



# Modern Human Origins

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## Lecture 1: Anatomical and Behavioral Modernity

Yonatan Sahle  
Hugo Reyes-Centeno  
Christian Bentz

WS 2018/2019, 22 October 2018



# Organization

## Lecture

Mondays, 12-14:00 c.t.

Institut für Naturwissenschaftliche Archäologie, Rümelinstraße 23, Room 703

## Instructors

Christian Bentz (linguistics)

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## Course website

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mix of multiple-choice, short-answer, and essay (90 minutes)

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# Course website

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|-----------|--------------------|--|---------|-------------------------|
| 2017/2018 | Lecturer           | <a href="#">Modern Human Origins</a>                     | Lecture | University of Tübingen  |
| 2017      | Lecturer           | <a href="#">Typology: Analyzing Linguistic Diversity</a> | Seminar | University of Tübingen  |
| 2016/2017 | Lecturer           | <a href="#">Typology II: Languages of the World</a>      | Seminar | University of Tübingen  |
| 2015/2016 | Lecturer           | <a href="#">Typology I: Languages of the World</a>       | Lecture | University of Tübingen  |
| 2014/2015 | Teaching assistant | Foundations in Statistics in R                           | Course  | University of Cambridge |
| 2014/2015 | Teaching assistant | Basic Quantitative Analyses in R                         | Course  | University of Cambridge |
| 2013/2014 | Teaching assistant | Bivariate Association in R                               | Course  | University of Cambridge |
| 2013/2014 | Teaching assistant | Linear Regression Part A in R                            | Course  | University of Cambridge |
| 2013/2014 | Teaching assistant | Linear Regression Part B in R                            | Course  | University of Cambridge |
| 2013/2014 | Tutor              | History of English (Part II)                             | Lecture | University of Cambridge |
| 2013/2014 | Tutor              | History of English (Part I)                              | Lecture | University of Cambridge |
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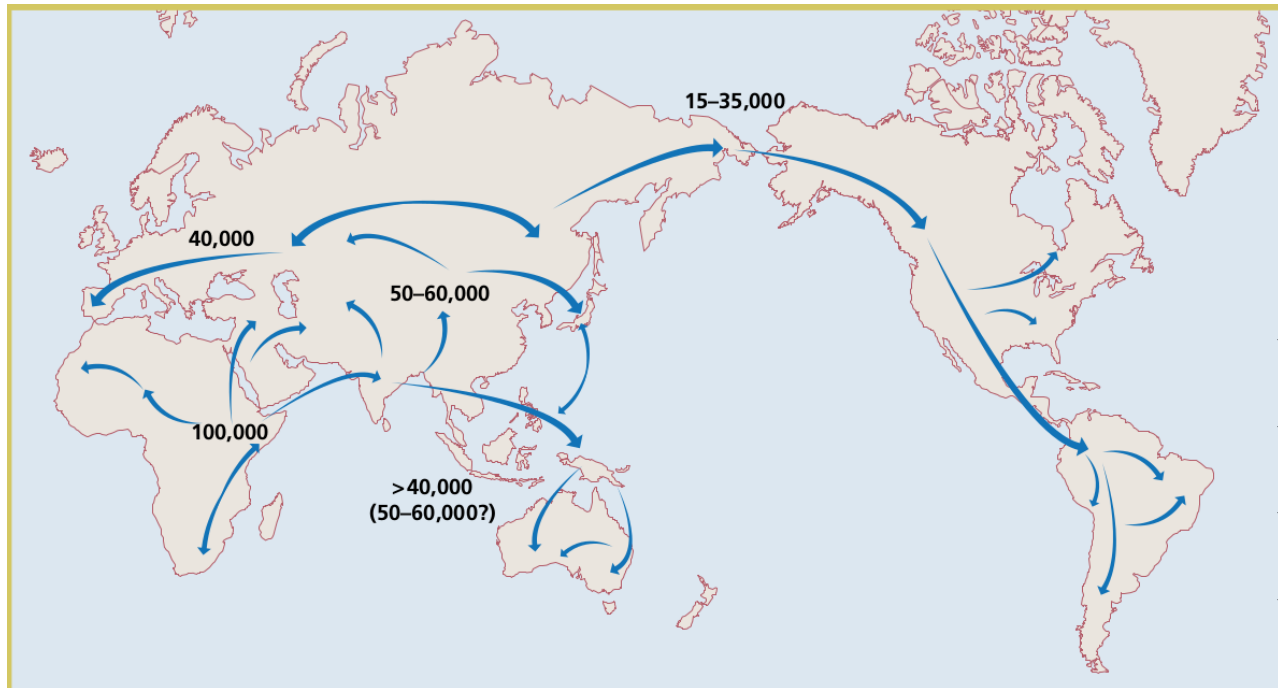
# Modern Human Origins and Dispersal ca. 50 000 and 200 000 years ago





[https://www.youtube.com/watch?v=PUwmA3Q0\\_OE](https://www.youtube.com/watch?v=PUwmA3Q0_OE)

## Consensus/conundrum



- ✓ Dispersal routes?
- ✓ Role of culture/behavior
- ✓ How many dispersals
- ✓ Euro-centric model?



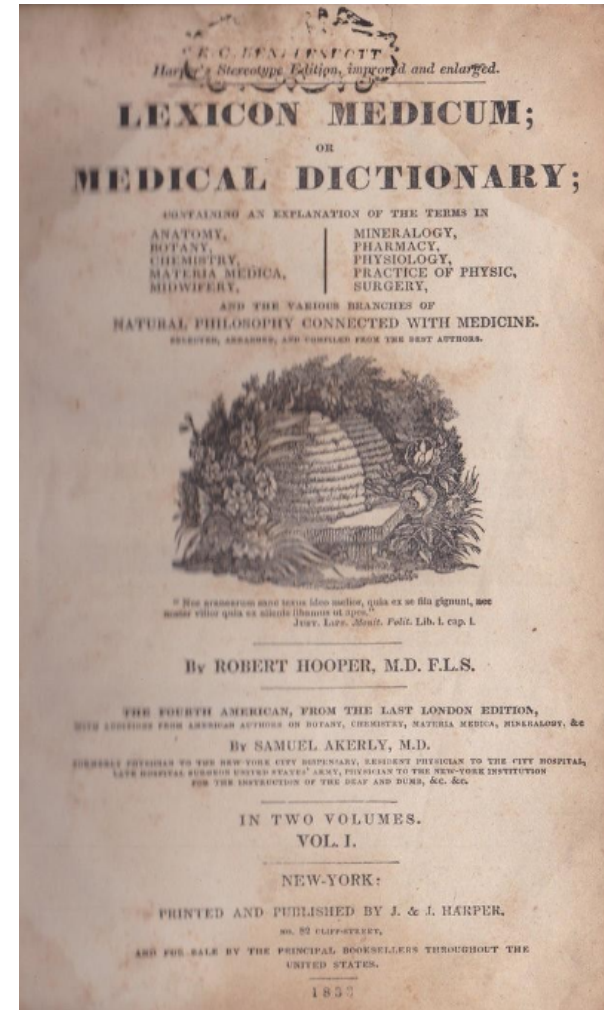
# Anthropogeny

The study of human origins



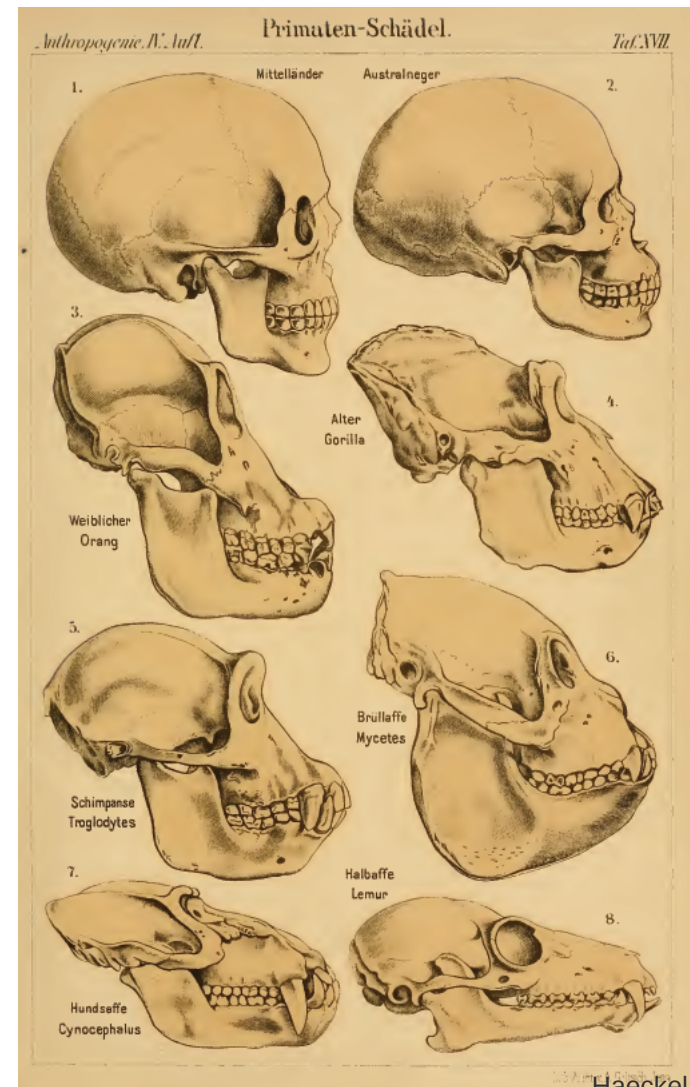
# Anthropogeny

- ❑ **Anthropos** (ανθρωπος)  
human/people
- ❑ **Génis** (γένις)  
birth, origin (genesis)



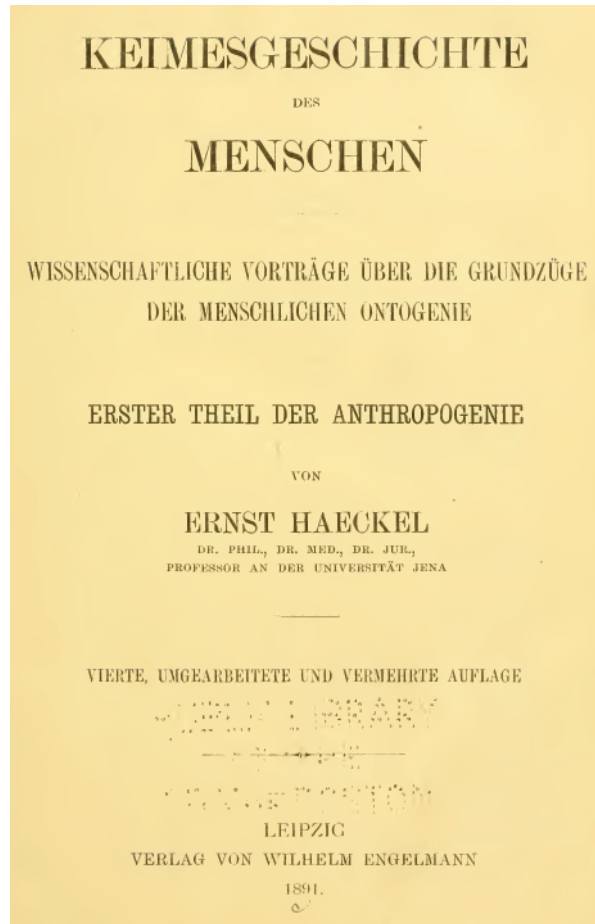
Hooper 1839

# Anthropogeny



Haeckel 1891

# Anthropogeny



Haeckel 1891





# Anthropogeny

❑ **Anthropos** (άνθρωπος)  
human/people

❑ **Génis** (γένης)  
birth, origin (genesis)

## SCIENCE

VOL. 77

FRIDAY, JANUARY 13, 1933

No. 1985

*The New Anthropogeny—Twenty-five Stages of Vertebrate Evolution, from Silurian Chordate to Man:* DR. WILLIAM K. GREGORY ..... 29

*Obituary:*  
*John Joseph Carty—an Appreciation:* DR. F. B. JEWETT ..... 41

*Scientific Events:*  
*The Natural History of Mount Everest; Forestry Program for the Southeastern States; The Wisconsin Alumni Research Foundation; The Pacific Division of the American Association for the Advancement of Science* ..... 43

*Scientific Notes and News* ..... 45

*Discussion:*  
*A Forgotten Evolutionist:* DR. S. J. HOLMES. *A Vicious Circle in Cytology:* PROFESSOR E. C. JEFFERY. *Twisted Trees and the Spiral Habit:* PROFESSOR WILLIAM SEIBER. *The Extinct Lake San Augustin, New Mexico:* PROFESSOR WILLIAM E. POWERS ..... 48

*Scientific Books:*  
*Faraday's Diary:* PROFESSOR W. P. MAGIE ..... 52

*Societies and Meetings:*  
*The Texas Academy of Science:* H. B. PARKS. *The Oklahoma Academy of Science:* HORACE J. HARPER ..... 54

*Scientific Apparatus and Laboratory Methods:*  
*An Apparatus for Determining the Absorption of Carbon Dioxide by Leaves under Natural Conditions:* PROFESSOR A. J. HEINCKE and M. B. HOFFMAN ..... 55

*Special Articles:*  
*The Function of the Adrenal Cortical Hormone and the Cause of Death from Adrenal Insufficiency:* PROFESSOR W. W. SWINGLE, J. J. PEIFFER, H. M. VARS, P. A. BOTT and W. M. PARRINS ..... 58

*Science News* ..... 8

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## THE NEW ANTHROPOGENY: TWENTY-FIVE STAGES OF VERTEBRATE EVOLUTION, FROM SILURIAN CHORDATE TO MAN<sup>1</sup>

By Professor WILLIAM K. GREGORY

COLUMBIA UNIVERSITY AND AMERICAN MUSEUM OF NATURAL HISTORY

THE subject of anthropogeny, as it was developed at the hands of Ernst Haeckel, involved an attempt to read the earlier stages of prehuman evolution largely from the data supplied by human and comparative embryology. Thus its main postulate was the so-called "law of recapitulation." But the attacks of modern zoologists on this "law" seem to have led, in this country at least, to a loss of confidence in Haeckel's chief conclusions. In certain quarters there has sprung up a regular epidemic, which may be named *Haeckelophobia*.

Meanwhile the new anthropogeny has been gradually taking shape. But before speaking of its origins and tentative results to date, it might be well to note that a humble exponent of the new doctrine is liable to experience a slightly guilty feeling if he finds himself obliged to speak in any official gathering of his scientific brethren. For example, the brethren of the orthodox anthropologist set are always piously busy, wielding their magic measuring wands and ringing the bells on their magic calculators, or thinking machines, while the poor anthropogenist stands idly by and must confess that he is not primarily bent on measuring or counting anything, but only in piecing together the broken story of the "big parade" that nature has staged across the ages.

Another contrast between the anthropogenist and

Gregory 1985

# Anthropogeny

- ❑ Anthropos (ανθρωπος)  
human/people
- ❑ Génis (γένης)  
birth, origin (genesis)
- ❑ Center for Academic Research & Training in Anthropogeny (CARTA),  
University of California – San Diego

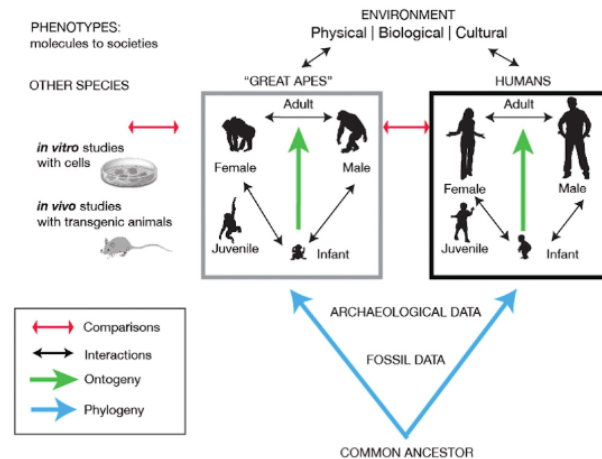
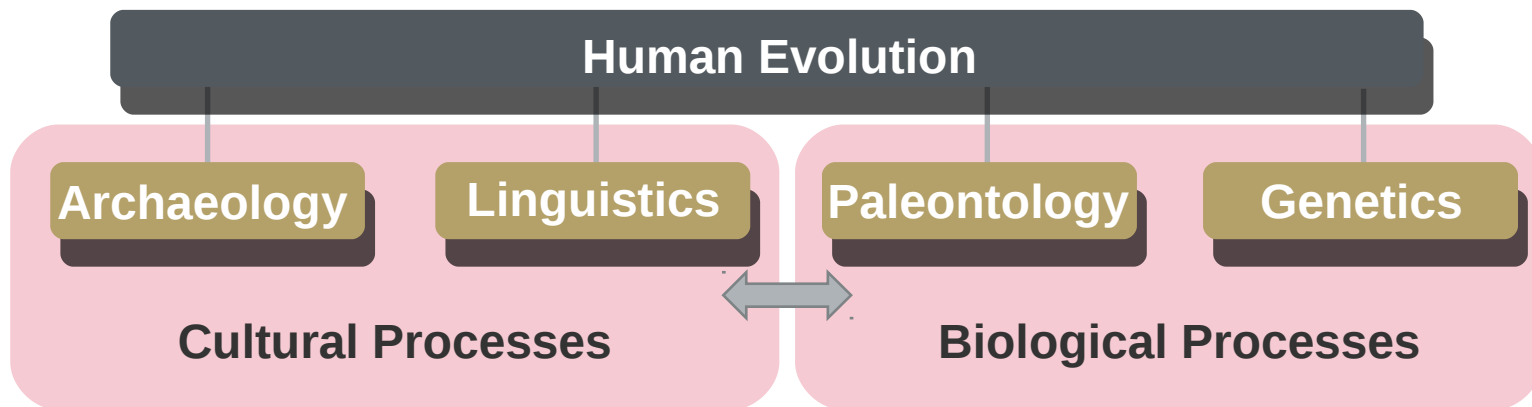


FIGURE 9.1 A systematic approach to Anthropogeny. Updated by P. Gagneux, from Varki, A., Nelson, D., 2007. Genomic differences between humans and chimpanzees. *Annual Review of Anthropology* 36, 191–209.

Varki & Gagneux 2017

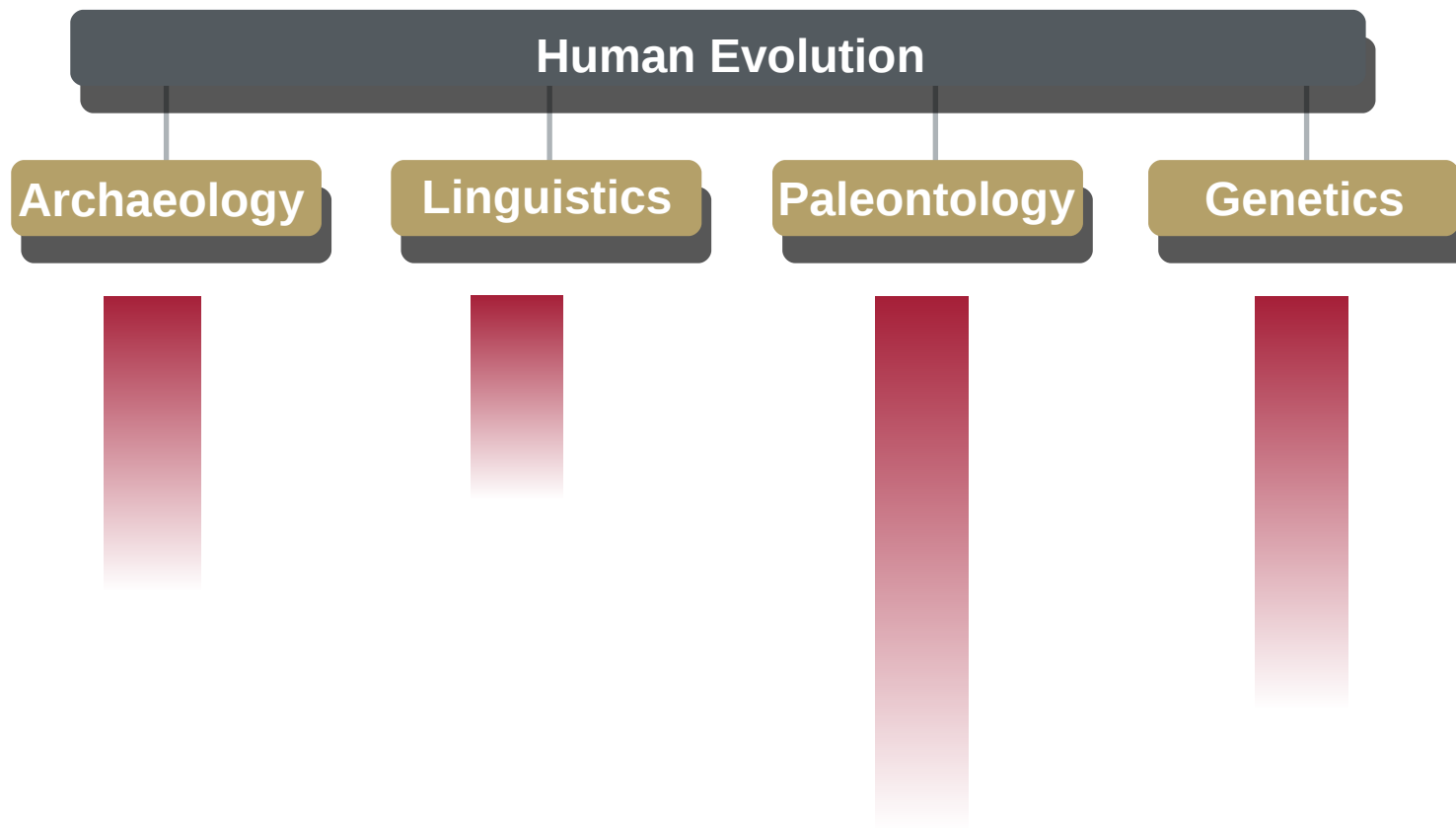


## Co-evolution in anthropogeny





## Co-evolution in anthropogeny





# Defining modernity

What does it mean to be a modern human?



## Defining modernity

- ❑ **Dictionary definition** (Oxford)  
*adj.* Present-day, contemporary, present-time, current, twenty-first-century, latter-day, recent, latest
- ❑ **Historical framework**  
Renaissance 17th century and post-modern time after WWII?
- ❑ **Defining modernity**  
Anatomical, genomic, archaeological, and linguistic frameworks
- ❑ **Models of anthropogeny**  
What model of modern human origins is best supported with the current evidence?

## Defining modernity

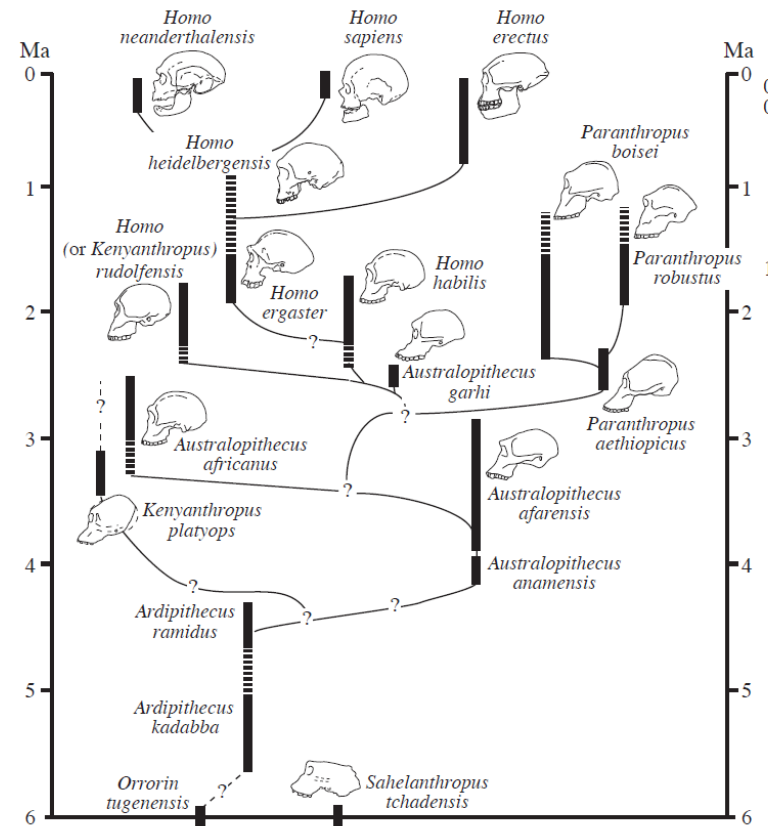


© 2007 Photographer P.Plailly / E.Daynes/ Eurelios – Reconstruction : Elisabeth Daynès Paris



# Anatomical modernity

## □ Hominid phylogeny

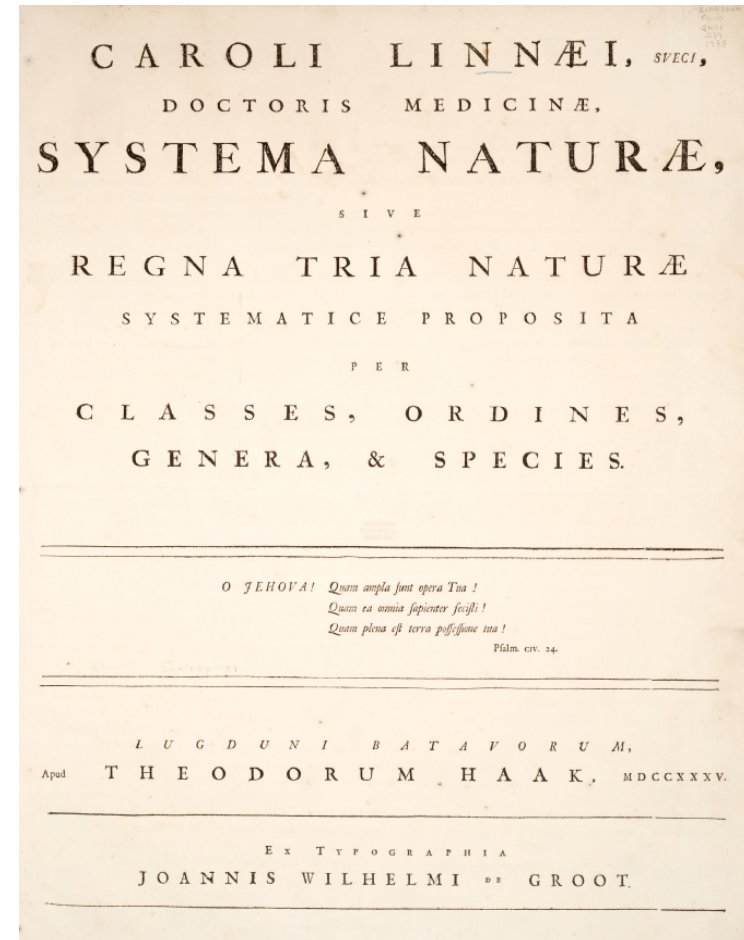


Klein 2009



# Anatomical modernity

## □ Hominid phylogeny



R E G N U M      A N I M A L E.

VI. VERMES.

Corporis *Megasthi* ab una parte basi euidam solide affixi.

[illegible]



# Anatomical modernity

## articles

### New hominin genus from eastern Africa shows diverse middle Pliocene lineages

Mave G. Leakey\*, Fred Spoor†, Frank H. Brown‡, Patrick N. Gathogo§, Christopher Kiarle\*, Louise N. Leakey\* & Ian McDougall¶

\* Division of Palaeontology, National Museums of Kenya, P.O. Box 49658, Nairobi, Kenya  
† Department of Anatomy & Developmental Biology, University College London, WC1E 6BT, UK  
‡ Department of Geology & Geophysics, University of Utah, Salt Lake City, Utah 84112, USA  
§ Research School of Earth Sciences, The Australian National University, Canberra ACT 0200, Australia

Most interpretations of early hominin phylogeny recognize a single early to middle Pliocene ancestral lineage, best represented by *Australopithecus afarensis*, which gave rise to a radiation of taxa in the late Pliocene. Here we report on new fossils discovered west of Lake Turkana, Kenya, which differ markedly from those of contemporary *A. afarensis*, indicating that hominin taxonomic diversity extended back, well into the middle Pliocene. A 3.5 Myr-old cranium, showing a unique combination of derived facial and primitive neurocranial features, is assigned to a new genus of hominin. These findings point to an early diet-driven adaptive radiation, provide new insight on the association of hominin craniodental features, and have implications for our understanding of Plio-Pleistocene hominin phylogeny.

The eastern African hominin record between 4 and 3 Myr is represented exclusively by a single species, *A. afarensis*, and its possible ancestor, *Australopithecus anamensis*, which are commonly thought to belong to the lineage ancestral to all later hominins<sup>1,2</sup>. This apparent lack of diversity in the middle Pliocene contrasts markedly with the increasingly bushy phylogeny evident in the later hominin fossil record. To study further the time interval between 4 and 3 Myr, fieldwork in 1998 and 1999 focused on sites of this age at Lomekwi in the Nachukui Formation, west of Lake Turkana. New hominin discoveries from Lomekwi, as well as two mandibles and isolated molars recovered previously<sup>3</sup> (Table 1), indicate that multiple species existed between 3.5 and 3.0 Myr. The new finds include a well-preserved temporal bone, two partial maxillae, isolated teeth, and most importantly a largely complete, although distorted, cranium. We assign the latter specimen to a new hominin genus on the basis of its unique combination of primitive and derived features.

#### Description of *Kenyanthropus platyops*

Order Primates LINNAEUS 1758  
Suborder Anthropoidea MIVART 1864  
Superfamily Hominoidea GRAY 1825  
*Kenyanthropus* gen. nov.

**Etymology.** In recognition of Kenya's contribution to the understanding of human evolution through the many specimens recovered from its fossil sites.

**Generic diagnosis.** A hominin genus characterized by the following morphology: transverse facial contour flat at a level just below the nasal bones; tall malar region; zygomaticoalveolar crest low and curved; anterior surface of the maxillary zygomatic process positioned over premolars and more vertically orientated than the nasal aperture and nasolabial clivus; nasolabial clivus long and both transversely and sagittally flat, without marked jugo-moderate subnasal prognathism; incisive alveoli parallel with, and only just anterior to, the bicanine line; nasal cavity entrance stepped; palate roof thin and flexed inferiorly anterior to the incisive foramen; upper incisor (I<sup>1</sup> and I<sup>2</sup>) roots near equal in size; upper premolars (P<sup>4</sup>, P<sup>3</sup>) mostly three-notched; upper first and second molars (M<sup>1</sup> and M<sup>2</sup>) small with thick enamel; tympanic element mediolaterally long and lacking a petrous crest; external acoustic foramen small. *Kenyanthropus* can be distinguished from *Antipithecus ramidus* by its buccolingually narrow M<sup>1</sup>, thick molar enamel, and a temporal

bone with a more cylindrical articular eminence and deeper mandibular fossa. It differs from *A. anamensis*, *A. afarensis*, *A. africanus* and *A. garhi* in the derived morphology of the lower face, particularly the moderate subnasal prognathism, sagittally and transversely flat nasolabial clivus, anteriorly positioned maxillary zygomatic process, similarly sized I<sup>1</sup> and I<sup>2</sup> roots, and small M<sup>1</sup> and M<sup>2</sup> crowns. From *A. afarensis* it also differs by a transversely flat midface, a small, external acoustic foramen, and the absence of an occipital/marginal venous sinus system, and from *A. africanus* by a tall malar region, a low and curved zygomaticoalveolar crest, a narrow nasal aperture, the absence of anterior facial pillars, a tubular, long and crestless tympanic element, and a small, external acoustic foramen. *Kenyanthropus* lacks the suite of derived dental and cranial features found in *Paranthropus aethiopicus*, *P. boisei* and *P. robustus* (Table 2), and the derived cranial features of species indisputably assigned to *Homo* (For example, *H. erectus* s.l. and *H. sapiens*, but not *H. rudolfensis* and *H. habilis*).<sup>4</sup>

**Type species** *Kenyanthropus platyops* sp. nov.

**Etymology.** From the Greek *platys*, meaning flat, and *opsis*, meaning face thus referring to the characteristically flat face of this species.

**Specific diagnosis.** Same as for genus.

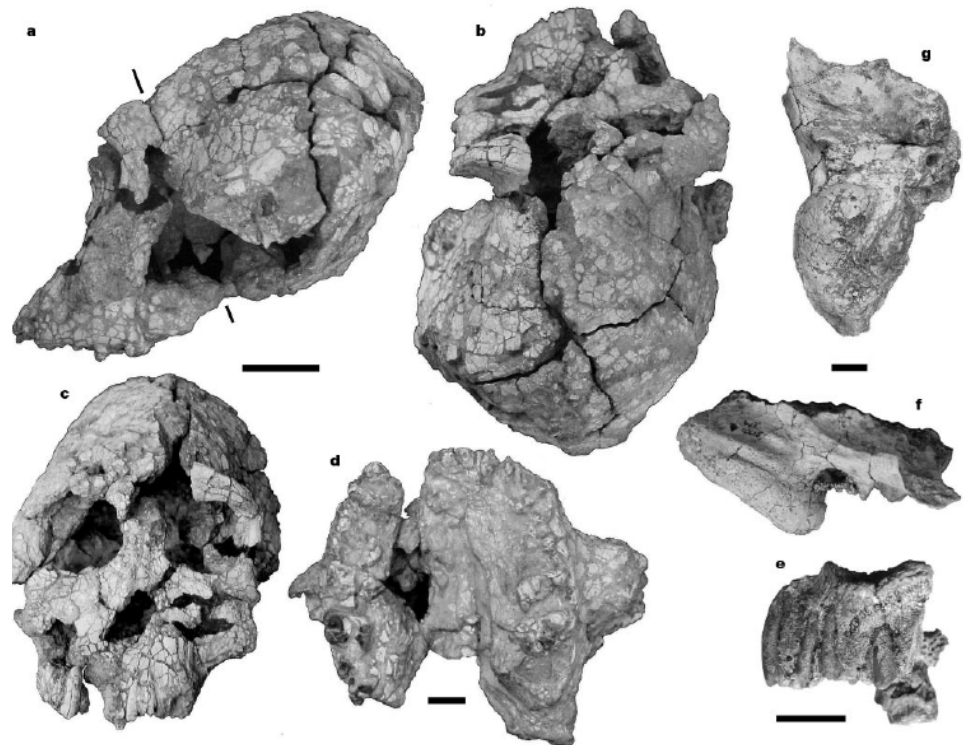
**Types.** The holotype is KNM-WT 40000 (Fig. 1a–d), a largely complete cranium found by J. Erus in August 1999. The paratype is KNM-WT 38350 (Fig. 1e), a partial left maxilla found by B. Onyango in August 1998. The repository is the National Museums of Kenya, Nairobi.

**Localities.** Lomekwi localities are situated in the Lomekwi and Topernawi river drainages in Turkana district, northern Kenya (Fig. 2). The type locality LO-6N is at 03° 54.03' north latitude, 035° 44.40' east longitude.

**Horizon.** The type specimen is from the Kataboi Member, 8 m below the Tulu Bor Tuff and 12 m above the Lokochot Tuff, giving an estimated age of 3.5 Myr. The paratype is from the lower Lomekwi Member, 17 m above the Tulu Bor Tuff, with an estimated age of 3.3 Myr.

#### Cranial description and comparisons

The overall size of the KNM-WT 40000 cranium falls within the range of *A. afarensis* and *A. africanus*. It is preserved in two main parts, the neurocranium with the superior and lateral orbital margins, but lacking most of the cranial base; and the face, lacking



**Fig. 1** Holotype KNM-WT 40000 **a**, left lateral view (markers indicate the plane separating the distorted neurocranium and the well-preserved face). **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. Scale bars: **a–c**, 3 cm; **d–g**, 1 cm.



# Classification and taxonomy

On the basis of its unique combination of primitive and derived features.

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▪ Superfamily Hominoidea GRAY 1825

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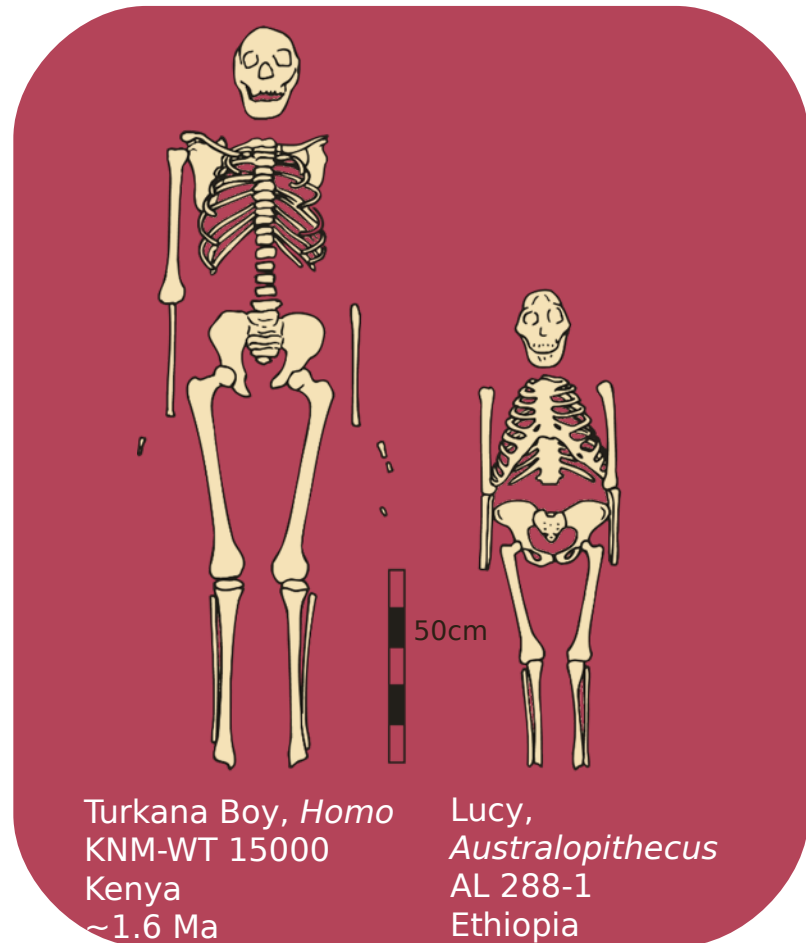
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Leakey et al. 2001

## Anatomical modernity

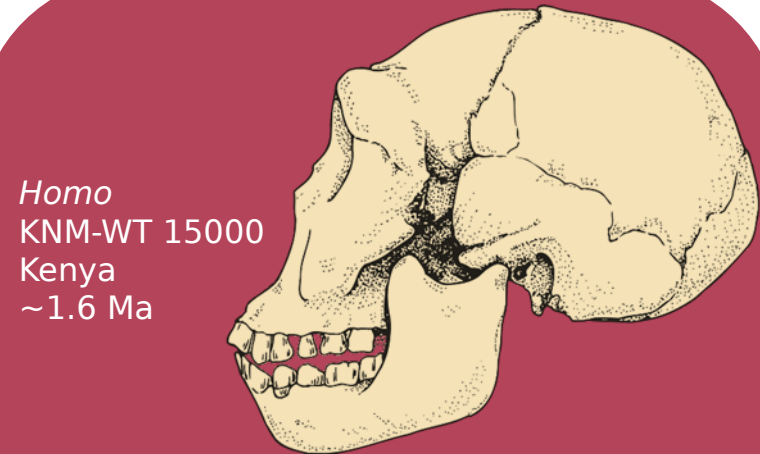
- Hominid phylogeny
- Emergence of *Homo*



Klein 2009

## Anatomical modernity

- Hominid phylogeny
- Emergence of *Homo*

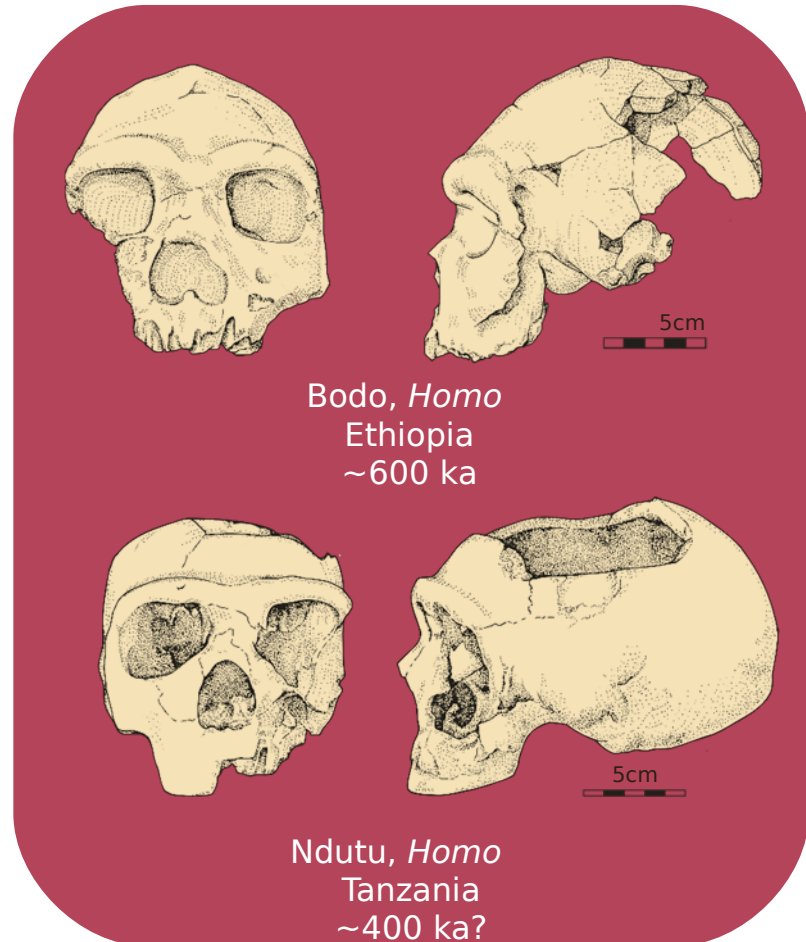


Klein 2009



## Anatomical modernity

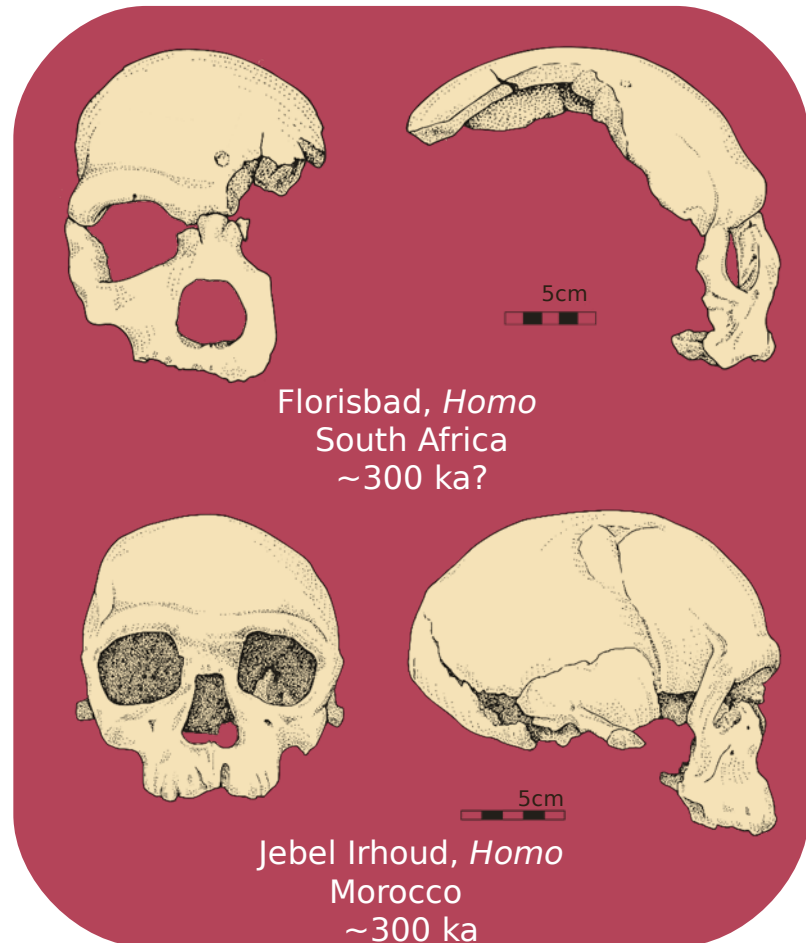
- Hominid phylogeny
- Emergence of *Homo*
- Emergence of modern face?



Klein 2009

## Anatomical modernity

- Hominid phylogeny
- Emergence of *Homo*
- Emergence of modern face?

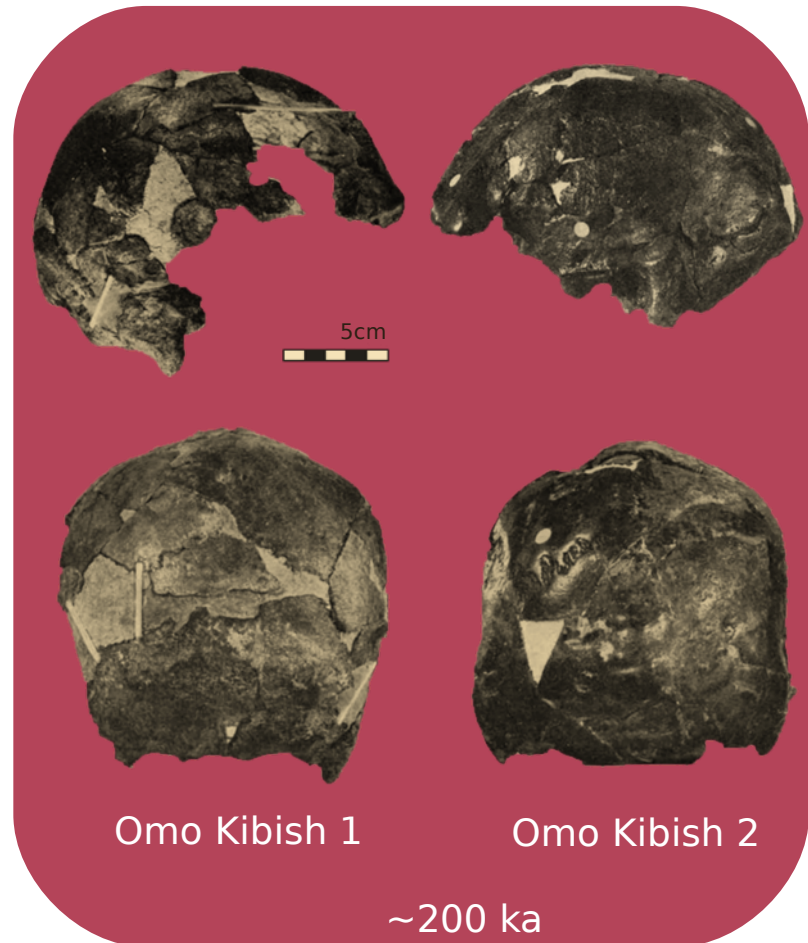


Klein 2009



## Anatomical modernity

- Hominid phylogeny
- Emergence of *Homo*
- Emergence of modern face?
- Emergence of modern neurocranium



Day 1969

## Anatomical modernity



Hublin et al. 2013



# Anatomical modernity



## Methods

Order Primates L., 1758  
Suborder Anthroidea Mivart, 1864  
Superfamily Hominoidea Gray, 1825  
Family Hominidae Gray, 1825  
*Homo sapiens idaltu* subsp. nov.

**Etymology.** The subspecies name 'idaltu' is taken from the Afar language. It means 'elder'.

**Holotype.** BOU-VP-16/1 (Fig. 1), an adult cranium with partial dentition. Holotype and referred material are housed at the National Museum of Ethiopia, Addis Ababa. Holotype from Bouri Vertebrate Paleontology Locality 16 (BOU-VP 16); differentially corrected GPS coordinates: 10° 15.5484' N and 40° 33.3834' E.

**Referred material.** BOU-VP-16/2 cranial fragments; BOU-VP-16/3 parietal fragment; BOU-VP-16/4 parietal fragment; BOU-VP-16/5 child's cranium; BOU-VP-16/6 R. upper molar; BOU-VP-16/7 parietal fragment, BOU-VP-16/18 parietal fragments; BOU-VP-16/42 upper premolar, BOU-VP-16/43 parietal fragment.

**Stratigraphy and age.** Bouri Formation, Upper Herto Member. Dated by  $^{40}\text{Ar}/^{39}\text{Ar}$  to between 160,000 and 154,000 years ago (ref. 6).

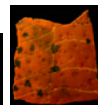
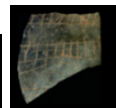
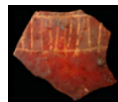
**Diagnosis.** On the limited available evidence, a subspecies of *Homo sapiens* distinguished from Holocene anatomically modern humans (*Homo sapiens sapiens*) by greater craniofacial robusticity, greater anterior-posterior cranial length, and large glenoid-to-occlusal plane distance. *Homo sapiens idaltu* is distinguished from the holotype of *Homo rhodesiensis* (Woodward, 1921) by a larger cranial capacity, a more vertical frontal with smaller face, and more marked midfacial topography (for example, canine fossa). We consider the holotypes of *H. helmei* and *H. njarasensis* too fragmentary for appropriate comparisons.

Received 21 November 2002; accepted 14 April 2003; doi:10.1038/nature01669.

White et al. 2003

## At the dawn of our species

- The archaeology of *H. sapiens*
- What separates our species from predecessors?
- Is “modern” as “modern” looks OR does?
- Evolution OR revolution?

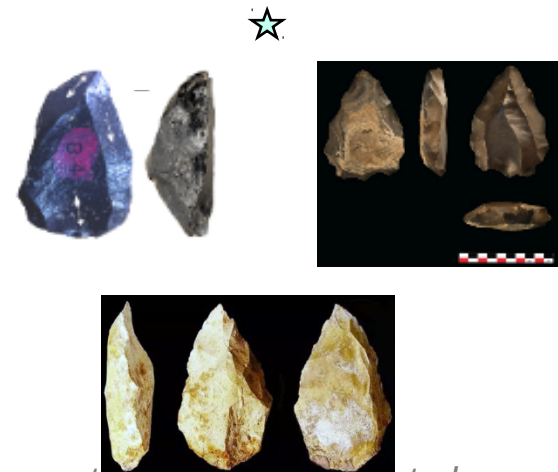
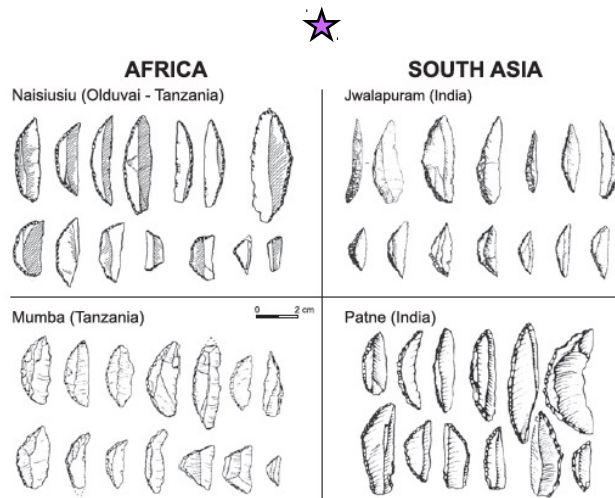


Wadley et al. (2013); Klein 2008; McBrearty & Brooks 2000



# Tracking the “Out-of-Africa”

Does similar tool forms = migration?



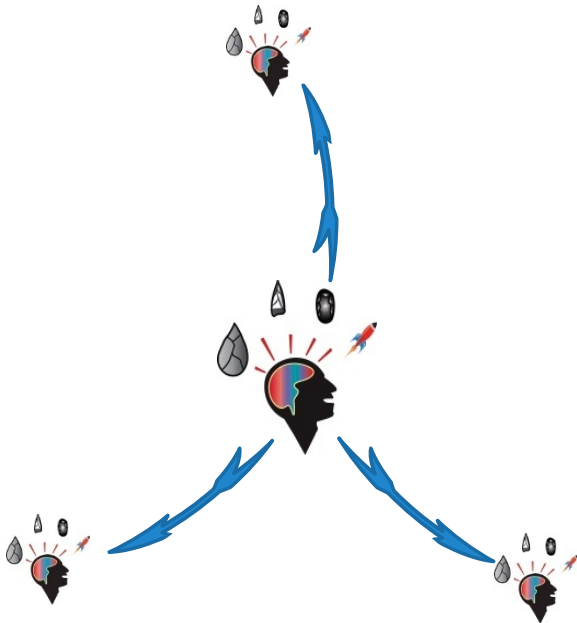
*Mellars (2006); Armitage et al. (2011), Rose et al. 2011*





## Paleolithic innovations

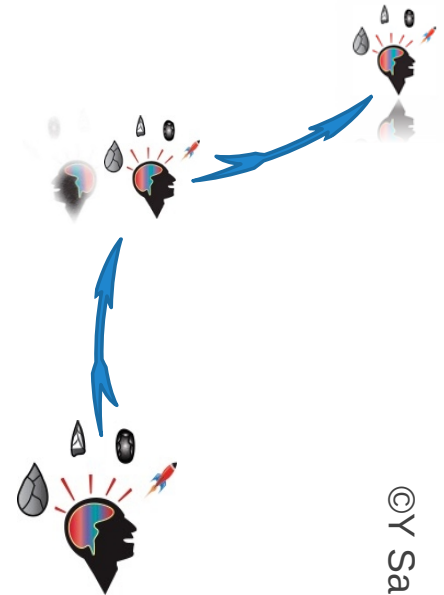
### Diffusion



### Convergence

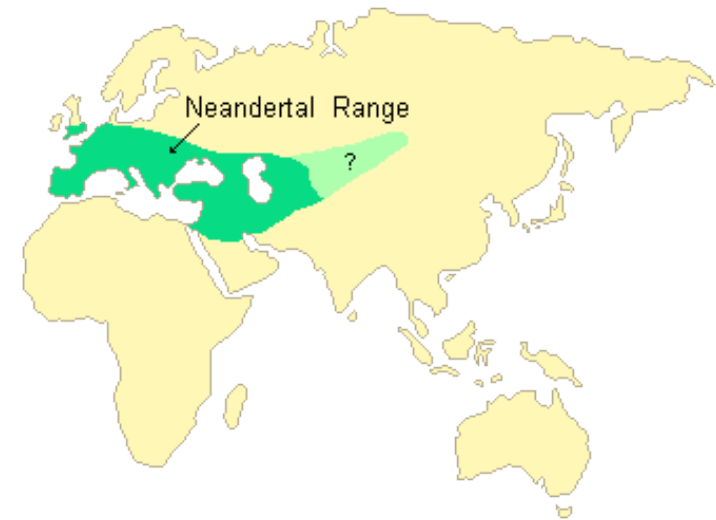


### Idiosyncrasy



## Advent in Europe

- ☐ Meeting, replacement
- ☐ Us and them



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*Conard (2010); Zilhão et al. (2010)*

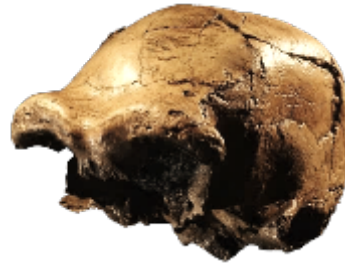
## What is Human “Modernity”? -The Linguistic View



simplest speculation about the evolution of language. Within some small group from which we are all descended, a rewiring of the brain took place in some individual, call him *Prometheus*, yielding the operation of unbounded Merge, applying to concepts with intricate (and little understood) properties.

Chomsky (2005). Some simple evo devo theses: how true might they be for language?

## Who is Prometheus?



*Homo erectus*  
(*ergaster*)



*Homo heidelbergensis*  
(*Homo rhodesiensis*)



*Homo sapiens (idaltu)*

First, why are there any languages at all? Second, why are there so many languages? According to what seems to be a fairly general scientific consensus, the questions are very recent ones in evolutionary time. Roughly 100,000+ years ago, the first question did not arise, because there were no languages. By about 50,000 years ago, the answers to both questions had been settled. By then our ancestors began to leave Africa, soon spreading over the entire world.

Chomsky (2005). Some simple evo devo theses: how true might they be for language?



# What is Language?

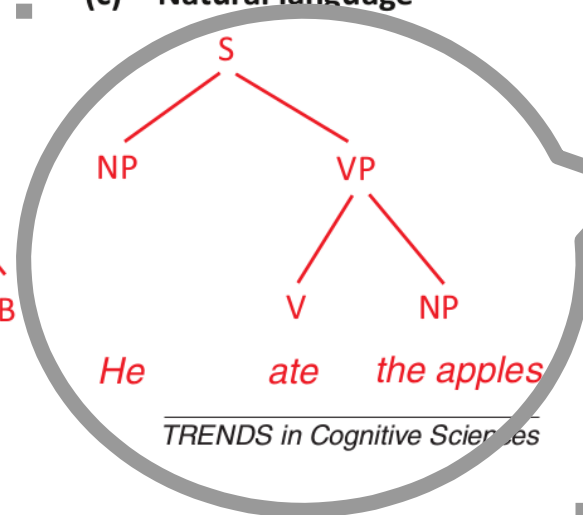
(a)  $(AB)^n$  Sequence



(b)  $A^nB^n$  Sequence



(c) Natural language



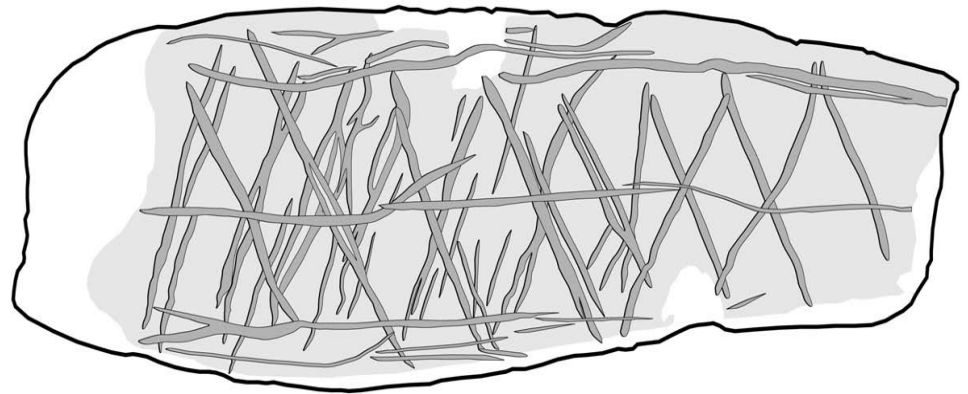
[...] the unified nature of human language arises from a shared, species-specific computational ability. This ability has identifiable correlates in the brain and has remained fixed since the origin of language approximately 100 thousand years ago.

Berwick et al. (2013). Evolution, brain, and the nature of language.



## Does language fossilize?

These finds demonstrate that ochre use in the MSA was not exclusively utilitarian and, arguably, the transmission and sharing of the meaning of the engravings relied on fully syntactical language [...]



Henshilwood et al. (2002). Emergence of Modern Human Behavior: Middle Stone Age Engravings from South Africa.

## Preadaptations to language (speech)



**A. Orangutan**

**B. Chimpanzee**

**C. Human**

Fitch (2010). The Evolution of Language.

## Predecessors of language: gesture, vocalization?



Kalan and Boesch (2018). Re-emergence of the leaf clip gesture during an alpha takeover affects variation in male chimpanzee loud calls. <https://peerj.com/articles/5079/>



# Schedule

**Jan 7, 2019**

Adaptive and Non-adaptive Theories of Language Evolution

**Jan 14, 2019**

Preadaptations to Language (Speech)

**Jan 21, 2019**

Interfaces with Archaeology and Palaeoanthropology





Thank you... and see you next week.







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