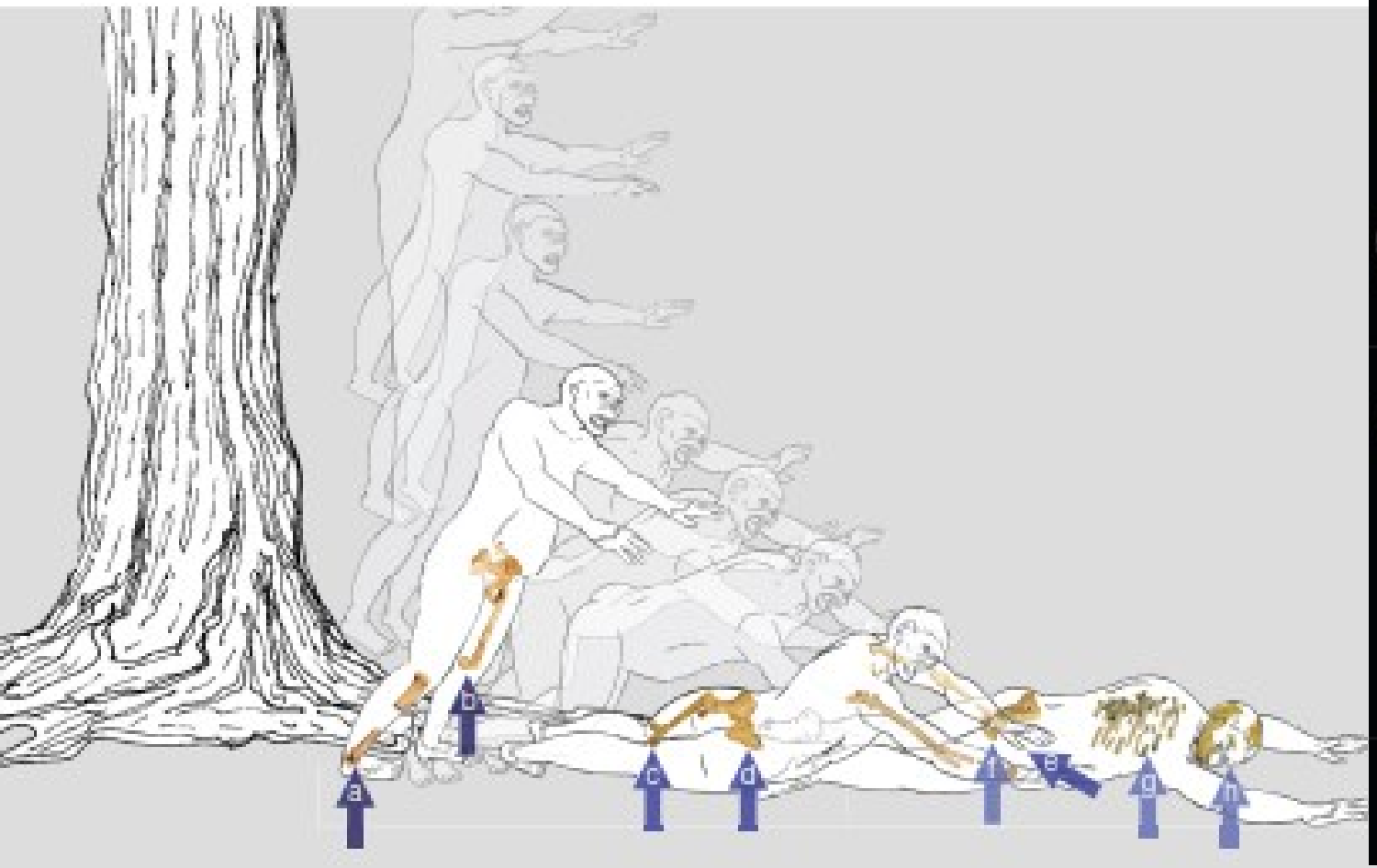
(Berillon & Marchal, 2005)

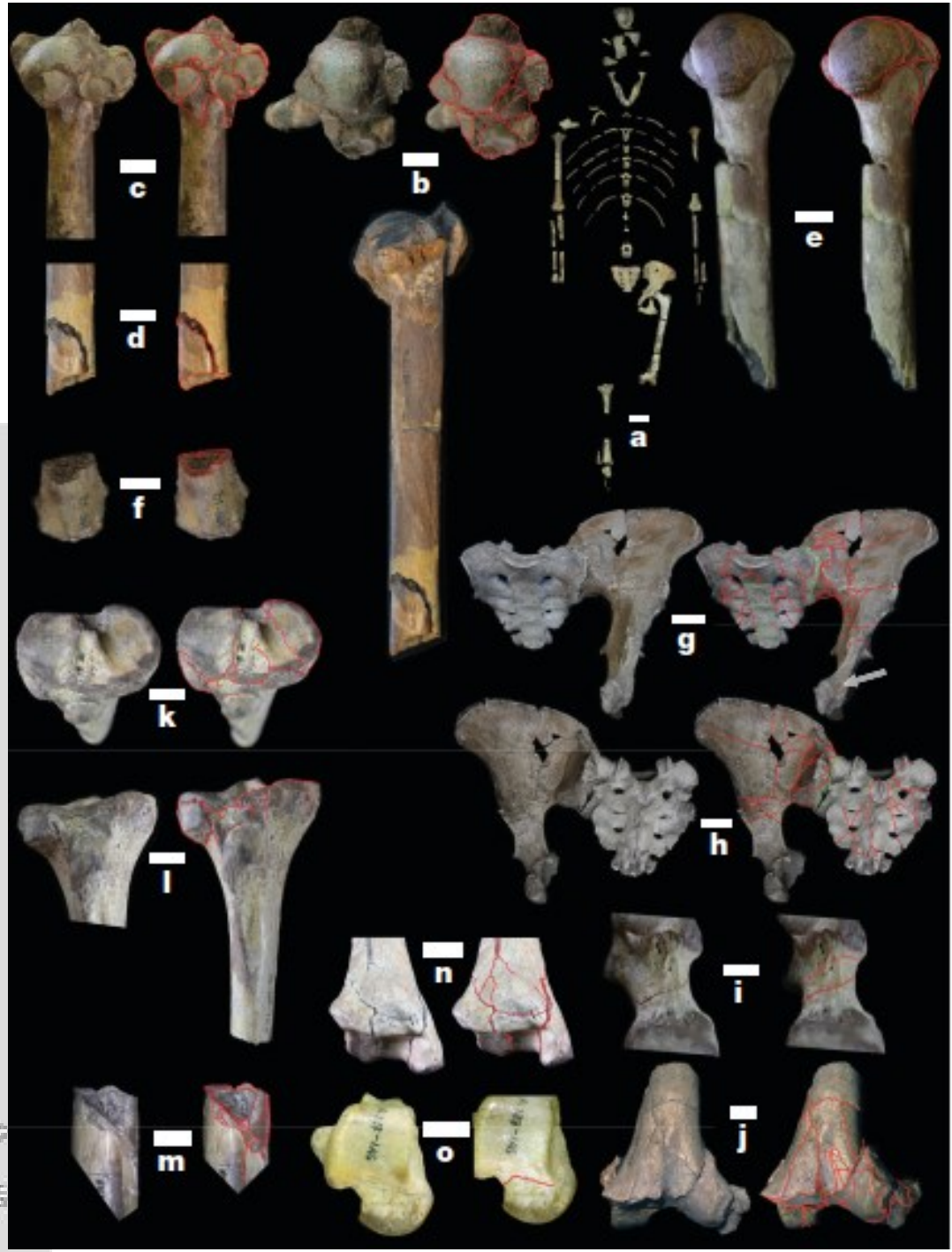
ARTICLE

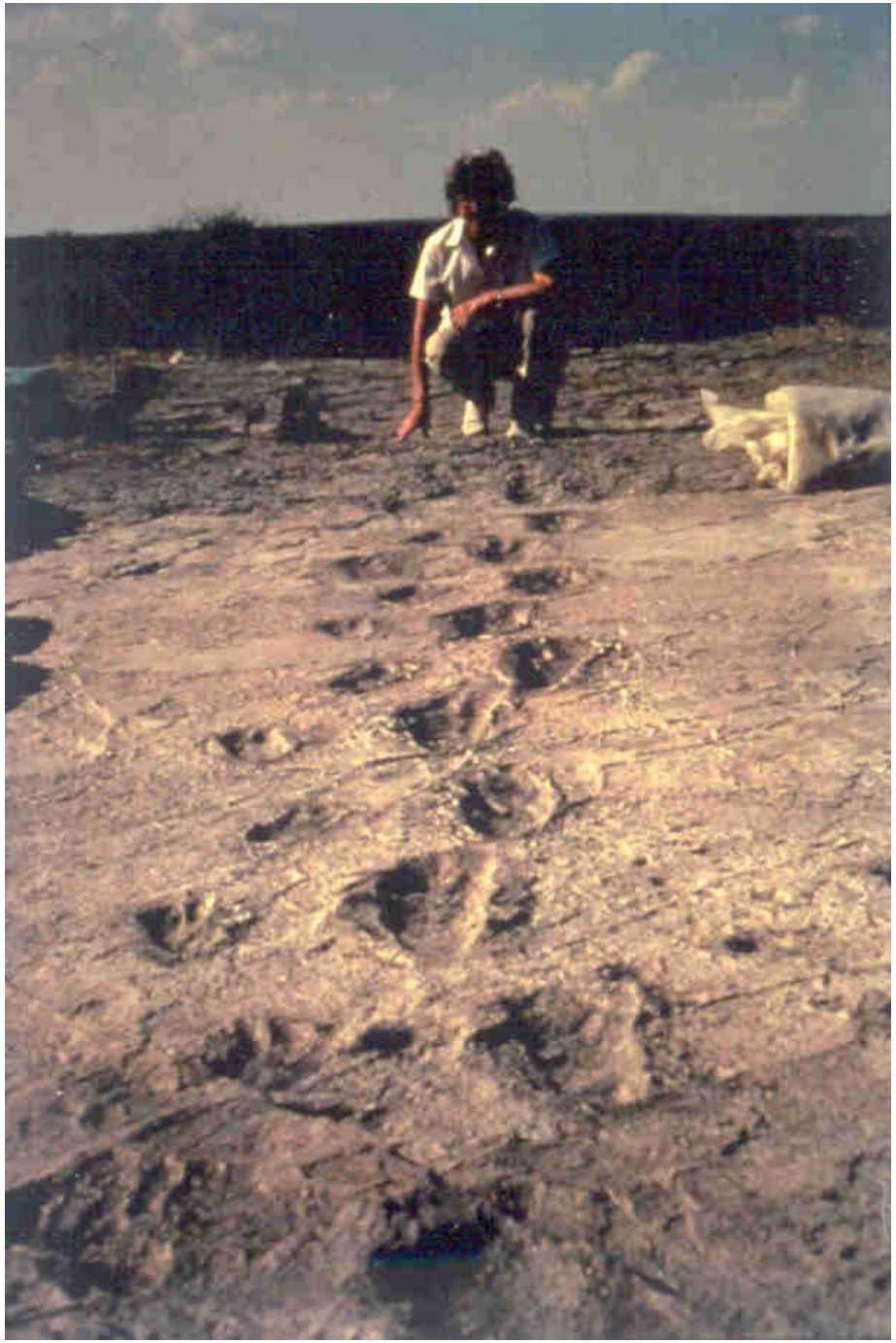
doi:10.1038/nature19332

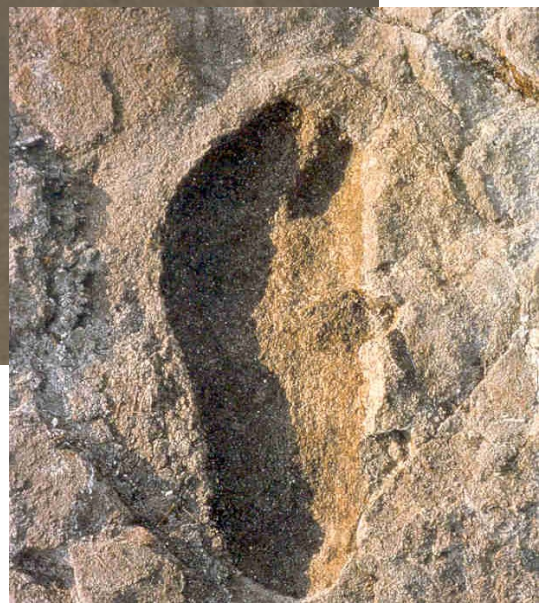
Perimortem fractures in Lucy suggest mortality from fall out of tall tree

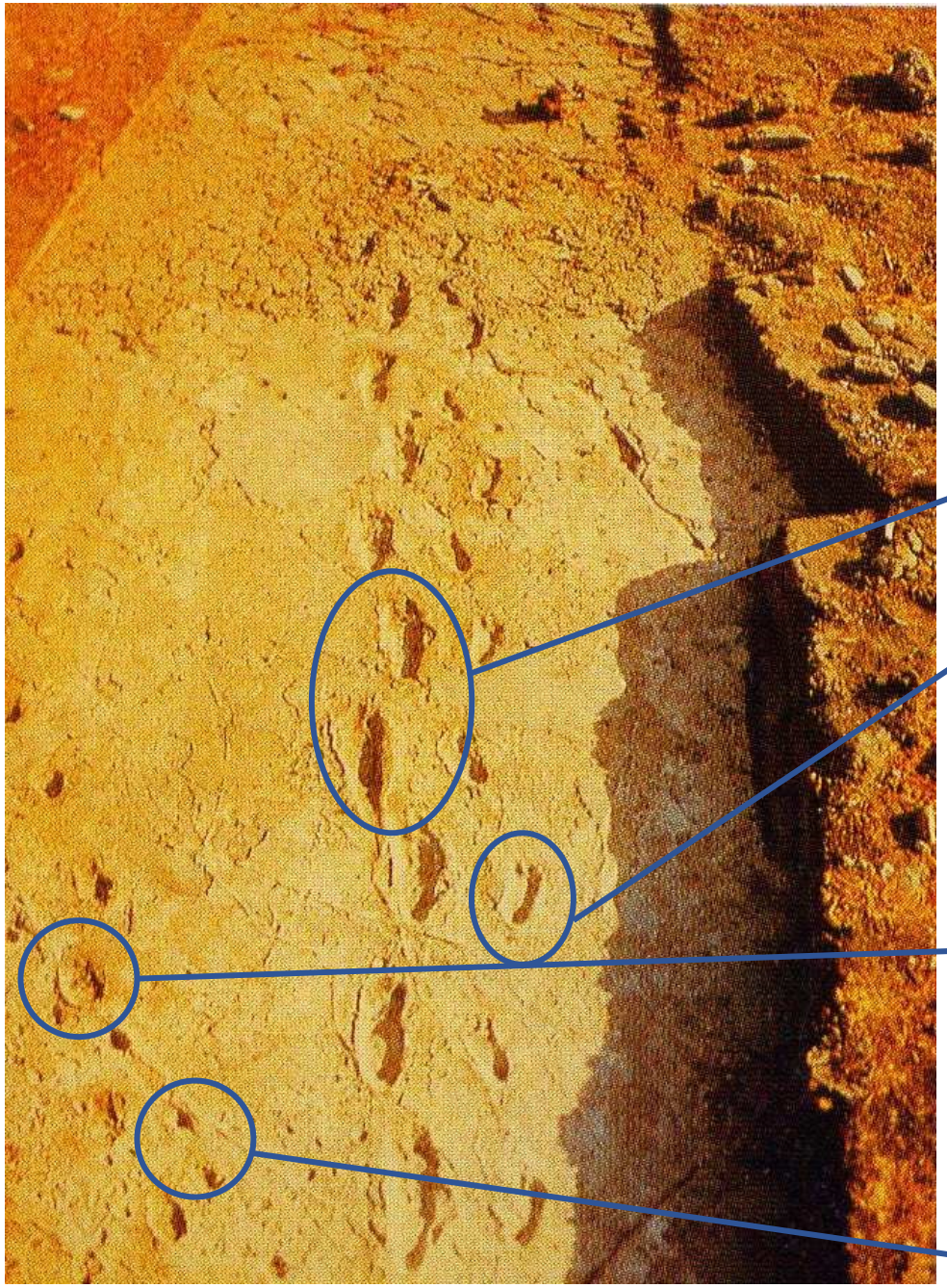
John Kappelman[1,2], Richard A. Ketcham[2], Stephen Pearce[3], Lawrence Todd[1], Wiley Akins[4], Matthew W. Colbert[2], Mulugeta Feseha[5], Jessica A. Maisano[2] & Adrienne Witzel[1]











Laetoli footprints

3,75 Ma

Superimposition of two adults footprints

Young hominid footprints

Hipparion footprints

Young Hipparion footprints

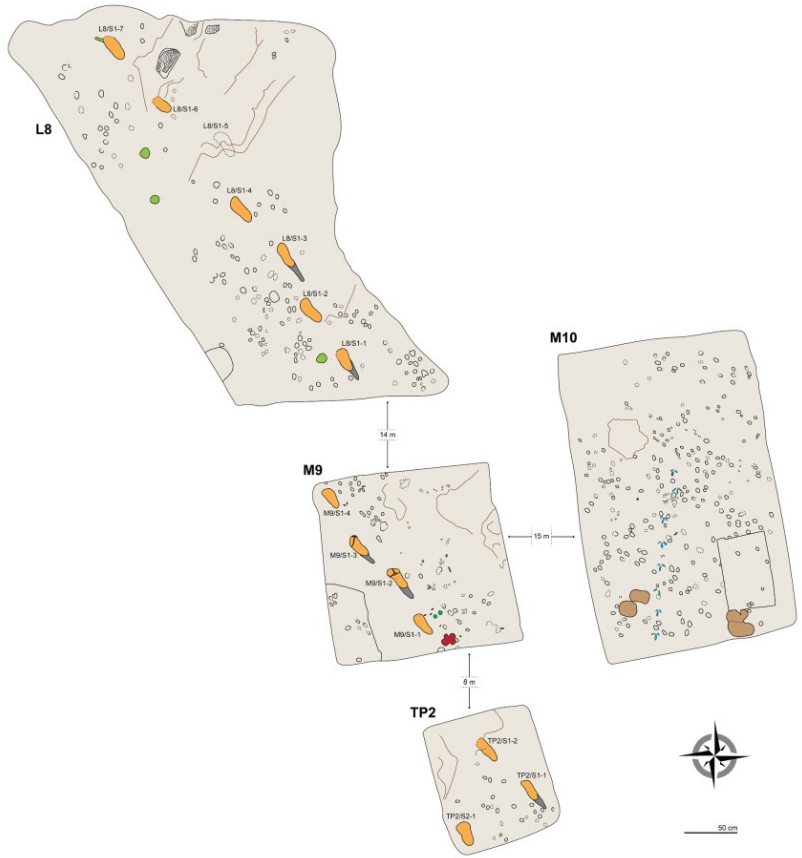
eLIFE elifesciences.org

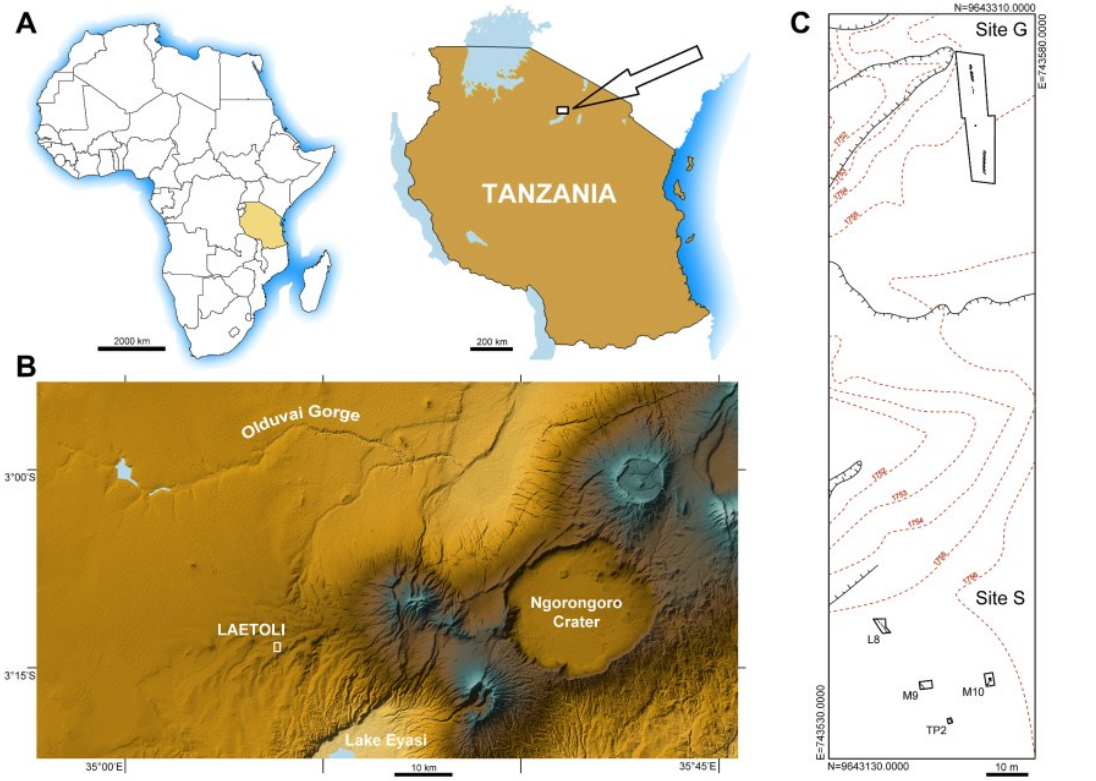
RESEARCH ARTICLE

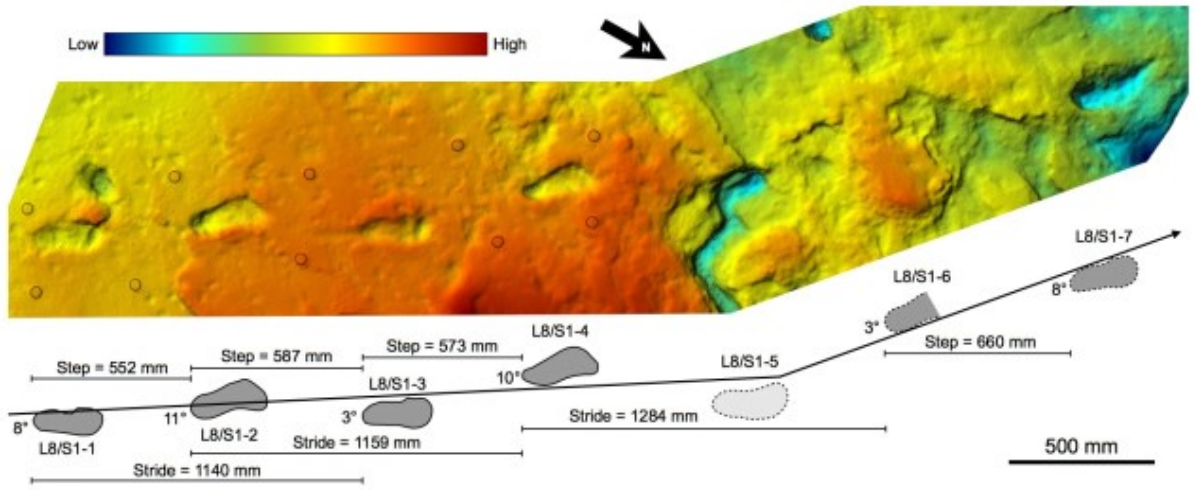
New footprints from Laetoli (Tanzania) provide evidence for marked body size variation in early hominins

Fidelis T Masao[1], Elgidius B Ichumbaki[1], Marco Cherin[2,3]*, Angelo Barili[4], Giovanni Boschian[5], Dawid A Iurino[3,6], Sofia Menconero[7], Jacopo Moggi-Cecchi[8], Giorgio Manzi[9]

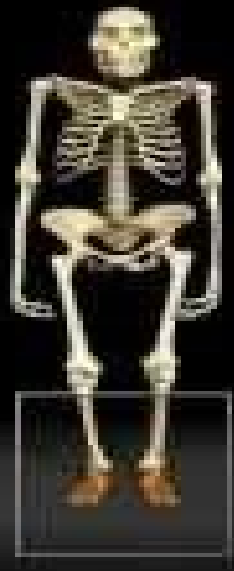
[1]Department of Archaeology and Heritage Studies, University of Dar es Salaam, Dar es Salaam, Tanzania; [2]Dipartimento di Fisica e Geologia, Università di Perugia, Perugia, Italy; [3]PaleoFactory, Sapienza Università di Roma, Roma, Italy; [4]Galleria di Storia Naturale, Centro d'Ateneo per i Musei Scientifici, Università di Perugia, Perugia, Italy; [5]Dipartimento di Biologia, Università di Pisa, Pisa, Italy; [6]Dipartimento di Scienze della Terra, Sapienza Università di Roma, Roma, Italy; [7]Studio Associato Grassi, Perugia, Italy; [8]Dipartimento di Biologia, Università di Firenze, Firenze, Italy; [9]Dipartimento di Biologia Ambientale, Sapienza Università di Roma, Roma, Italy







Chimpanzee



Lucy
Australopithecus afarensis

Modern human

Journal of Human Evolution 153 (2021) 102956

Contents lists available at ScienceDirect

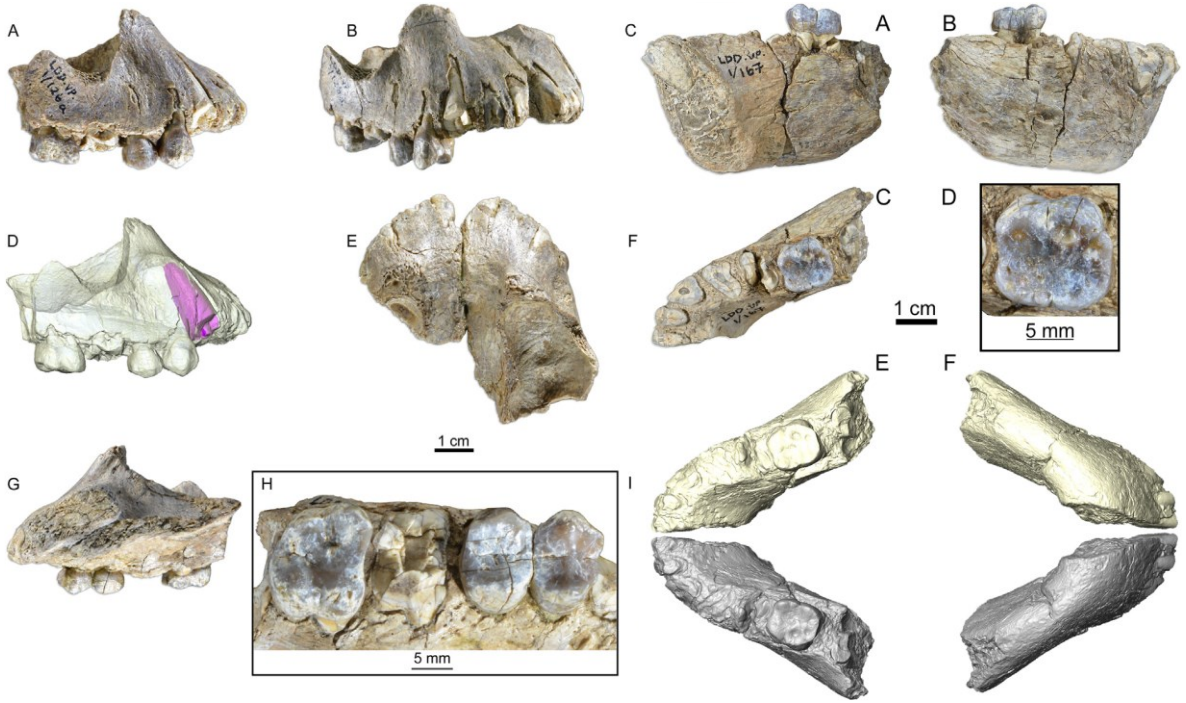
Journal of Human Evolution

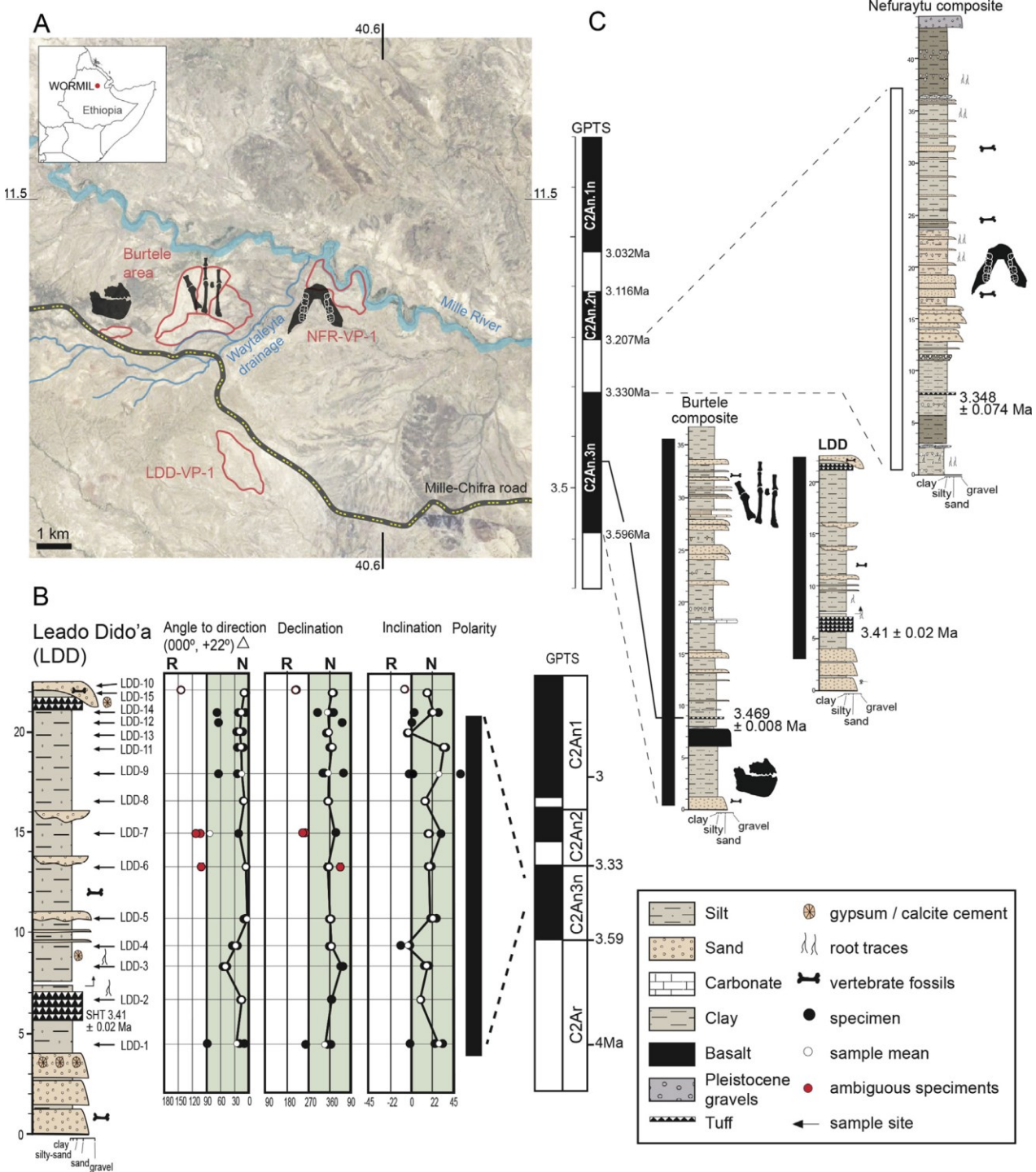
journal homepage: www.elsevier.com/locate/jhevol

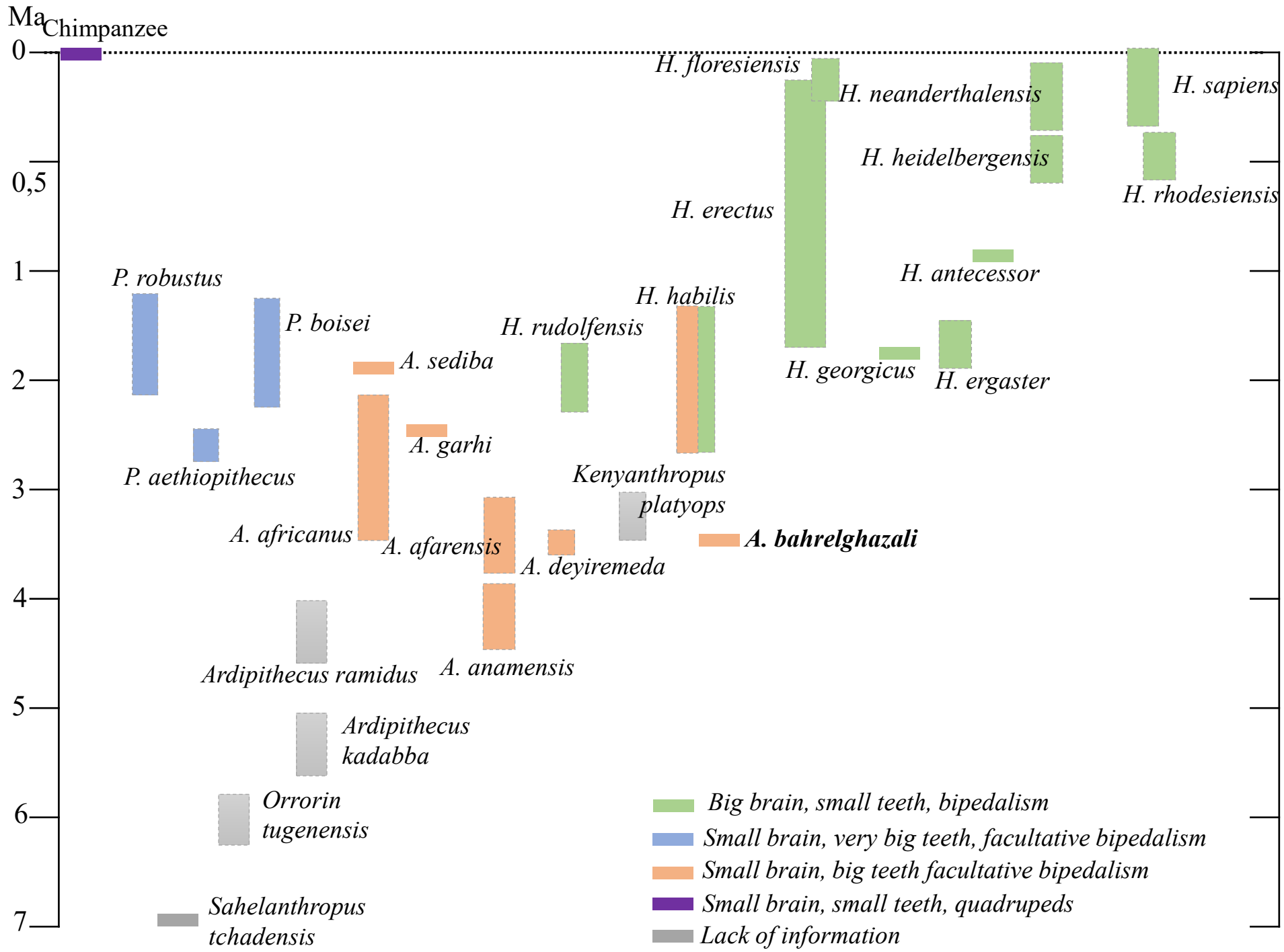
New Pliocene hominin remains from the Leado Dido'a area of Woranso-Mille, Ethiopia

Stephanie M. Melillo [a, *], Luis Gibert [b], Beverly Z. Saylor [c], Alan Deino [d], Mulugeta Alene [e], Timothy M. Ryan [f], Yohannes Haile-Selassie [g, h]

Fossiliferous deposits at Woranso-Mille span the period when *Australopithecus anamensis* gave rise to *Australopithecus afarensis* (3.8e3.6 Ma) and encompass the core of the *A. afarensis* range (ca. 3.5e3.2 Ma).
Within the latter period, fossils described to date include the intriguing but taxonomically unattributed Burtele foot, dentognathic fossils attributed to *Australopithecus deyiremeda*, and one specimen securely attributed to *A. afarensis* (the Nefuraytu mandible).



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H. floresiensis
H. neanderthalensis
H. sapiens
H. heidelbergensis
H. rhodesiensis
H. erectus
H. antecessor
P. robustus
P. boisei
H. habilis
H. rudolfensis
A. sediba
H. georgicus
H. ergaster
A. garhi
P. aethiopithecus
Kenyanthropus platyops
A. africanus
A. afarensis
A. deyiremeda
A. bahrelghazali
A. anamensis
Ardipithecus ramidus
Ardipithecus kadabba
Orrorin tugenensis
Sahelanthropus tchadensis
Big brain, small teeth, bipedalism
Small brain, very big teeth, facultative bipedalism
Small brain, big teeth facultative bipedalism
Small brain, small teeth, quadrupeds
Lack of information

Autralopithecus bahrelghazali

Australopithecus africanus Dart 1925

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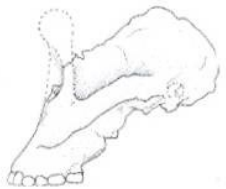

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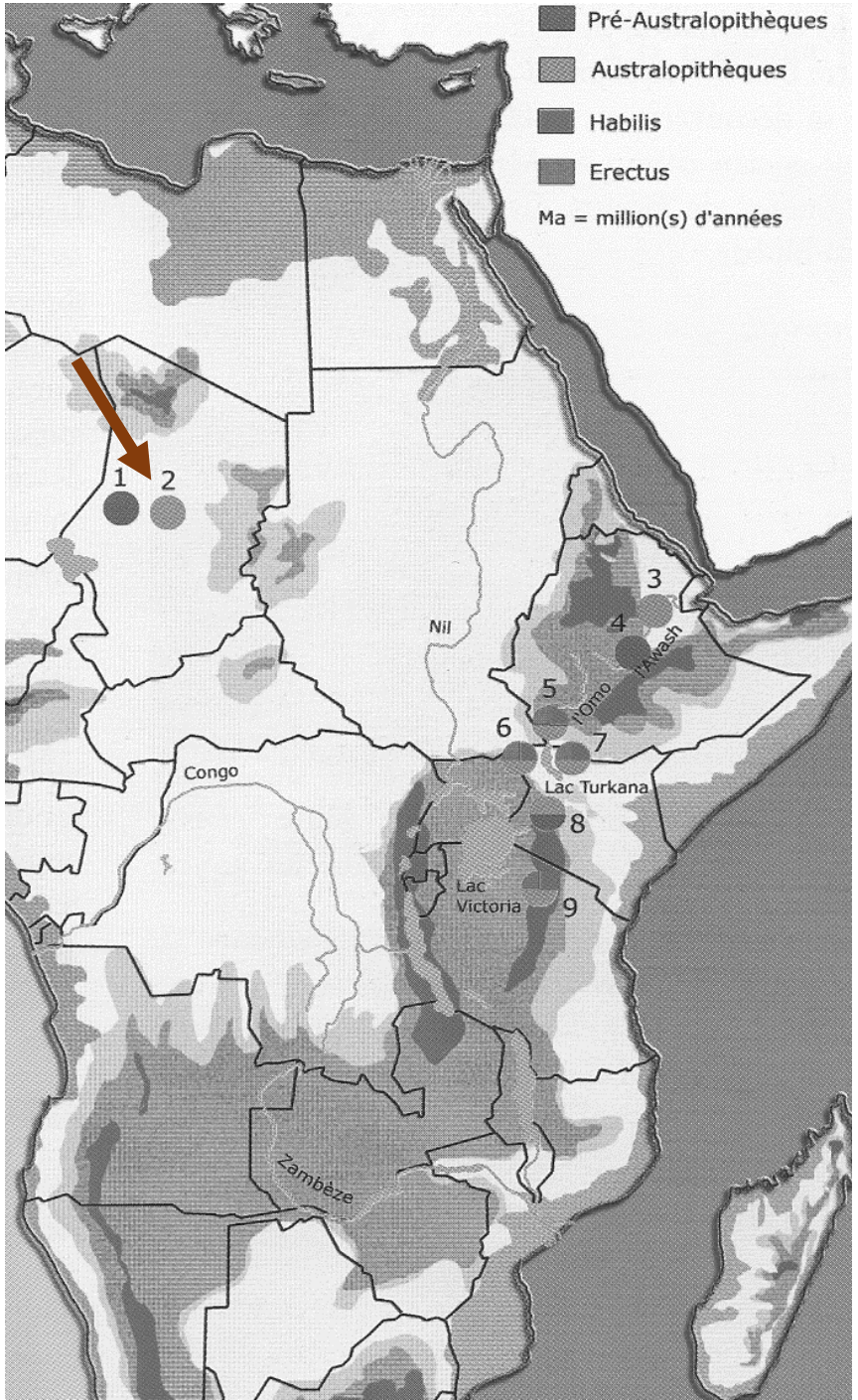
Holotype : Crâne KNM-WT 40000 (Lomekwi, Ouest-Turkana, Kenya)

Da Histoire d'ancetres- Grimaud *et al.*, 2005

Au. bahrelghazali, Ciad 3-3.5 MA
(Abel)

Mandibola particolarmente verticale anteriormente = prognatismo ridotto
Forma parabolica

Anterior part of the mandible almost vertical = reduction of the prognathism
Parabolic shape



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Journal of Human Evolution 55 (2008) 37–47

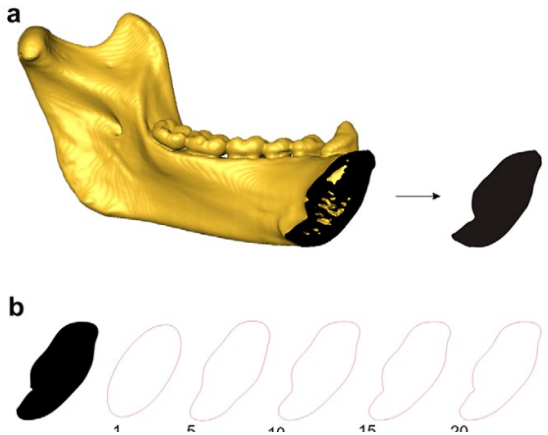
Symphyseal shape variation in extant and fossil hominoids, and the symphysis of *Australopithecus bahrelghazali*

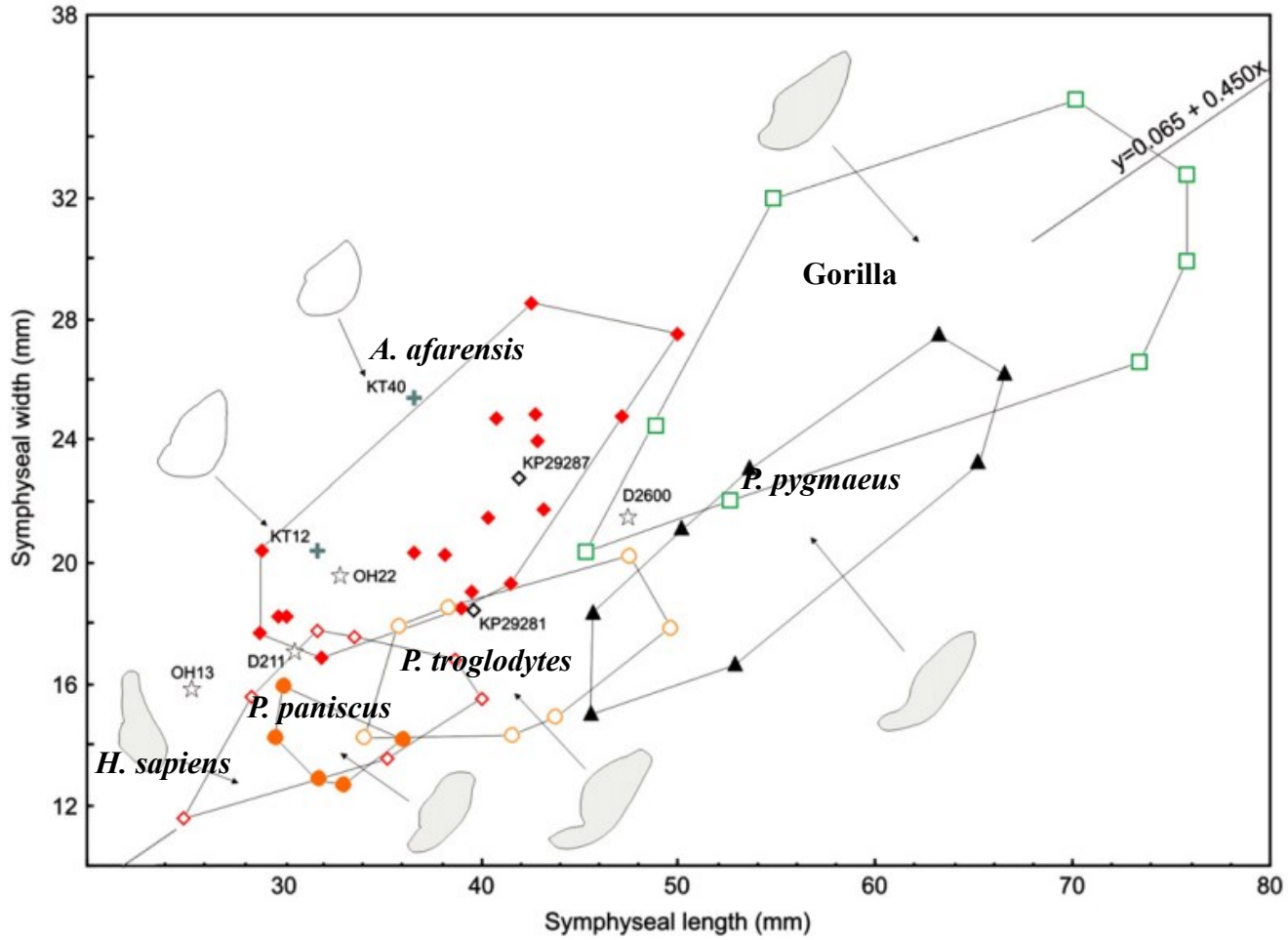
Franck Guy [a,*], Hassane-Taïsso Mackaye [b], Andossa Likius [b], Patrick Vignaud [a], Matthieu Schmittbuhl [c], Michel Brunet [a]

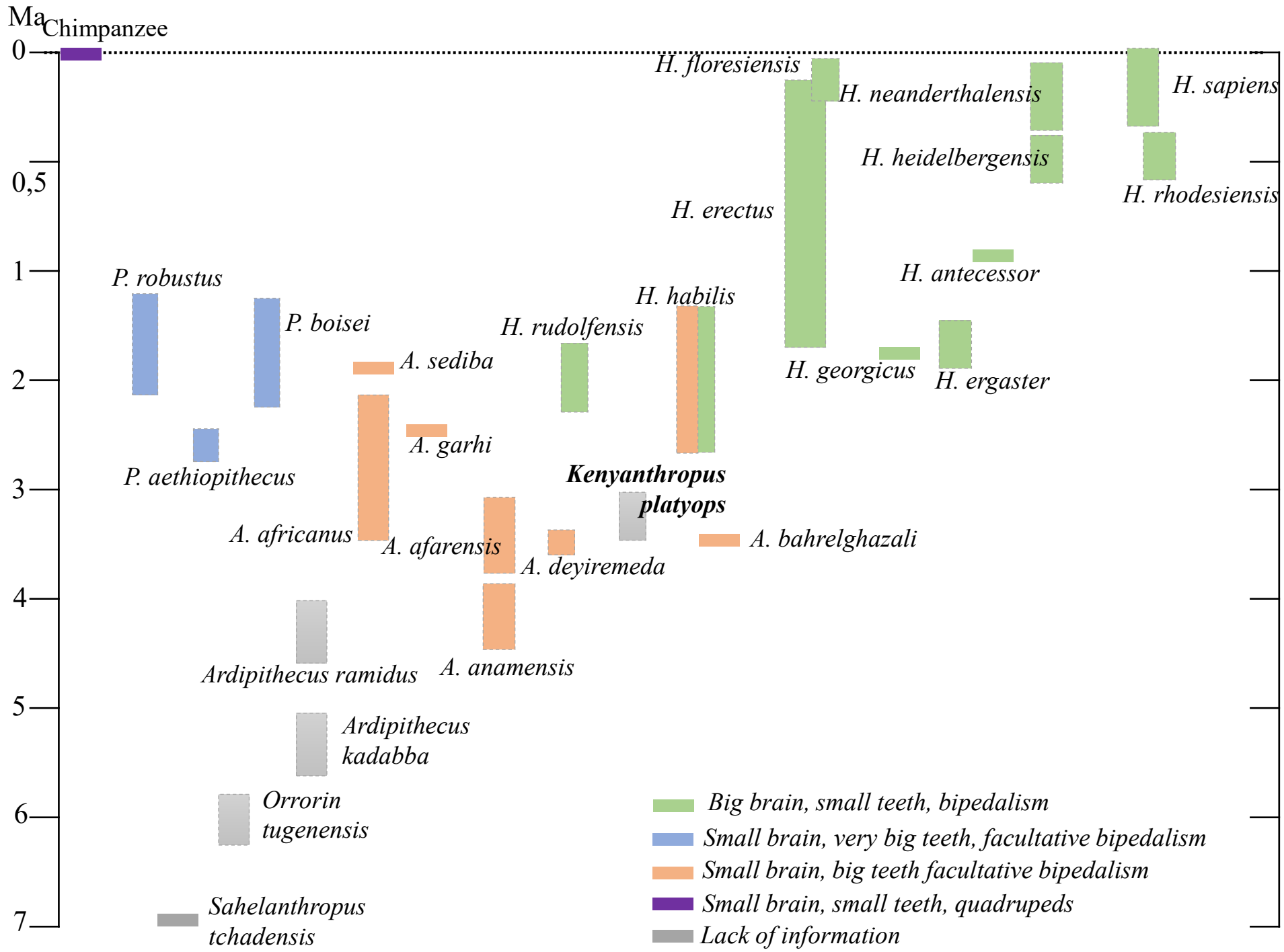
[a] CNRS UMR 6046, IPHEP Institut International de Paléoprimatologie, Paléontologie Humaine: Evolution et Paléoenvironnements, Faculté des Sciences, Université de Poitiers, 40 Avenue du Recteur Pineau, F-86022 Poitiers Cedex, France
[b] Université de N'Djamena, BP 1117, N'Djamena, Tchad
[c] EA 3428: ''Espèce humaine et primates: variabilité et évolution,'' Faculté de Médecine, F-67085 Strasbourg, France

Received 9 October 2006; accepted 3 December 2007

Au. anamensis: KNM-KP 29287, KNM-KP 29281
Early *Homo*: D211, D2600, OH 13, OH 22



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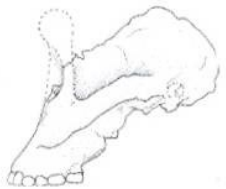

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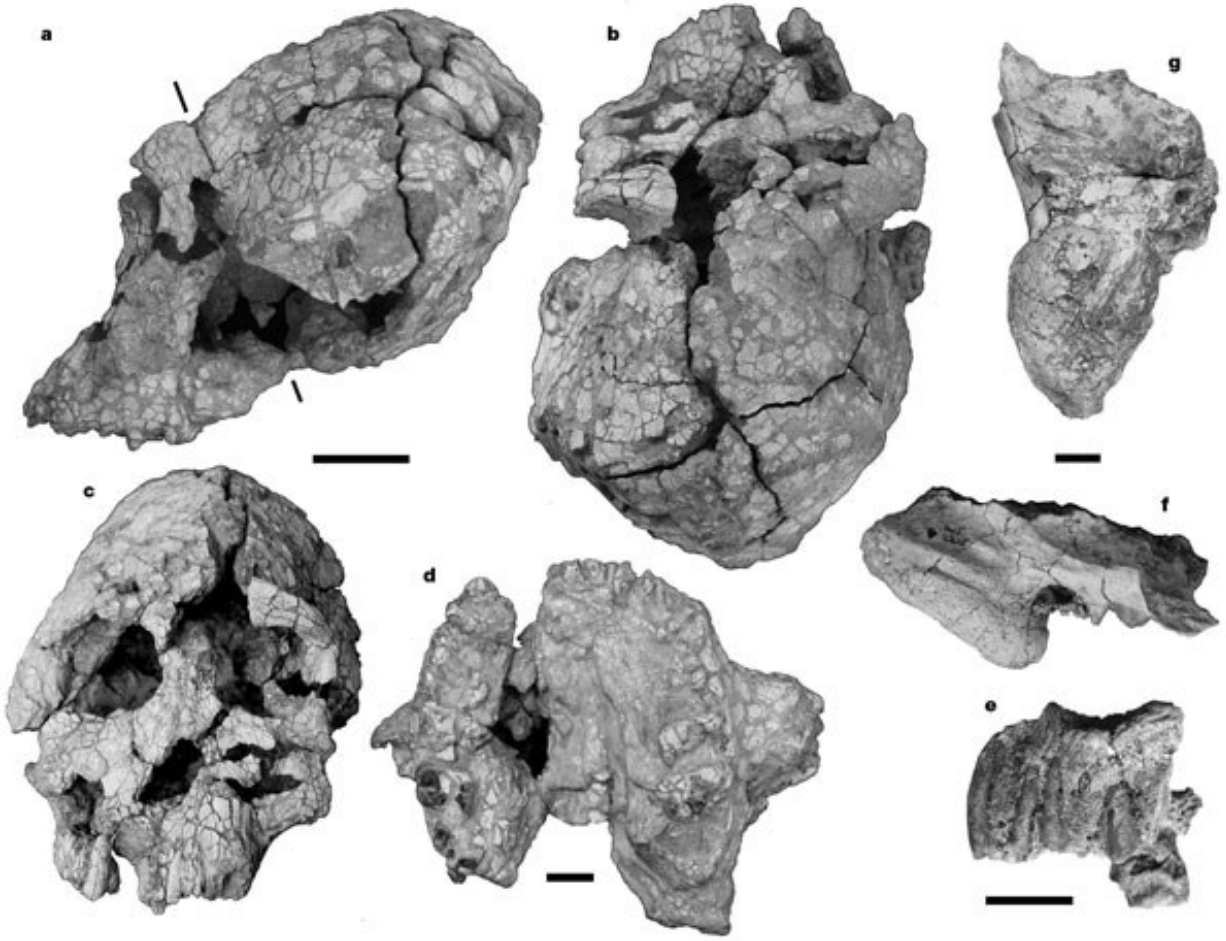
Da Histoire d'ancetres- Grimaud *et al.*, 2005

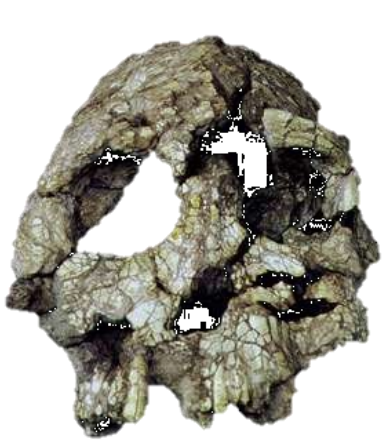
KNM - WT 40000 – West Turkana 3,5 – 3 Ma



(Leakey et al., 2001) - b, Superior view. c, Anterior view. d, Occlusal view of palate. Paratype KNM-WT 38350. e, Lateral view. KNM-WT 40001. f, Lateral view. g, Inferior view.

Tim White: *A. afarensis*
M. Leakey: linea evolutiva distinta forse alla base della speciazione del genere *Homo*
Evolutionary lineage distinct at the basis of the Homo *speciation*

Faccia piatta *Flat face*
Denti piccoli Small teeth
Capacità cranica = australopitecine



KNM WT 40000

ER 1470 (*H. rudolfensis*)

Condivide caratteristiche primitive con *A. afarensis*

≠ *A. afarensis* (specie contemporanea)
- Sulla parte inferiore della faccia

Radice del processo maxillo-zigomatico posizionato anteriormente
Piano subnasale trasversalmente e sagittalmente piatto con una proiezione minima oltre i canini

Non ci sono caratteri derivati che potrebbe unirlo alla linea evolutiva *anamensis-afarensis*

Shared primitive features with *Au. afarensis*

≠ *A. afarensis* (contemporaneous specie)
- On the lower part of the face:

anteriorly positioned root of the maxillary zygomatic process
transversely and sagittaly flat submasal plane with minimal projection beyond the canines

There are no shared derived characters linking it to the *anamensis-afarensis* species-lineage

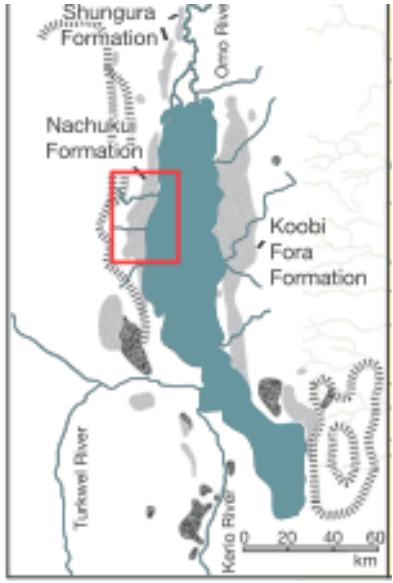
ARTICLE

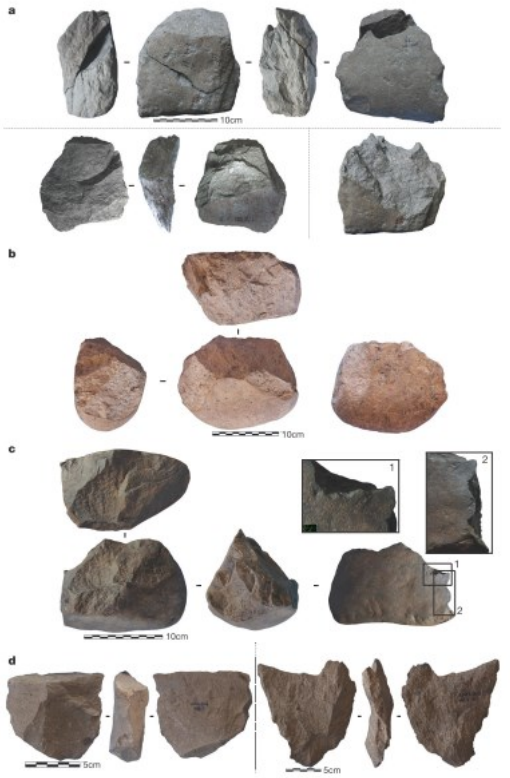
doi:10.1038/nature14464

3.3-million-year-old stone tools from Lomekwi 3, West Turkana, Kenya

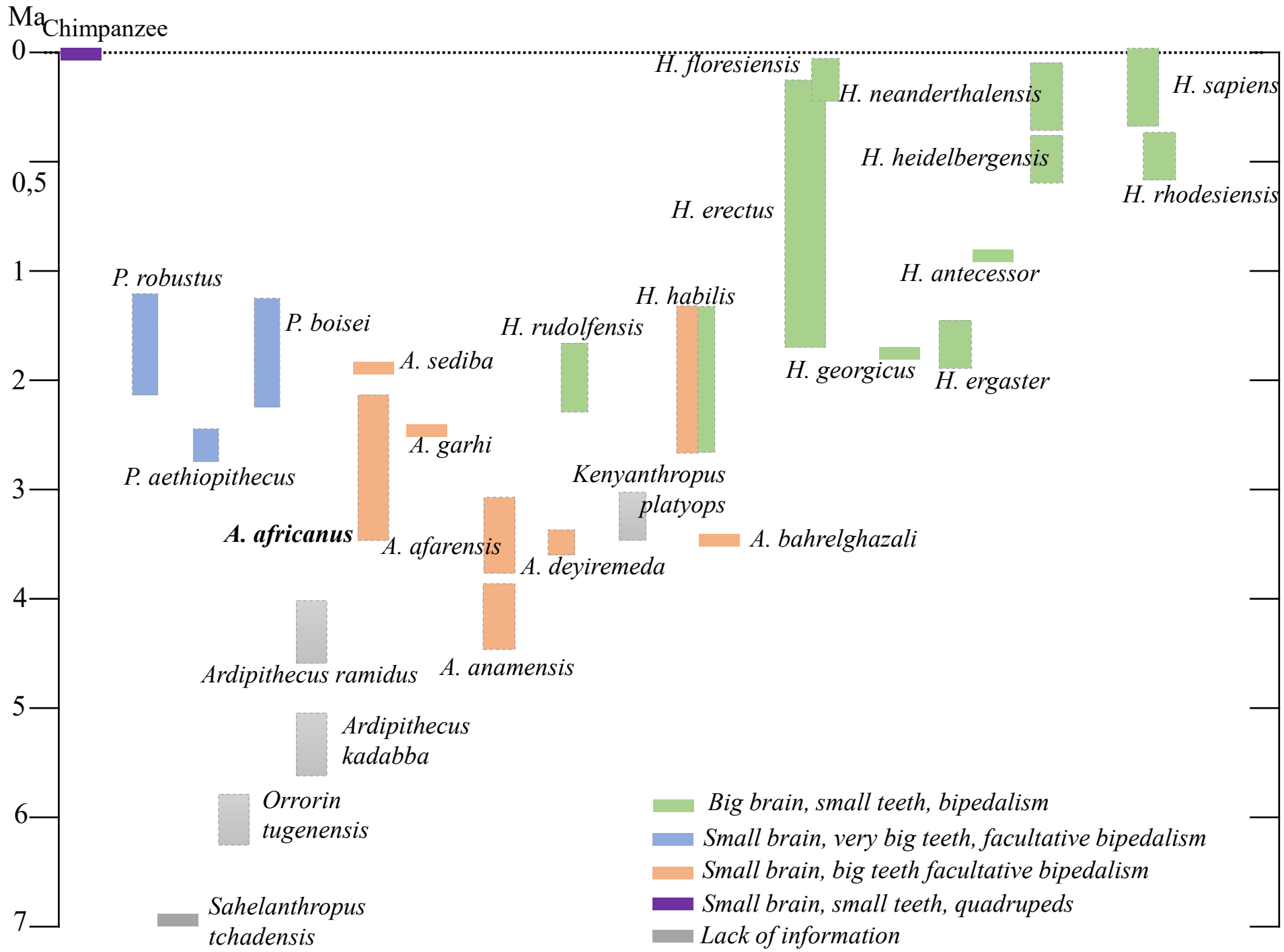
Sonia Harmand[1,2,3], Jason E. Lewis[1,3,4], Craig S. Feibel[3,4,5], Christopher J. Lepre[3,5,6], Sandrine Prat[3,7], Arnaud Lenoble[3,8], Xavier Boës[3,7], Rhonda L. Quinn[3,5,9], Michel Brenet[8,10], Adrian Arroyo[2], Nicholas Taylor[2,3], Sophie Clément[3,11], Guillaume Daver[12], Jean-Philip Brugal[3,13], Louise Leakey[1], Richard A. Mortlock[5], James D. Wright[5], Sammy Lokorodi[3], Christopher Kirwa[3,14], Dennis V. Kent[5,6] & Hélène Roche[2,3]

Human evolutionary scholars have long supposed that the earliest stone tools were made by the genus *Homo* and that this technological development was directly linked to climate change and the spread of savannah grasslands. New fieldwork in West Turkana, Kenya, has identified evidence of much earlier hominin technological behaviour. We report the discovery of Lomekwi 3, a 3.3-million-year-old archaeological site where *in situ* stone artefacts occur in spatio-temporal association with Pliocene hominin fossils in a wooded palaeoenvironment. The Lomekwi 3 knappers, with a developing understanding of stone's fracture properties, combined core reduction with battering activities. Given the implications of the Lomekwi 3 assemblage for models aiming to converge environmental change, hominin evolution and technological origins, we propose for it the name 'Lomekwian', which predates the Oldowan by 700,000 years and marks a new beginning to the known archaeological record.





These finds occur in the same geographic and chronological range as the paratype of *Kenyanthropus platyops* (KNM-WT 38350), other hominin fossils generally referred to cf. *K. platyops*, and one unpublished hominin tooth (KNM-WT 64060) found by WTAP in 2012.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H. floresiensis
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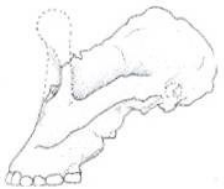

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Nom : *Australopithecus africanus*

Origine : Afrique du Sud (Makapansgat, Sterkfontein, Taung)

Dates : 3,5 à 1,2 MA

Cerveau : 400 à 500 cm^3

Taille : 1,20 m

Intermediate form between *Paranthropus* and *Autralopithecus*

Taung baby 2,6 Ma

STS 5 Miss Ples 2,8 – 2, 6 Ma

STS 14

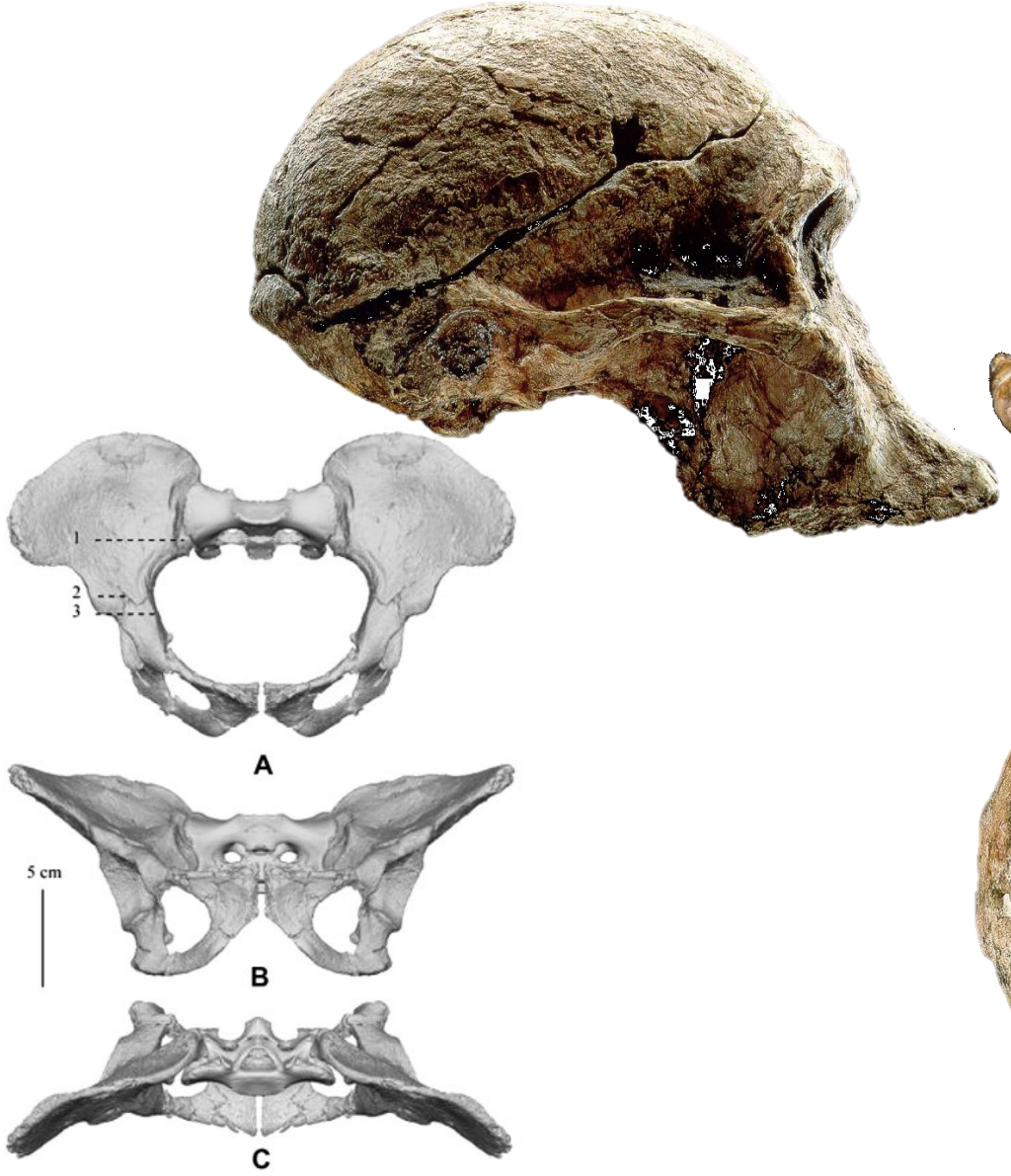
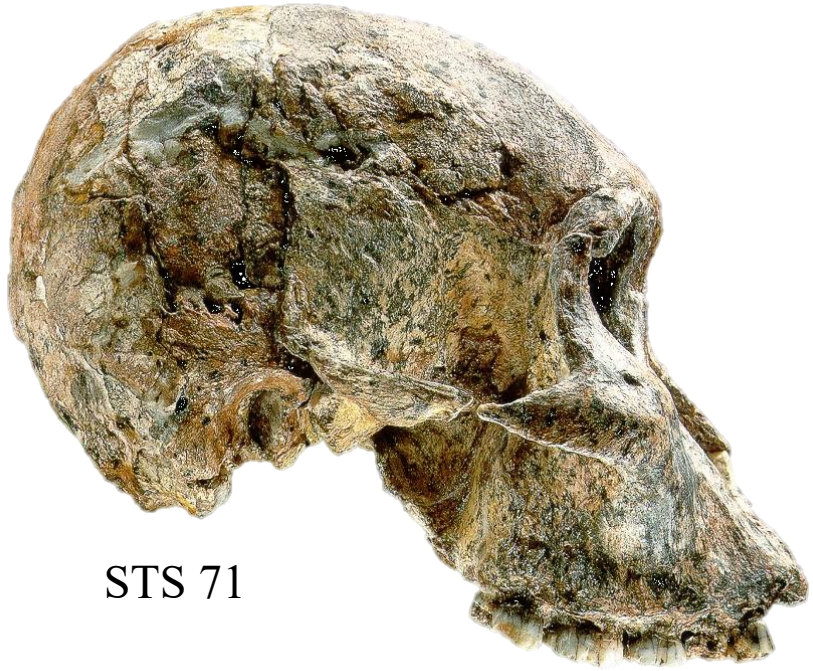


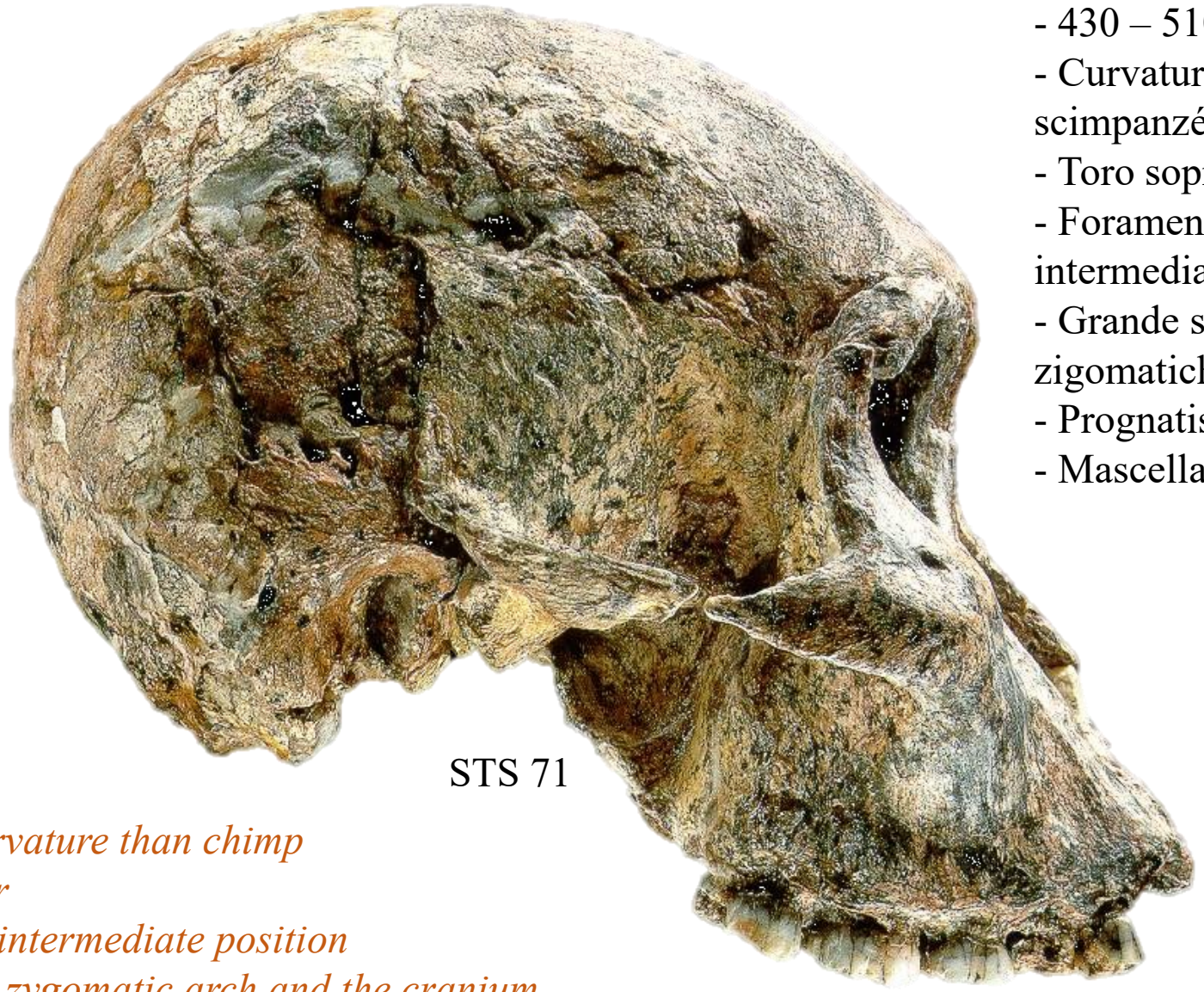
Fig. 5. The reconstructed Sts 14 pelvis. A: anterior superior view; B: anterior view. C: superior view. 1: space corresponding to the epiphysial lamina; 2: crack-line; 3: iliopubic eminence.

Berge 2010, JHE 58



STS 71

1,20 m
- 430 – 510 cc
- Curvature cranica più marcata che i scimpanzé
- Toro sopra-orbitale più spesso
- Foramen magnum in posizione intermedia
- Grande spazio tra le arcate zigomatiche e il cranio
- Prognatismo alveolare pronunciato
- Mascella parabolica

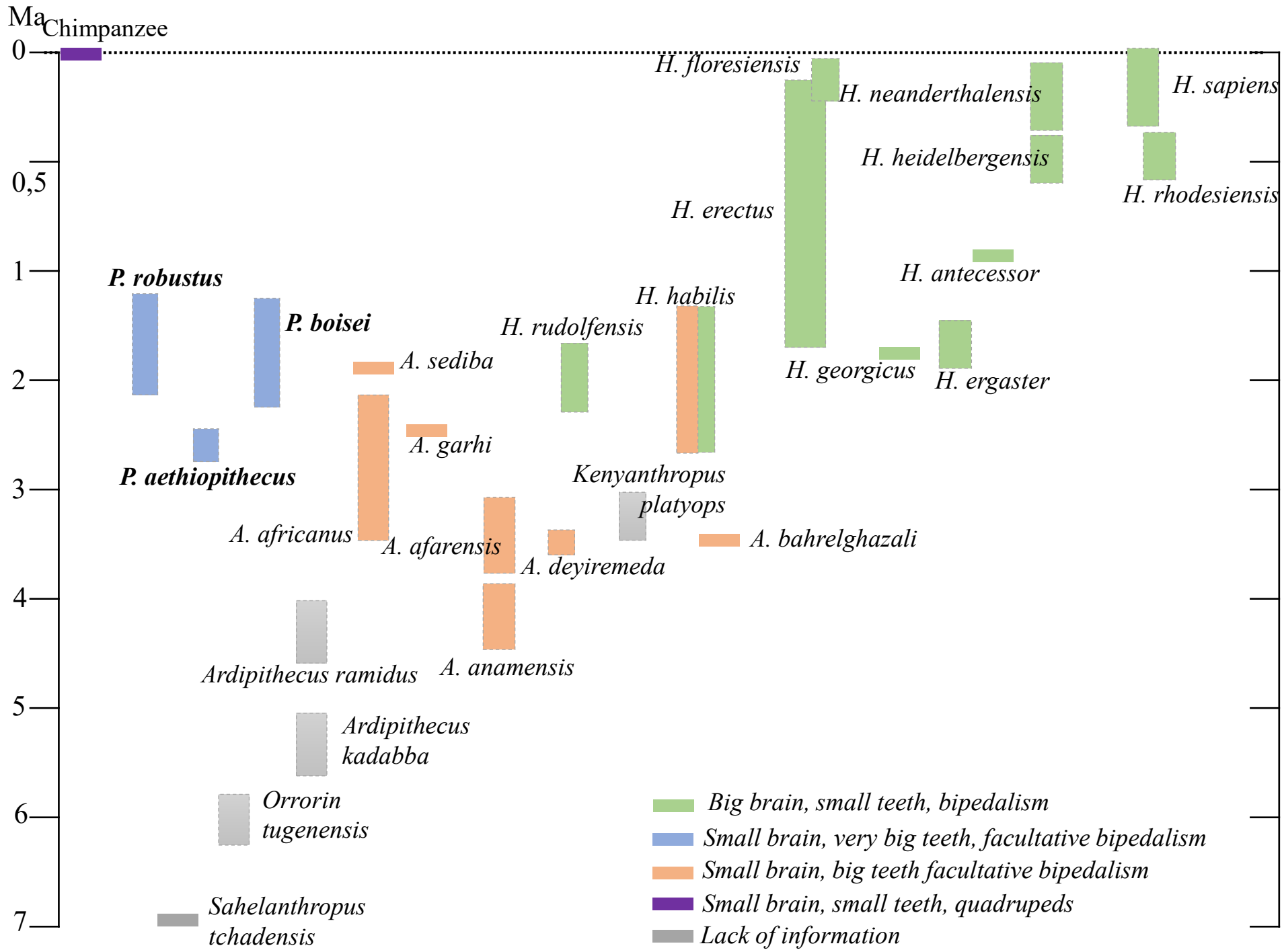


STS 71

- 1,20 m
- 430 – 510 cc
- More marked cranial curvature than chimp
- Supra orbital torus ticker
- Foramen magnum in an intermediate position
- Large space between the zygomatic arch and the cranium
- Marked alveolar prognatism
- Parabolic jaw

≠ *A. afarensis*
Scattola cranica più alta e corta senza cresta sagittale
Base del cranio stretta relativamente alla sua lunghezza
Foramen magnum situato posteriormente
Pilastro anteriore prominente che limita l'apertura nasale
Zona subnasale piatta e meno proiettata relativamente all'asse bicanino
Radice del processo zigomatico prende origine anteriormente
Corpo mandibolare più robusto
Denti postcanini più larghi

≠ *A. afarensis*
Higher and shorter braincase with rare sagittal cresting
Cranial base narrow relative to its lenght
Foramen magnum located more posteriorly
Prominent anterior pillars bord the nasal aperture
Subnasal plate is flat and much less projecting relative to the bicanine axis
Zygomatic process roots originated more anteriorly
Mandible corpus more robust
Larger postcanine teeth

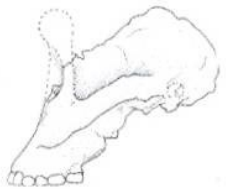

Ma
Chimpanzee
0
0,5
1
2
3
4
5
6
7
H. floresiensis
H. neanderthalensis
H. sapiens
H. heidelbergensis
H. rhodesiensis
H. erectus
H. antecessor
P. robustus
P. boisei
H. habilis
H. rudolfensis
H. georgicus
H. ergaster
A. sediba
A. garhi
P. aethiopithecus
Kenyanthropus platyops
A. africanus
A. afarensis
A. deyiremeda
A. bahrelghazali
A. anamensis
Ardipithecus ramidus
Ardipithecus kadabba
Orrorin tugenensis
Sahelanthropus tchadensis
Big brain, small teeth, bipedalism
Small brain, very big teeth, facultative bipedalism
Small brain, big teeth facultative bipedalism
Small brain, small teeth, quadrupeds
Lack of information

Parantropus robustus, boisei, aethiopicus

Australopithecus africanus Dart 1925

Holotype : Crâne de Taung (Afrique du Sud)

Synonymies :
- *Australopithecus transvaalensis* Broom, 1936 Sterkfontein, fgt de maxillaire TM 1511 (S1)
- *Plesianthropus transvaalensis* (Broom et Schepers, 1946) Sterkfontein, fgt mandibule TM 1516 et crâne Sts 5
- *Australopithecus prometheus* Dart, 1948 Makapansgat, calotte crânienne MDL-1



Paranthropus robustus Broom 1938

Holotype : Crâne et postcrânien TM 1517 (Kromdraai, Afrique du Sud)

Synonymies :
- *Paranthropus crassidens* Broom, 1949 Swartkrans, mandibule SK 6

Paranthropus boisei (Tobias 1967)

Holotype : Crâne OH 5 (Olduvai, Tanzanie)

Synonymies :
Zinjanthropus boisei Leakey, 1959
Paranthropus boisei (Robinson, 1960)
Australopithecus (Paranthropus) boisei (Leakey, Tobias et Napier, 1964)

Paranthropus aethiopicus (Arambourg et Coppens 1967)

Holotype : Mandibule Omo 18-1967-18 (Shungura, Omo, Éthiopie)

Australopithecus afarensis Johanson, White et Coppens 1978

Holotype : Mandibule LH 4 (Laetoli, Tanzanie)

Synonymies :
- *Meganthropus africanus* (Wernert, 1950) Maxillaire Garusi I
- *Praeanthropus africanus* (Senyürek, 1955) Maxillaire Garusi I

Australopithecus bahrelghazali Brunet *et al.* 1996

Holotype : Mandibule KT 12/H1 (Koro Toro, Tchad)

Australopithecus anamensis Leakey *et al.* 1995

Holotype : Mandibule KNM-KP 29 281 (Kanapoi, Kenya)

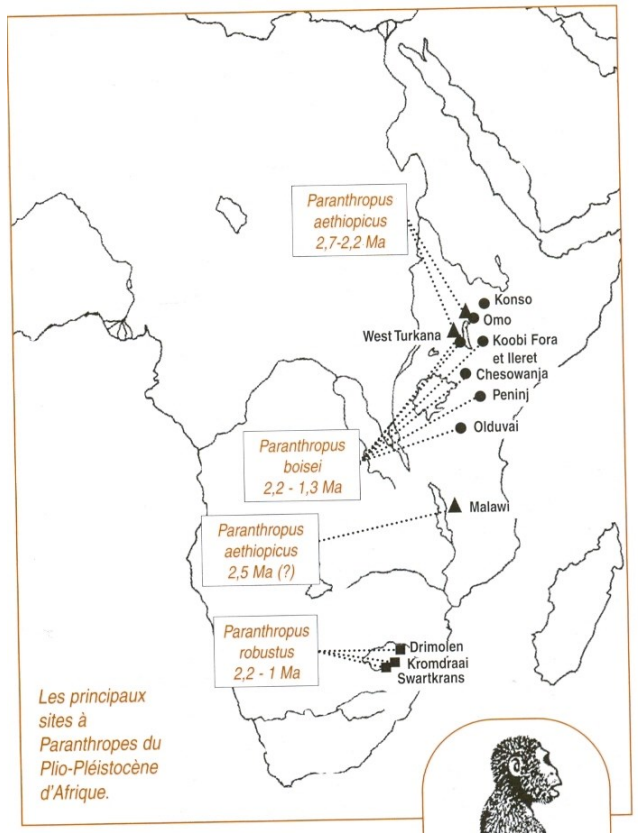
Australopithecus garhi Asfaw *et al.* 1999

Holotype : Bou-VP-12/130 (Bouri, Middle Awash, Ethiopie)

Kenyanthropus platyops Leakey *et al.* 2001

Holotype : Crâne KNM-WT 40000 (Lomekwi, Ouest-Turkana, Kenya)

Da Histoire d'ancetres- Grimaud *et al.*, 2005



Les principaux sites à Paranthropes du Plio-Pléistocène d'Afrique.

Nom : Paranthropus aethiopicus
Origine : Afrique de l'Est (Omo, West-Turkana, Malawi)
Dates : 2,7 à 2,2 Ma
Cerveau : 500 à 550 cm^3
Taille : 1,50 m - 1,60 m

P. aethiopicus KNM-WT 17000 2.5 MA

≠ *A. afarensis*
Extreme midfacial prognathism, flat subnasal plane, vertically thick palate, anteriorly positioned zygomatic process rooths, massive postcanine dentition

Nom : *Paranthropus robustus*

Origine : Afrique du Sud (Swartkrans, Kromdraai)

Dates : 2,2 à 1,5 MA

Cerveau : 500 à 550 cm^3

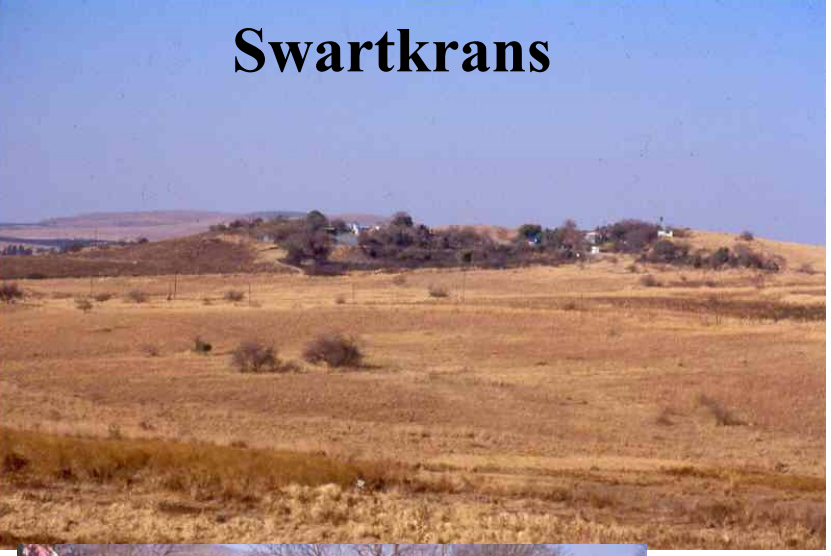
Taille : 1,50 - 1,60 m

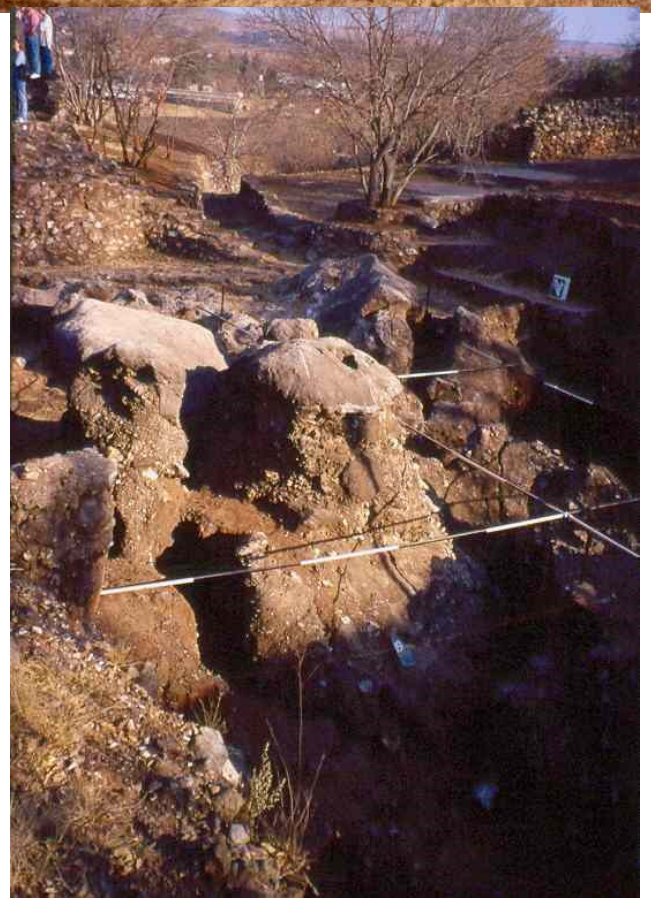
≠ *A. afarensis*

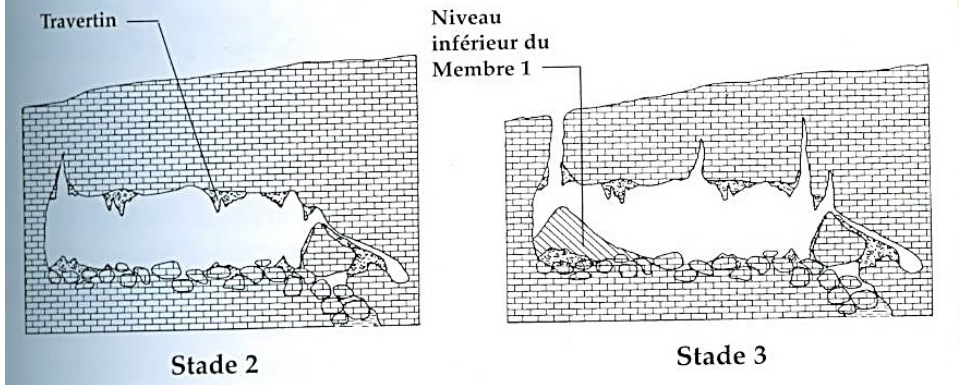
Large postcanine dentition and unusual facial morphology with depressed infraorbital surfaces

P. robustus SK 48 Swartkrans, 2-1.5 MA

Swartkrans

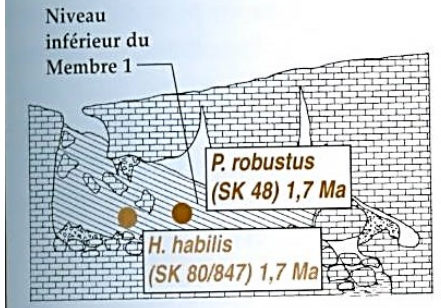




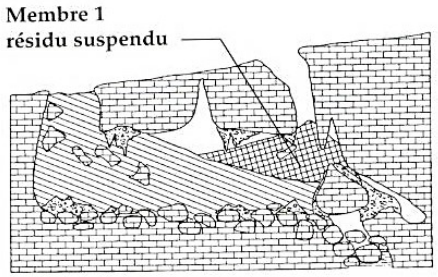


Stade 2

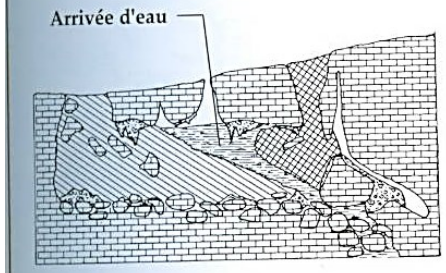
Stade 3



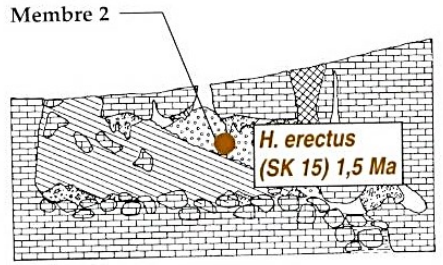
Stade 4



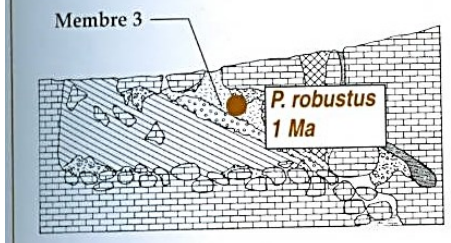
Stade 5



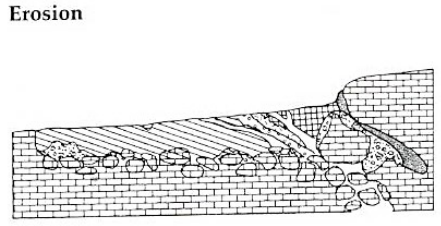
Stade 6



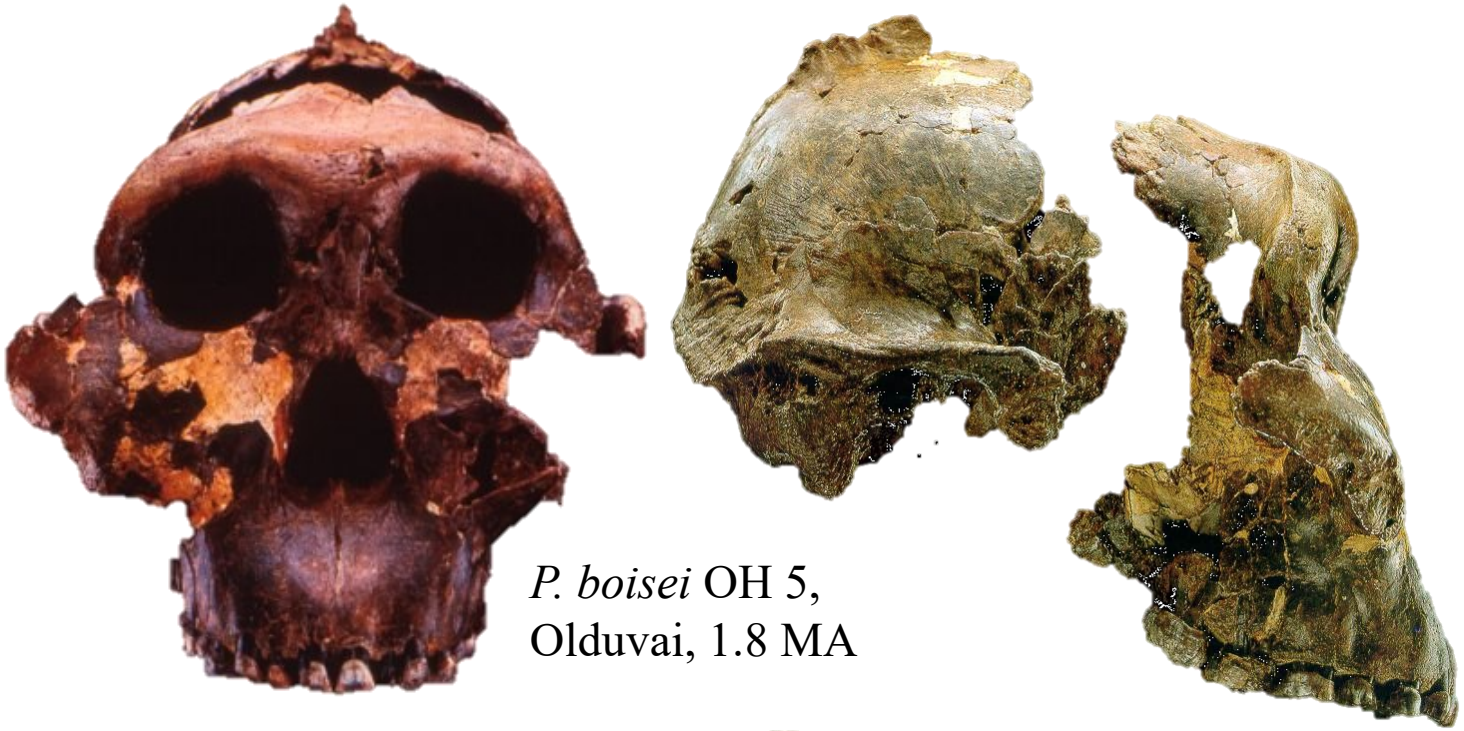
Stade 7



Stade 8



Stade 9



P. boisei OH 5,
Olduvai, 1.8 MA

P. boisei KNM-ER
732, Koobi Fora
1.7 MA

P. boisei KNM-ER
406, Koobi Fora
1.7 MA

P. boisei OH 5,
Olduvai, 1.8 MA

≠ *P. robustus* principalmente nel complesso dentognatico
Denti postcanini più larghi
Disproporzione tra la dentizione postcanini e anteriore più importante
Toro sopraorbitale più robusto
Foramen magnum piu corto

≠ *P. robustus* principaly in the dentognathic complex
Absolutely larger postcanine teeth
Greater disproportion between the postcanine and anterior dentitions
Stronger supraorbital torus
Shorter foramen magnum

Sagital keeling

VS

Sagital crest

Carena sagittale

Homo erectus

Bone robustness

Cresta sagittale : Insertion of temporal muscle

Muscular robustness

PARANTROPI o AUSTRALOPITECI ROBUSTI:

-Così definiti per la robustezza dell'apparato masticatorio (denti, mandibole, mascelle, creste di inserzione muscolare)
Defined for the robustness of the masticatory apparatus (teeth, mandible, maxilla, sagittal crest)

-Sviluppata cresta sagittale che da inserzione ai muscoli temporali che avvolgono praticamente tutto il cranio
Developed sagittal crest for the insertion of the temporal muscle which envelop almost all the skull

-Fosse temporali molto ampie
Wide temporal fossa

-Arcate zigomatiche vistose
Considerable zygomatics

-Scheletro facciale accorciato
Short face

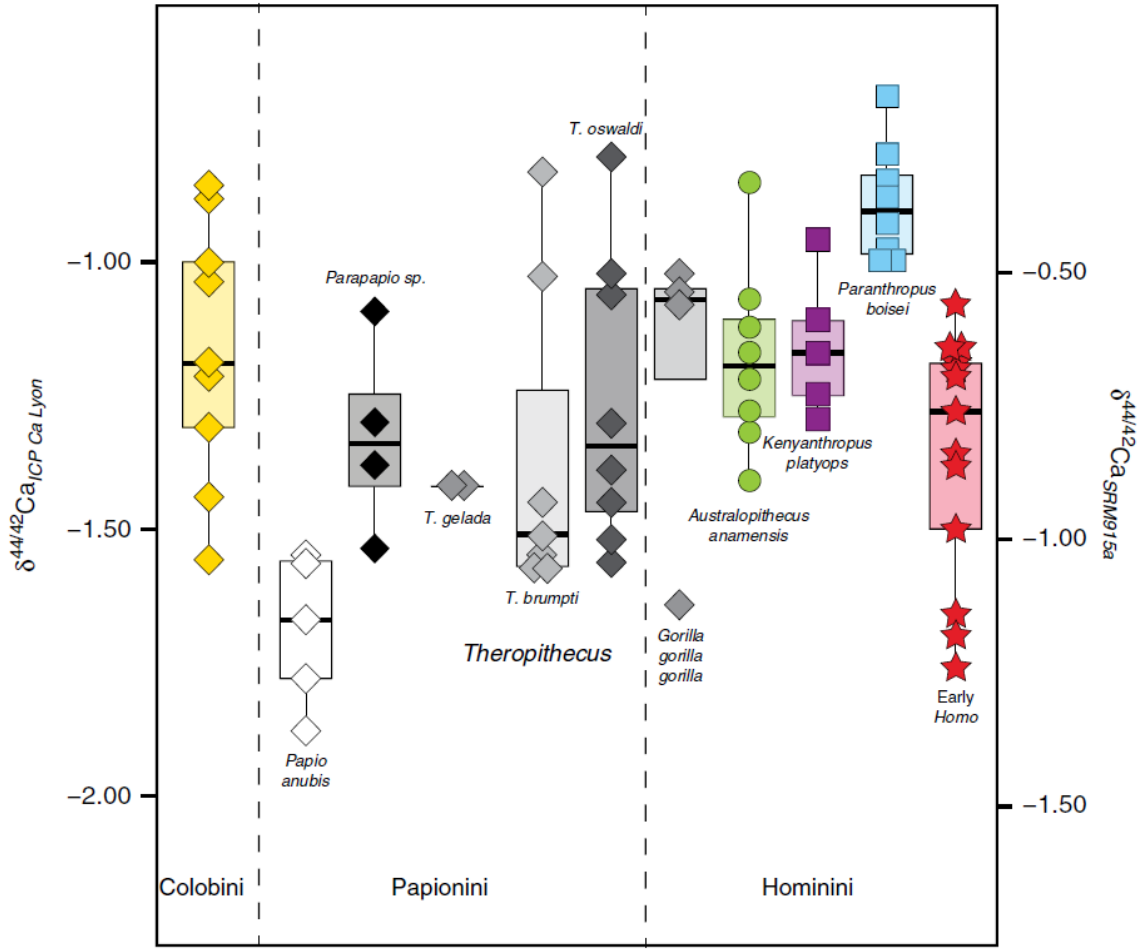
ARTICLE

https://doi.org/10.1038/s41467-020-17427-7 OPEN

Calcium isotopic ecology of Turkana Basin hominins

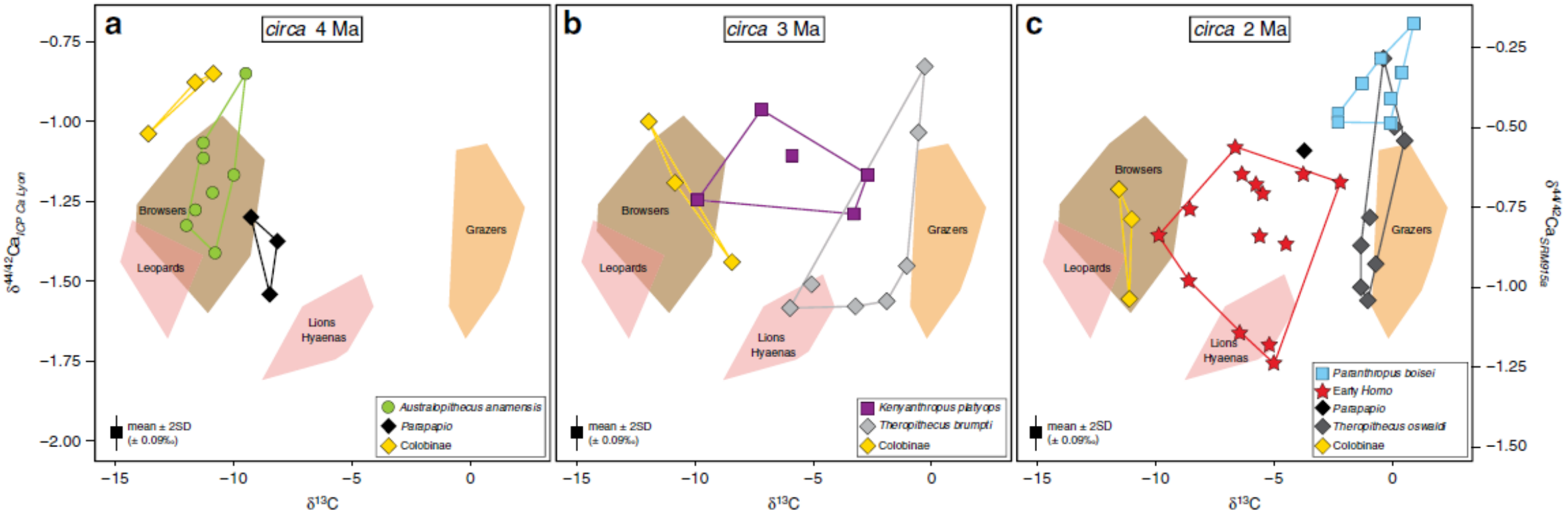
Jeremy E. Martin[1✉], Théo Tacail[2], José Braga[3,4], Thure E. Cerling[5] & Vincent Balter[1]

44Ca/42Ca ratio : narrow range of calcium isotopic composition in a consumer tissue may reflect a **specialized diet;**
whereas a scattered distribution should reflect a **more complex interplay** between resource diversity, isotopic variation in resources, and differential consumption of resources by individuals within a group.



Box and whisker plots showing the distribution of $\delta_{44/42}Ca$ values (in‰) between the various non-hominin and hominin primates analyzed in this study as well as some modern representatives (*Papio anubis*, *Theropithecus gelada*, and *Gorilla gorilla gorilla*).

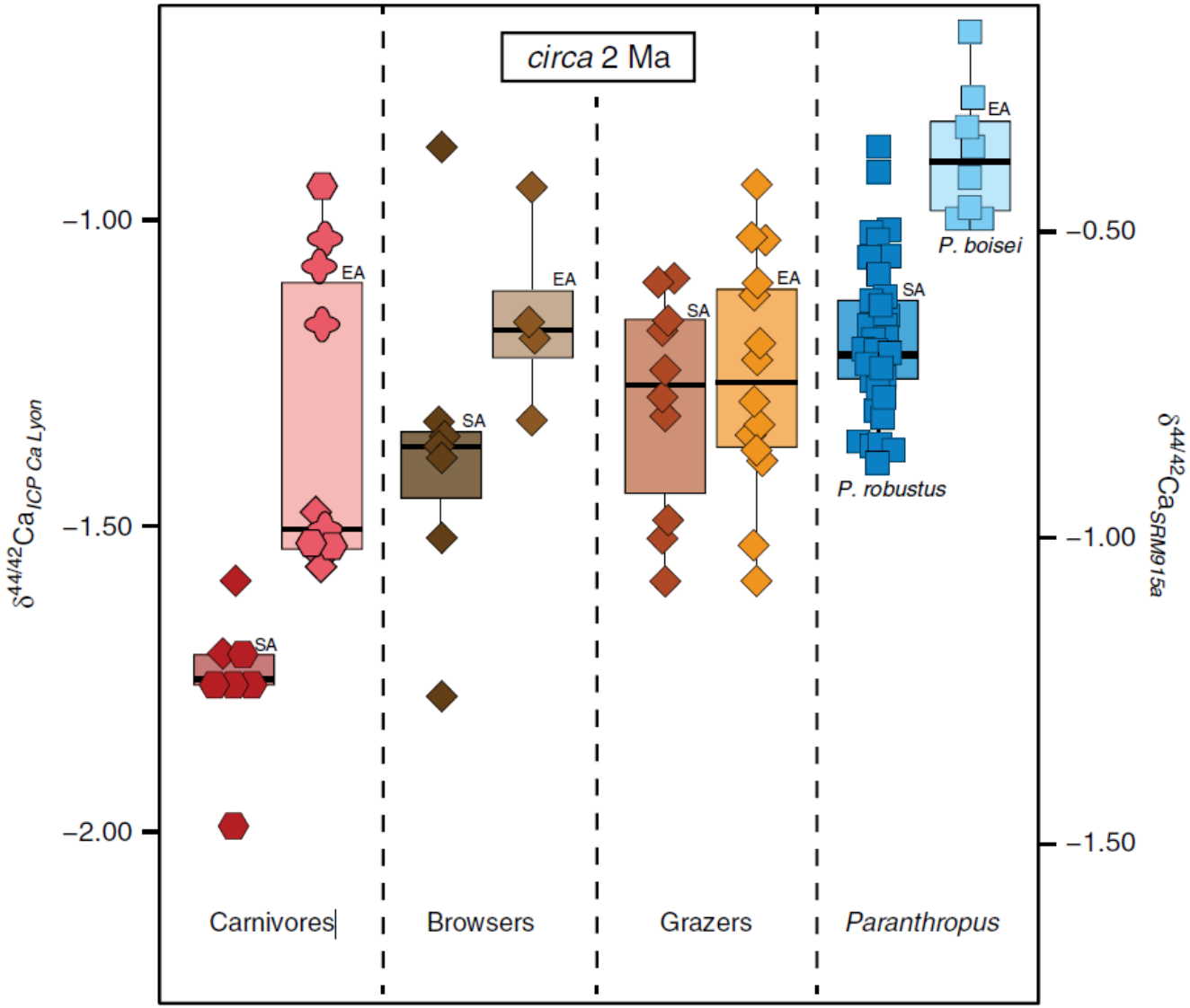
A browser (brucatori) is a type of an herbivorous animal that specializes in eating leaves, fruits of high-growing woody plants, soft shoots and shrubs (C3 plants).
A grazing (ramicciatori) animal is an herbivore that feeds on plants such as grass and other low-lying vegetation (C4 plants)



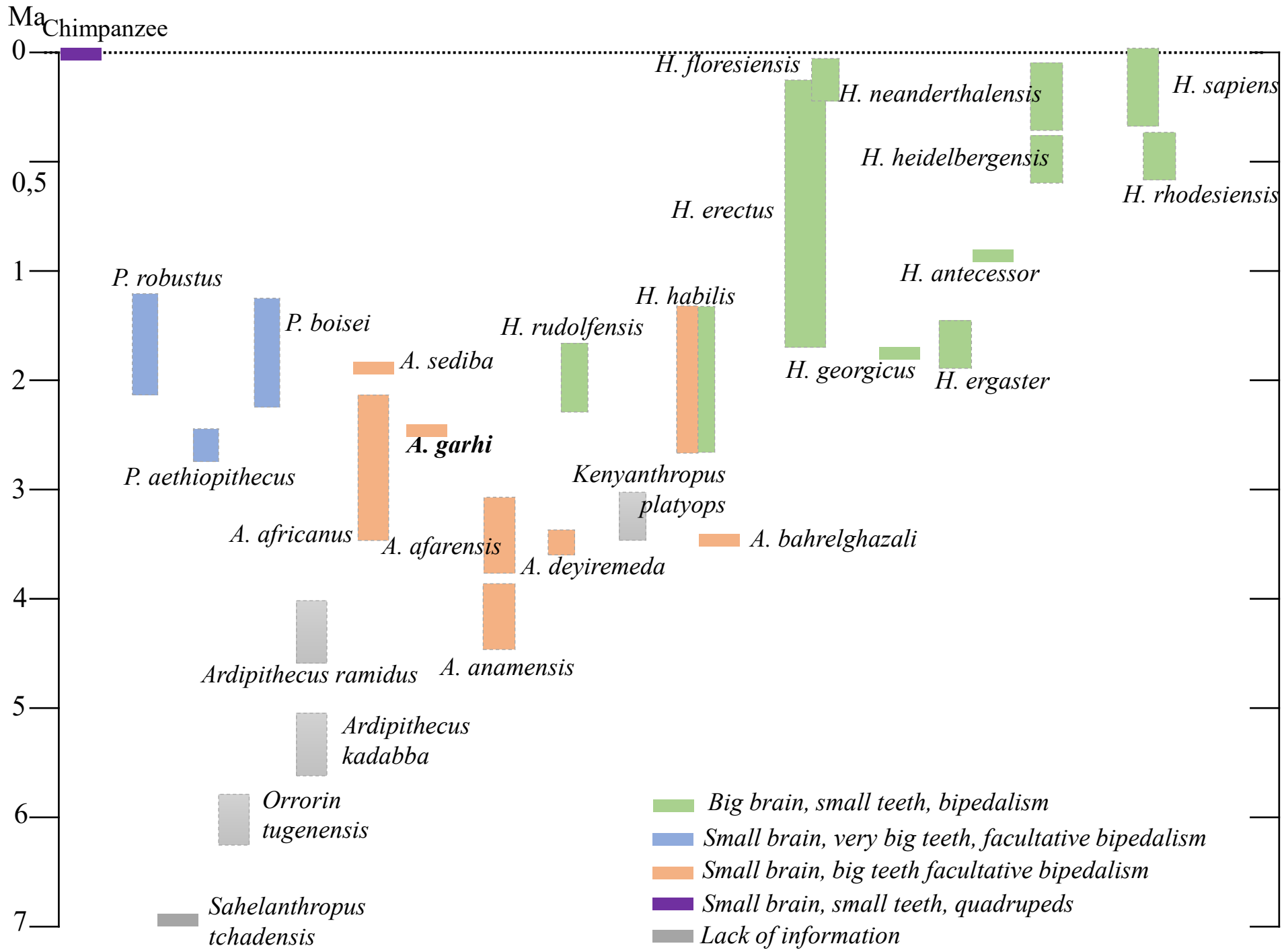
$\delta_{44/42}Ca$ (in‰) as a function of $\delta_{13}C$ (in‰) measured from tooth enamel of fossil hominin and non-hominin primates from the Turkana Basin area, Kenya for different time bins, i.e., circa 4 Ma, circa 3Ma and circa 2Ma (numbers of biologically independent samples per group: n = 9 for Colobini; n =4 for *Parapapio* sp.; n = 7 for *Theropithecus brumpti*; n =8 for *Theropithecus oswaldi*; n = 8 for *Australopithecus anamensis*; n = 5 for *Kenyanthropus platyops*; n = 8 for *Paranthropus boisei*; n = 13 for early *Homo*).

P. boisei species remains remarkable for exhibiting $_{44}$Ca-enriched tooth enamel within a narrow range of isotope values, which most likely reflect a **specialized diet** on items with low isotopic variability possibly associated to a physiology different than other primates. The range of calcium isotope values of *P. boisei* not only differs from other hominins of the Turkana Basin, it also differs from that of its South African congener P. *robustus*, which shows lower calcium isotope values.

P. robustus was interpreted to have had a **flexible diet** together with the contemporaneous early *Homo* from South Africa.



Box and whisker plots showing the distribution of $\delta_{44/42}$Ca values (in ‰) between Turkana Basin *Paranthropus boisei*, South African *Paranthropus robustus* and associated mammal faunas.


Ma
Chimpanzee
0
0,5
1
2
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7
H. floresiensis
H. neanderthalensis
H. sapiens
H. heidelbergensis
H. rhodesiensis
H. erectus
H. antecessor
P. robustus
P. boisei
H. habilis
H. rudolfensis
A. sediba
H. georgicus
H. ergaster
A. garhi
P. aethiopithecus
Kenyanthropus platyops
A. africanus
A. afarensis
A. bahrelghazali
A. deyiremeda
A. anamensis
Ardipithecus ramidus
Ardipithecus kadabba
Orrorin tugenensis
Sahelanthropus tchadensis
Big brain, small teeth, bipedalism
Small brain, very big teeth, facultative bipedalism
Small brain, big teeth facultative bipedalism
Small brain, small teeth, quadrupeds
Lack of information

Australopithecus garhi

Australopithecus africanus Dart 1925

Holotype : Crâne de Taung (Afrique du Sud)

Synonymies :
- *Australopithecus transvaalensis* Broom, 1936 Sterkfontein, fgt de maxillaire TM 1511 (S1)
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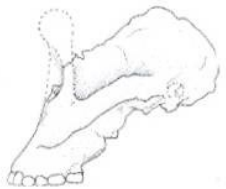

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Holotype : Bou-VP-12/130 (Bouri, Middle Awash, Ethiopie)

Kenyanthropus platyops Leakey *et al.* 2001

Holotype : Crâne KNM-WT 40000 (Lomekwi, Ouest-Turkana, Kenya)

Da Histoire d'ancetres- Grimaud *et al.*, 2005

BOU-BP-12-130

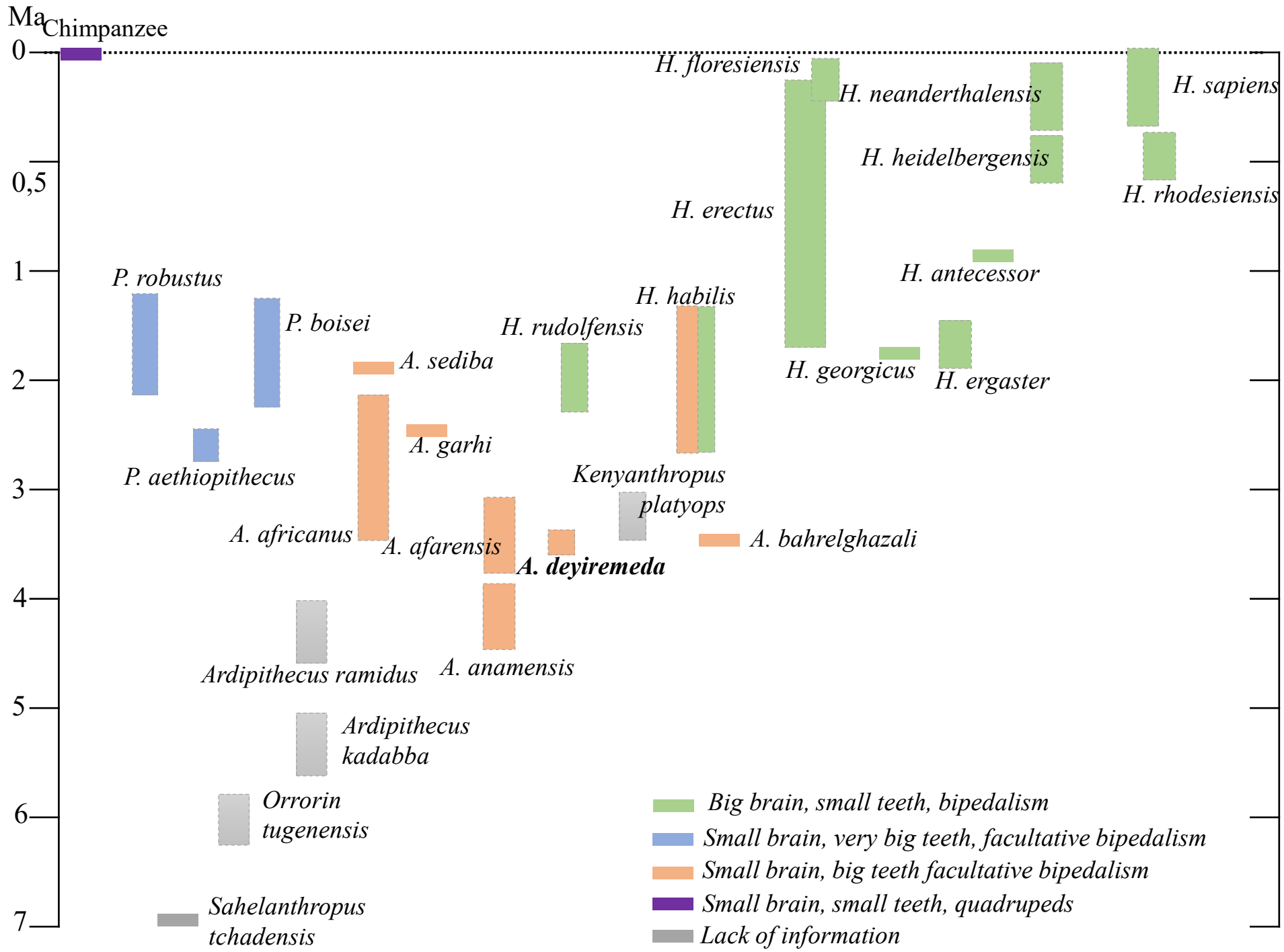
Età : 2, 5 Ma

Intermediario tra *A. afarensis* e i primi appartenenti al genere *Homo*
Combina una faccia e un palato plesiomorfi con una morfologia del calvaria derivata e una configurazione dentaria insolita (denti molto grandi)

Intermediate between A. afarensis *and the first* Homo
Combine a largely plesiomorphic face and palate with derived calvaria morphology and a highly unusual hominin dental configuration (huge teeth)

= *Au. afarensis*
Prognatismo pronunciato, zona subnasale convessa, margine dell'apertura nasale affilate, assenza di pilastro, palato poco profondo
Maxillary features: strongly prognathic, convex subnasal surface, sharp lateral margins of the nasal aperture, lack of anterior pillar, shallow palate

Asfaw, B., T.D. White, O. Lovejoy, B. Latimer, S. Simpson, and G. Suwa. 1999. "Australopithecus garhi: A new species of early hominid from Ethiopia." In Science, vol. 284, pp. 629-635


Ma
Chimpanzee
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H. floresiensis
H. neanderthalensis
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H. rhodesiensis
H. erectus
H. antecessor
P. robustus
H. habilis
P. boisei
H. rudolfensis
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H. georgicus
H. ergaster
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P. aethiopithecus
Kenyanthropus platyops
A. africanus
A. afarensis
A. bahrelghazali
A. deyiremeda
A. anamensis
Ardipithecus ramidus
Ardipithecus kadabba
Orrorin tugenensis
Sahelanthropus tchadensis
Big brain, small teeth, bipedalism
Small brain, very big teeth, facultative bipedalism
Small brain, big teeth facultative bipedalism
Small brain, small teeth, quadrupeds
Lack of information

Autralopithecus deyiremeda

ARTICLE

doi:10.1038/nature14448

New species from Ethiopia further expands Middle Pliocene hominin diversity

Yohannes Haile-Selassie[1,2], Luis Gibert[3], Stephanie M. Melillo[4], Timothy M. Ryan[5], Mulugeta Alene[6], Alan Deino[7], Naomi E. Levin[8], Gary Scott[7] & Beverly Z. Saylor[2]

Middle Pliocene hominin species diversity has been a subject of debate over the past two decades, particularly after the naming of *Australopithecus bahrelghazali* and *Kenyanthropus platyops* in addition to the well-known species *Australopithecus afarensis*. Further analyses continue to support the proposal that several hominin species co-existed during this time period. Here we recognize a new hominin species (*Australopithecus deyiremeda* sp. nov.) from 3.3–3.5-million-year-old deposits in the Woranso–Mille study area, central Afar, Ethiopia. The new species from Woranso–Mille shows that there were at least two contemporaneous hominin species living in the Afar region of Ethiopia between 3.3 and 3.5 million years ago, and further confirms early hominin taxonomic diversity in eastern Africa during the Middle Pliocene epoch. The morphology of *Au. deyiremeda* also reinforces concerns related to dentognathic (that is, jaws and teeth) homoplasy in Plio–Pleistocene hominins, and shows that some dentognathic features traditionally associated with *Paranthropus* and *Homo* appeared in the fossil record earlier than previously thought.

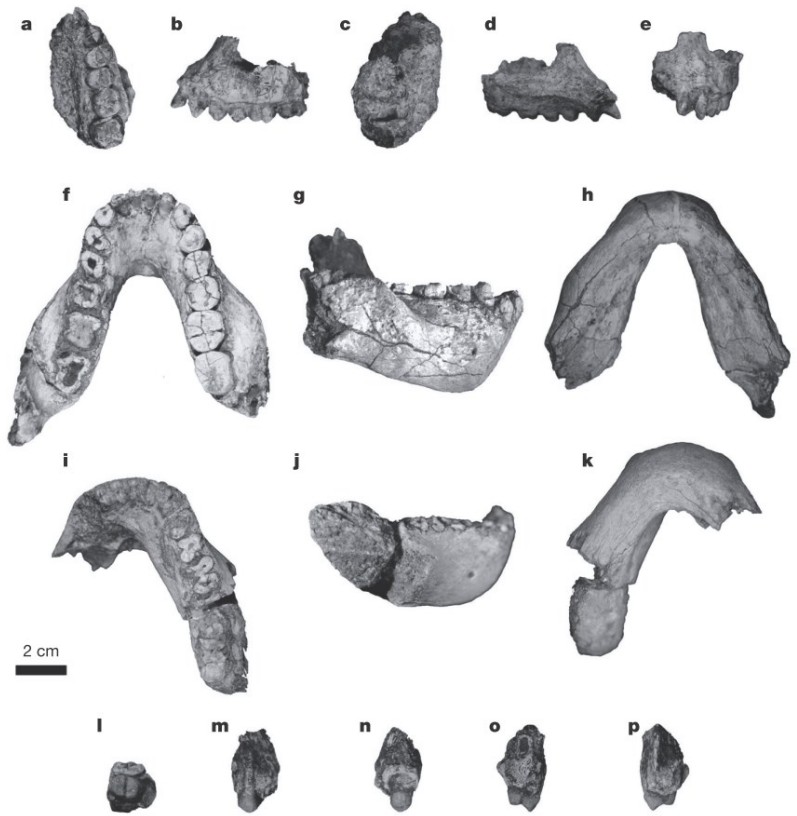
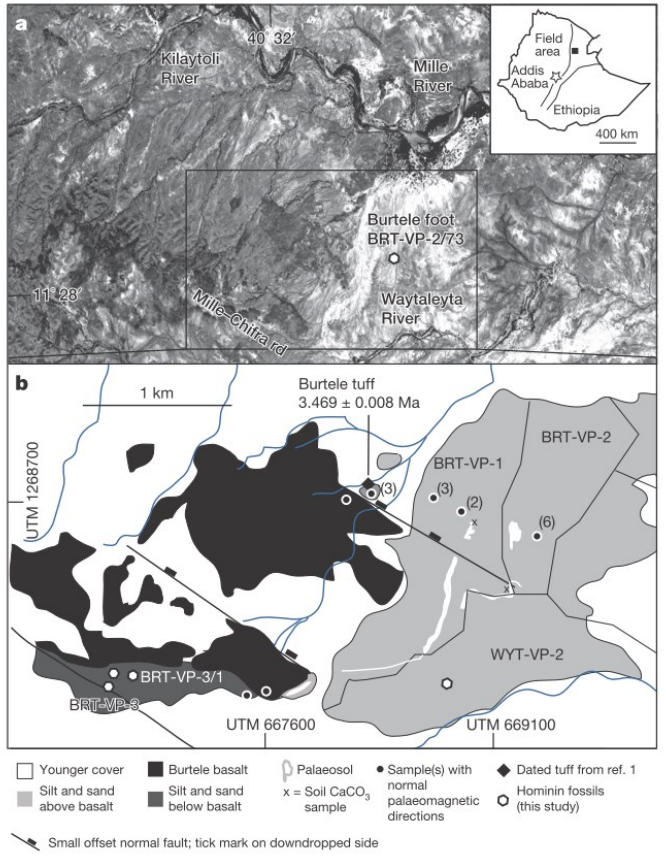


Figure 1 | Holotype BRT-VP-3/1. **a**, Occlusal view. **b**, Lateral view. **c**, Superior view. **d**, Medial view. **e**, Anterior view. Paratype BRT-VP-3/14. **f**, Occlusal view. **g**, Right lateral view. **h**, Basal view. Paratype WYT-VP-2/10. **i**, Occlusal view. **j**, Right lateral view. **k**, Basal view. Referred specimen BRT-VP-3/37. **l**, Occlusal view. **m**, Buccal view. **n**, Lingual view. **o**, Distal view. **p**, Mesial view.



Differential diagnosis: *A. deyiremeda* is
≠ *Ar. ramidus* for: thicker enamel, P4 with 3 roots and a robust jaw
≠ *A. anamensis* for the mandibular symphysis profil slighly receeding, a more robust mandibular corpus, bicuspid P3
≠ *A. afarensis* for the general architecture of the jaw, smaller postcanina teeth
≠ *A garhi* for the reduced subnasal prograthism and the riduced canine and post-canine dimension

Australopithecus sediba

Australopithecus sediba: A New Species of *Homo*-Like Australopith from South Africa

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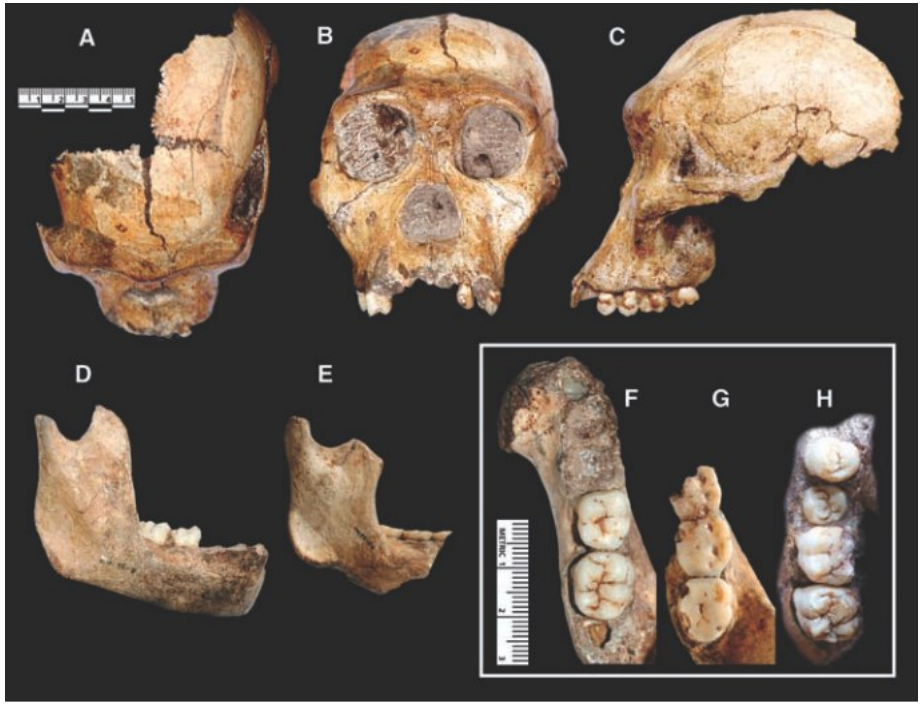
Despite a rich African Plio-Pleistocene hominin fossil record, the ancestry of *Homo* and its relation to earlier australopithecines remain unresolved. Here we report on two partial skeletons with an age of 1.95 to 1.78 million years. The fossils were encased in cave deposits at the Malapa site in South Africa. The skeletons were found close together and are directly associated with craniodental remains. Together they represent a new species of *Australopithecus* that is probably descended from *Australopithecus africanus*. Combined craniodental and postcranial evidence demonstrates that this new species shares more derived features with early *Homo* than any other australopith species and thus might help reveal the ancestor of that genus.

Age: 1,95 e 1,78 Ma

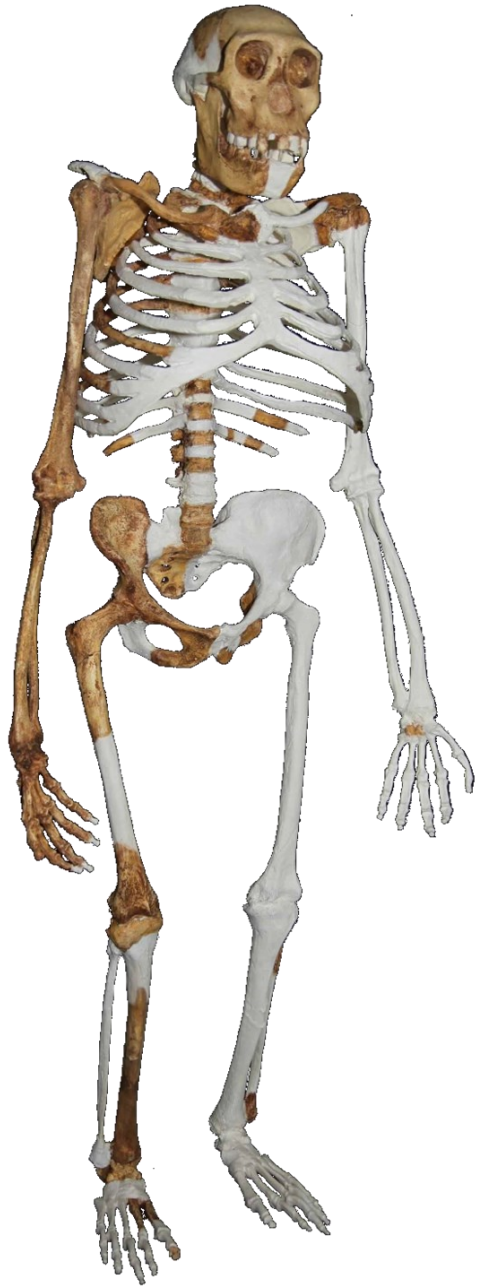
Site: Malapa, Southafrica

Fossils: 2 partial scheletton

Features: share more derivated features with early *Homo* than with Australopiths.



Craniodental elements *of Au. sediba*. UW88-50 (MH1) juvenile cranium in (A) superior, (B) frontal, and (C) left lateral views.
(D) UW88-8 (MH1) juvenile mandible in right lateral view, (E) UW88-54 (MH2) adult mandible in right lateral view, (F) UW88-8 mandible in occlusal view,
(G) UW 88-54 mandible in occlusal view, and
(H) UW 88-50 right maxilla in occlusal view (scale bars are in centimeters).



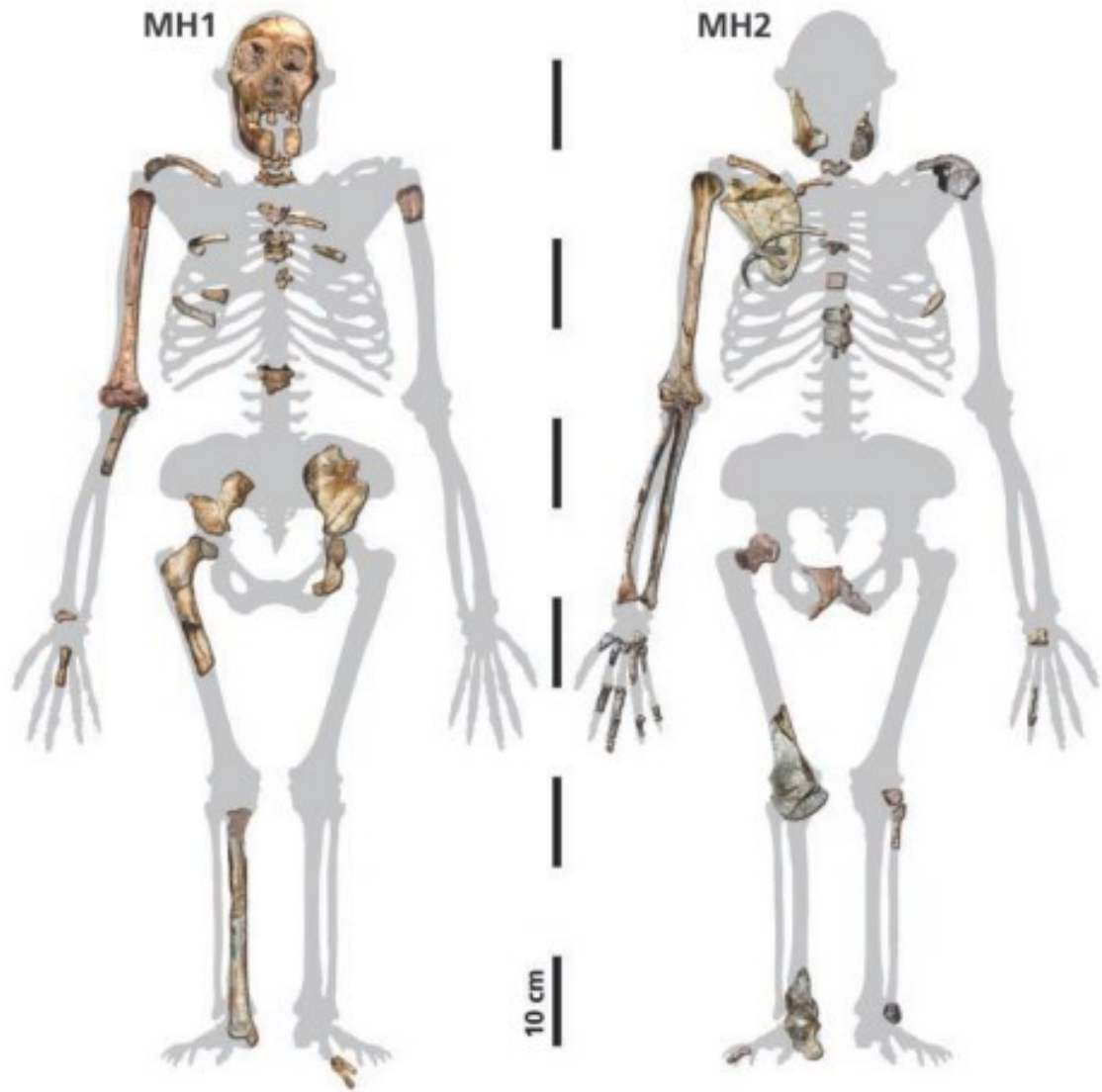


Fig. 2. Associated skeletal elements of MH1 (**left**) and MH2 (**right**), in approximate anatomical position, superimposed over an illustration of an idealized *Au. africanus* skeleton (with some adjustment for differences in body proportions). The proximal right tibia of MH1 has been reconstructed from a natural cast of the proximal metaphysis.

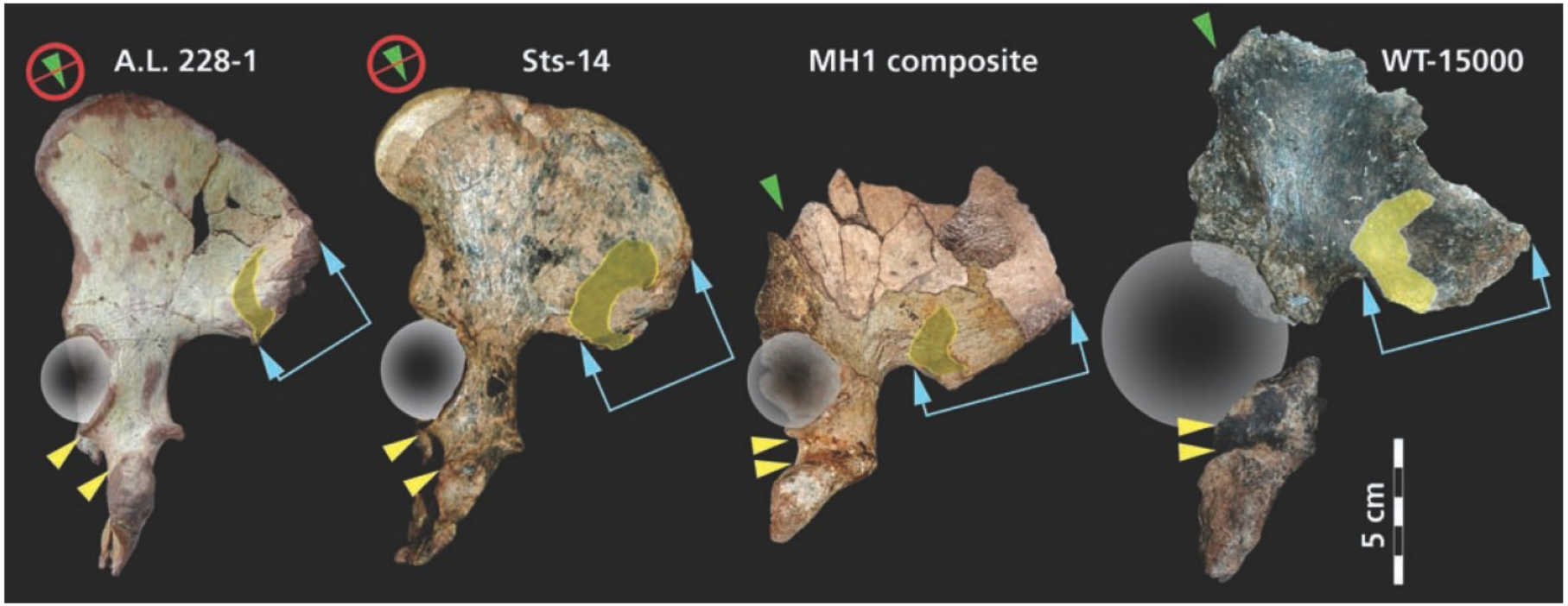


Fig. 4. Representative ossa coxae, in lateral view, from left to right, of *Au. afarensis* (AL 288-1), *Au. africanus* (Sts 14), *Au. sediba* (MH1), and *H. erectus* (KNM-WT 15000). The specimens are oriented so that the iliac blades all lie in the plane of the photograph (which thus leads to differences between specimens in the orientation of the acetabula and ischial tuberosities). MH1 possesses derived, *Homo*-like morphology compared to other australopithecines, including a relative reduction in the weight transfer distance from the sacroiliac (yellow) to hip (circle) joints; expansion of the retroauricular surface of the ilium (blue arrows) (determined by striking a line from the center of the sphere representing the femoral head to the most distant point on the posterior ilium; the superior arrow marks the terminus of this line, and the inferior arrow marks the intersection of this line with the most anterior point on the auricular face); narrowing of the tuberoacetabular sulcus (delimited by yellow arrows); and pronouncement of the acetabulocristal (green arrows) and acetabulosacral buttresses.