



Modern Human Origins

Hugo Reyes-Centeno, Yonatan Sahle, Christian Bentz



For today's lecture:

- ❑ **Hominin taxonomy**
How do we classify human fossils?
- ❑ **Modern human fossils**
When and where do we find anatomically modern fossils?
- ❑ **Populations and demes**
Are population models better than species models?
- ❑ **Models of anthropogeny**
What model of modern human origins is best supported with the current evidence?



Hominin taxonomy

How do we classify human fossils?



Classification and taxonomy

- Classifying the natural world
- Linnean hierarchical classification
- Numerical taxonomy
- Cladistics
- Phylogenetics



Classification and taxonomy

- ❑ **Classifying the natural world**
 - Classification based on perceived organismal complexity
 - Tied to metaphysical understanding of existence

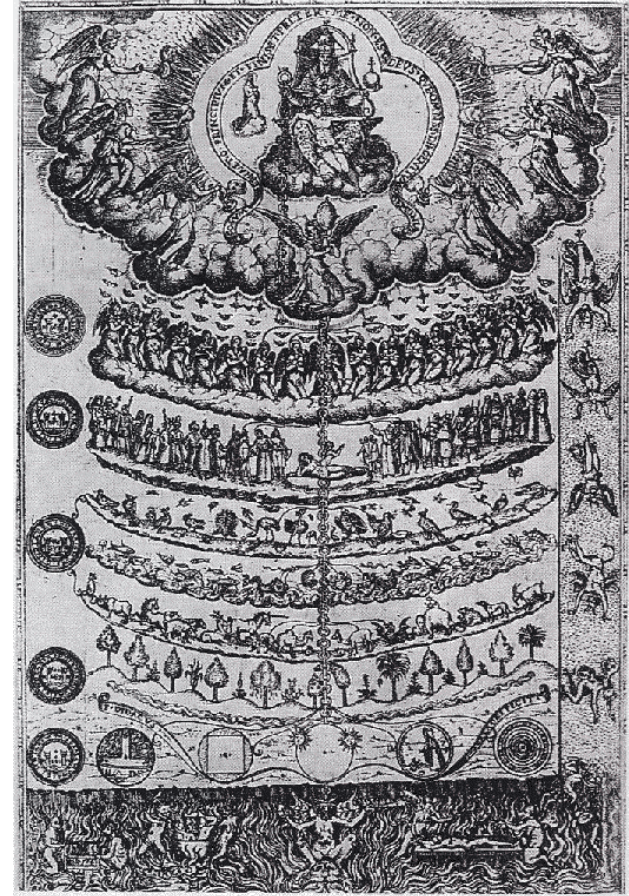


Classification and taxonomy

□ Classifying the natural world

- Classification based on perceived organismal complexity
- Tied to metaphysical understanding of existence

Aristotle's Great Chain of Being, Plato's Academy, 4th Century Greece



Valades, Didacus. 1579. *Rhetorica Christiana*.



Classification and taxonomy

□ Classifying the natural world

- Classification based on perceived organismal complexity
- Tied to metaphysical understanding of existence

Khaldun's *Introduction to Universal History*, 14th Century Islam, Tunisia

“..the world of creation...started out from the minerals and progressed, in an ingenious, gradual manner, to plants and animals. ...the last stage of each group is fully prepared to become the first stage of the newest group. The animal world then widens, its species become numerous, and, in a gradual process of creation, it finally leads to man, who is able to think and reflect.”

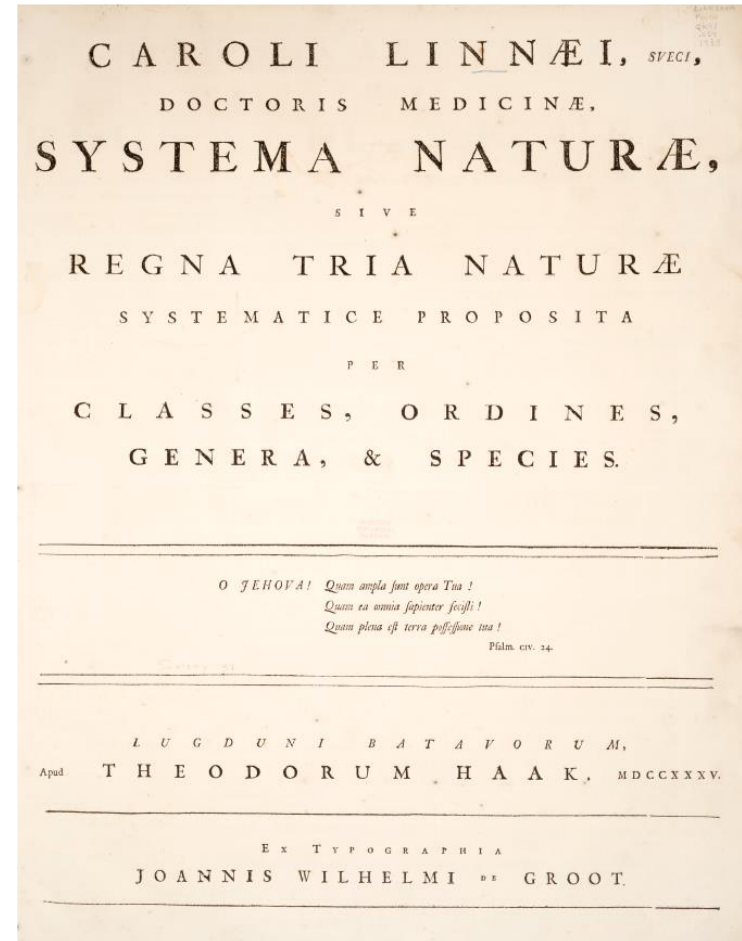


Khaldun, Ibn, 14th Century, *The Muqaddimah* (مقدمة)



Classification and taxonomy

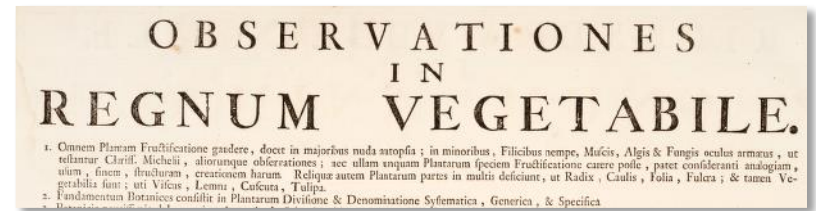
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- ❑ Phylogenetics





Classification and taxonomy

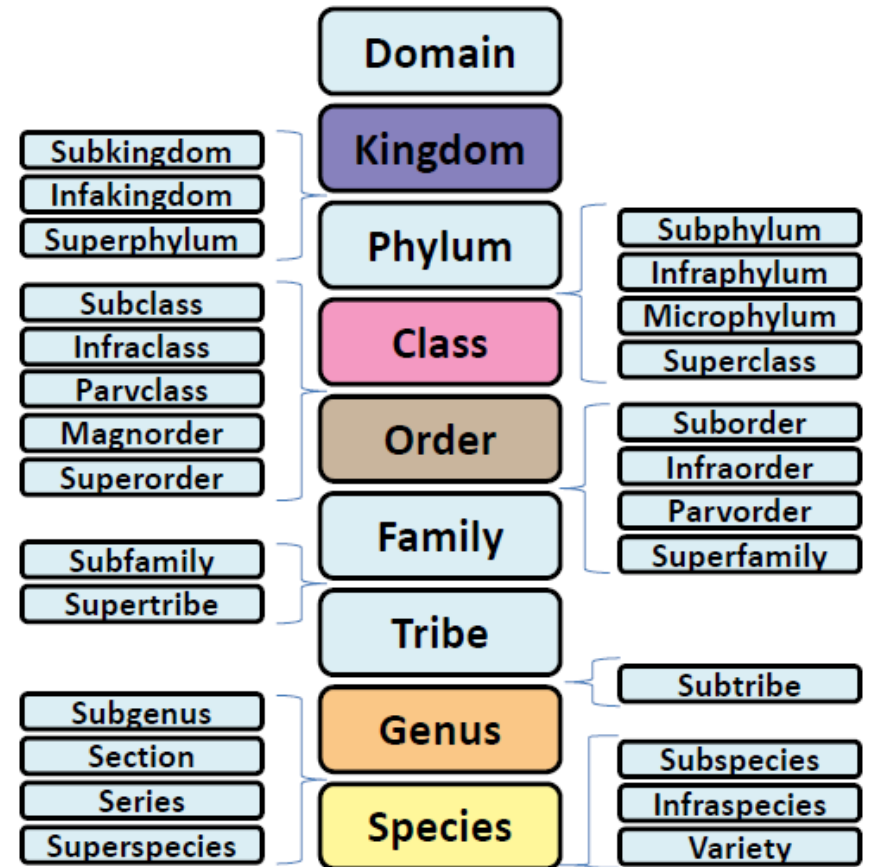
- ❑ Classifying the natural world
- ❑ Linnean hierarchical classification
 - Classification based on observations and physical affinities
 - Development of binomial nomenclature
 - Establishment of International Commission on Zoological Nomenclature (ICZN) in 1895





Classification and taxonomy

- ❑ **Classifying the natural world**
- ❑ **Linnean hierarchical classification**
 - Classification based on observations and physical affinities
 - Development of binomial nomenclature
 - Establishment of International Commission on Zoological Nomenclature (ICZN) in 1895
 - Sub-categories increasingly used





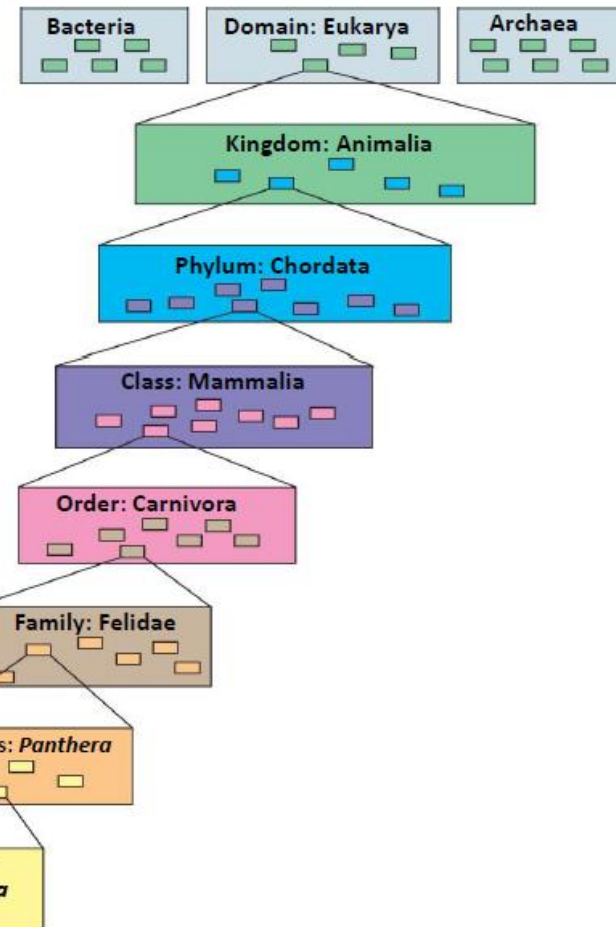
Classification and taxonomy

Leopard Classification



Species: *Panthera pardus*

**Binomial
Nomenclature**





Classification and taxonomy

- ❑ Classifying the natural world
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 - Classification based on observations and physical affinities
 - Development of binomial nomenclature
 - Establishment of International Commission on Zoological Nomenclature (ICZN) in 1895
 - Sub-categories increasingly used
 - Type specimens

Papilio agamemnon Linnaeus, 1758

Scalebar = 1 cm

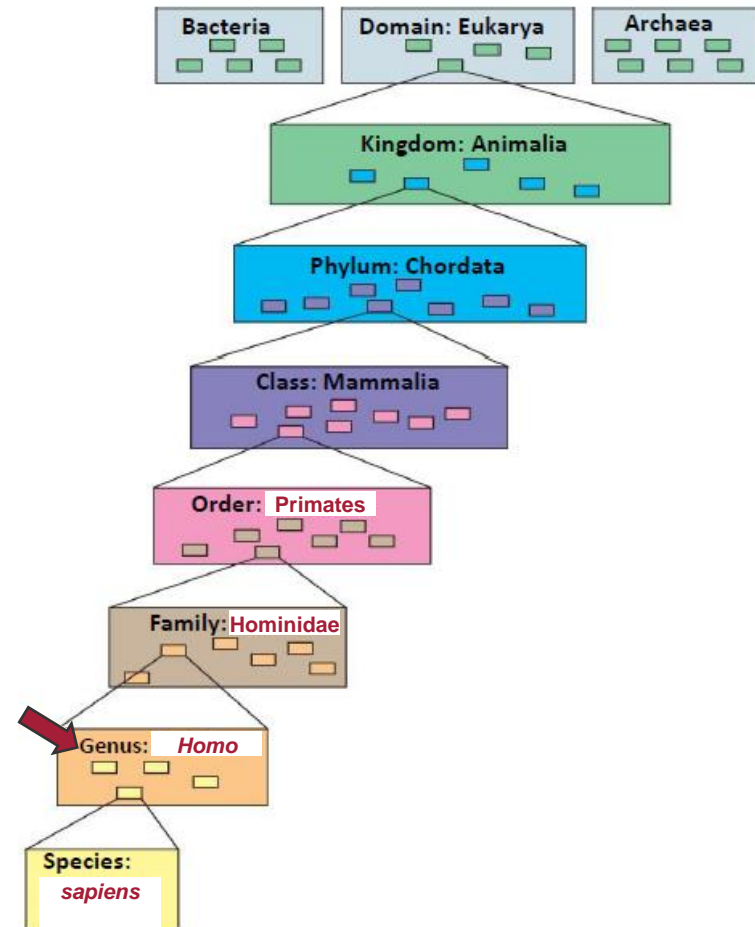


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Classification and taxonomy

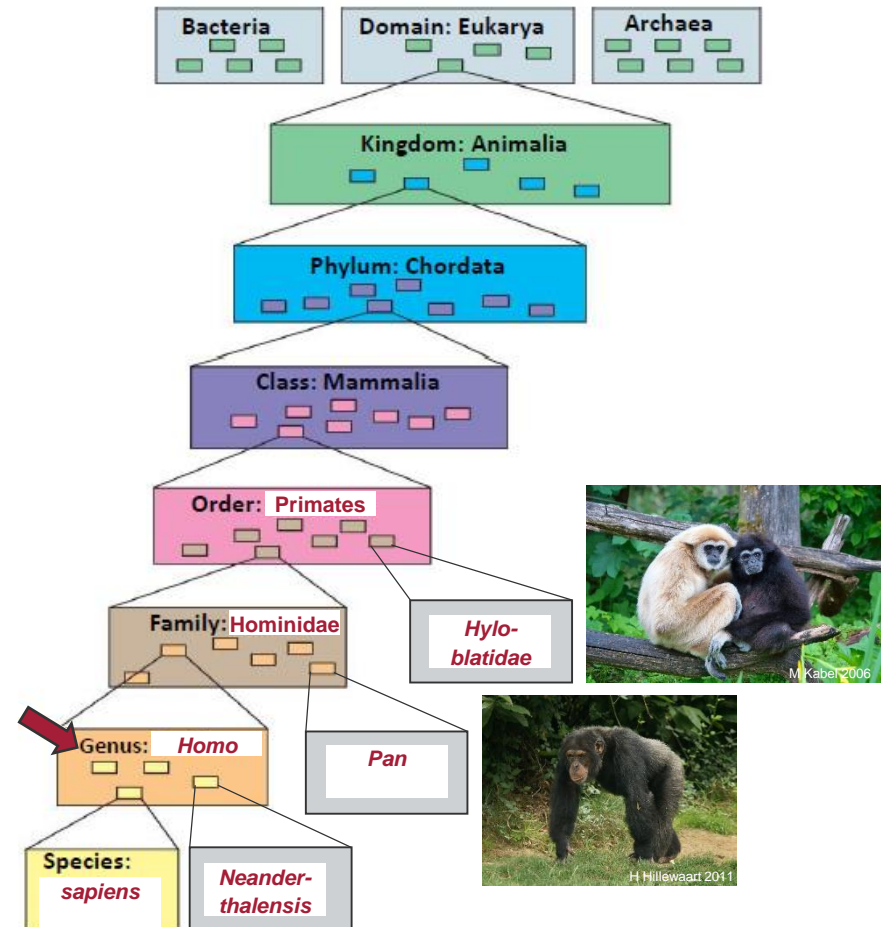
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Classification and taxonomy

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CAROLI LINNÆI REGNUM ANIMALE.

I. QUADRUPEDIA. Corpus quadrupes. Fossae vitæ quatuor. Libera.

Table of Quadrupedia (I) with columns for animal names (e.g., Equus, Bovus, Felis) and their Latin descriptions.

II. AVES. Corpus plumosum. Alii dicit. Tota die. Regum ceterum. Fossae vitæ quatuor.

Table of Aves (II) with columns for bird names (e.g., Falco, Corvus, Columba) and their Latin descriptions.

III. AMPHIBIA. Corpus vitæ, vel squamosum. Tota die. Fossae vitæ quatuor. Tota vitæ.

Table of Amphibia (III) with columns for amphibian names (e.g., Salamandra, Testudo) and their Latin descriptions.

PARADOXA

Text discussing paradoxical cases in taxonomy, such as the classification of the platypus (Ornithorhynchus anatinus).

IV. PISCES. Corpus aquatum, parvi viti multitudine, natans, vel squamosum.

Table of Pisces (IV) with columns for fish names (e.g., Salmon, Corax, Cyprinus) and their Latin descriptions.

V. INSECTA. Corpus cuncta vitæ cuncta loco testans. Corpus animæ infinitum.

Table of Insecta (V) with columns for insect names (e.g., Bombyx, Musca, Lepidoptera) and their Latin descriptions.

VI. VERMES. Corpus diffusum ab uno parte vel cunctis fossis afficit.

Table of Vermes (VI) with columns for worm names (e.g., Lumbricus, Ascaris) and their Latin descriptions.



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- Type specimens

articles

New hominin genus from eastern Africa shows diverse middle Pliocene lineages

Meave G. Leakey¹, Fred Spoor¹, Frank H. Brown¹, Patrick N. Gathogo¹, Christopher Kiarle¹, Louise N. Leakey¹ & Ian McDougall²

¹ Division of Palaeontology, National Museums of Kenya, P.O. Box 40058, Nairobi, Kenya
² Department of Anatomy & Developmental Biology, University College London, WC1E 6BT, UK
³ Department of Geology & Geophysics, University of Utah, Salt Lake City, Utah 84112, USA
⁴ 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^{1,2}. 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 previously³ (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 MVART 1864
 Superfamily Hominoidea GRAY 1825

Kenyanthropus gen. nov.

Etiymology. 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 jugal; moderate subnasal prognathism; incisor 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 (I¹ and I²) roots near equal in size; upper premolars (P³, P⁴) mostly three-rooted; upper first and second molars (M¹ and M²) small with thick enamel; tympanic element mediolaterally long and lacking a petrous crest; external acoustic porus small. *Kenyanthropus* can be distinguished from *Ardipithecus ramidus* by its buccolingually narrow M², 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 I¹ and I² roots, and small M¹ and M² crowns. From *A. afarensis* it also differs by a transversely flat midface, a small, external acoustic porus, 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 porus. *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*⁴).

Type species *Kenyanthropus platyops* sp. nov.

Etiymology. 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. Erua 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 Topera 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 Lokocho 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



Classification and taxonomy

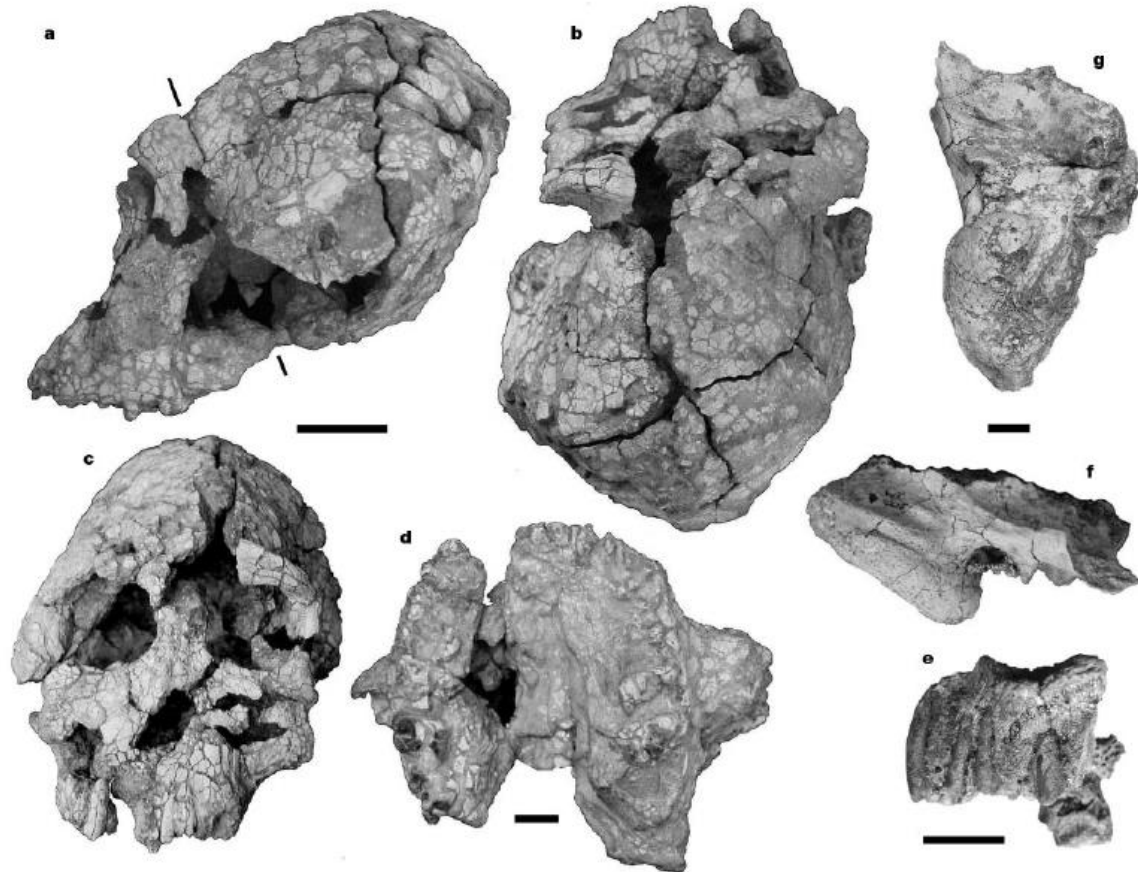


Figure 1 Holotype KNM-WT 40000 **a**, left lateral view (markers indicate the plane separating the distorted neurocranium and the well-preserved face). **b**, Superior view.

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

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Leakey et al. 2001



Classification and taxonomy

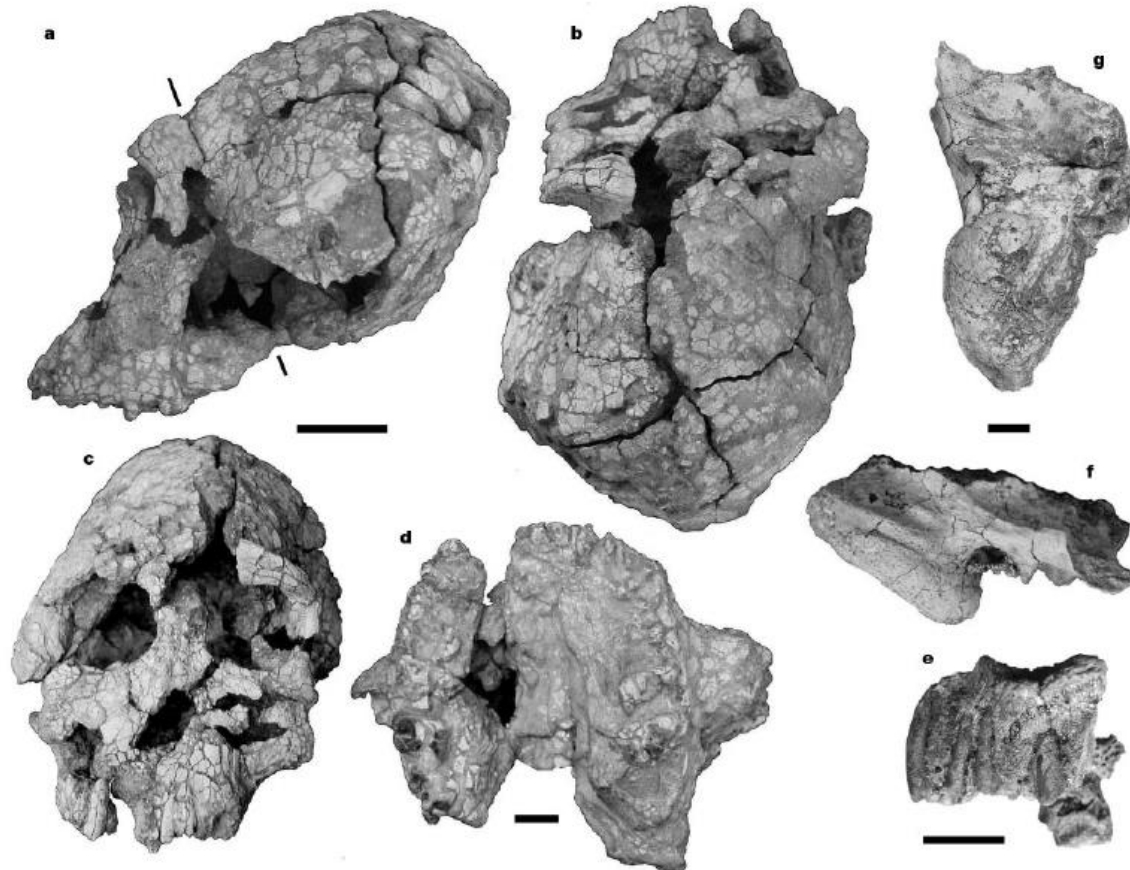


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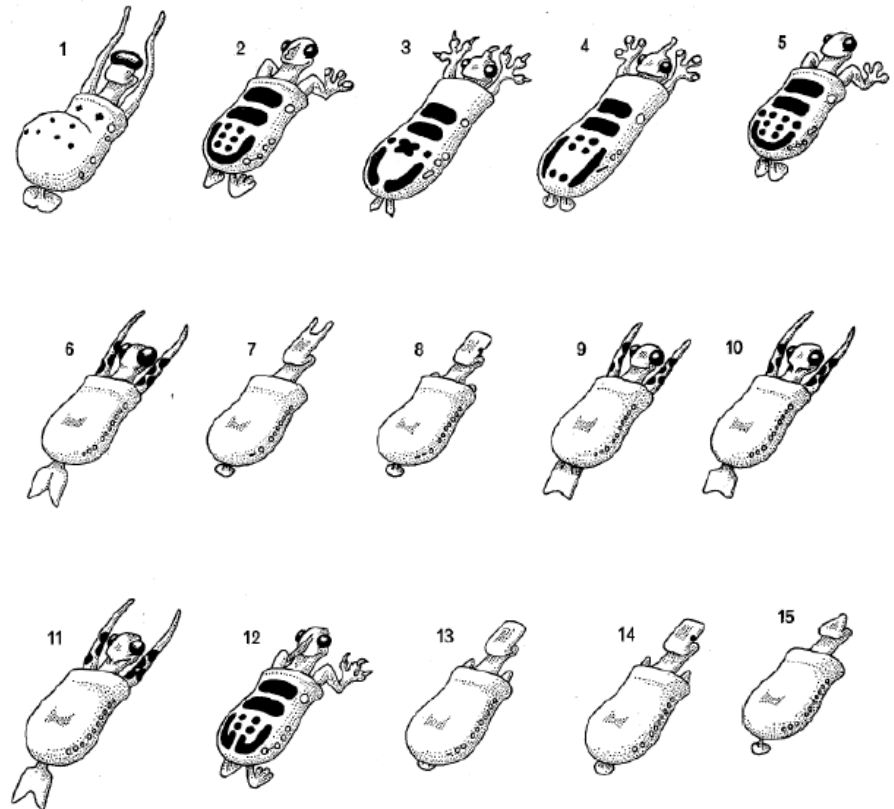
Classification and taxonomy

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- Cladistics
- Phylogenetics



Classification and taxonomy

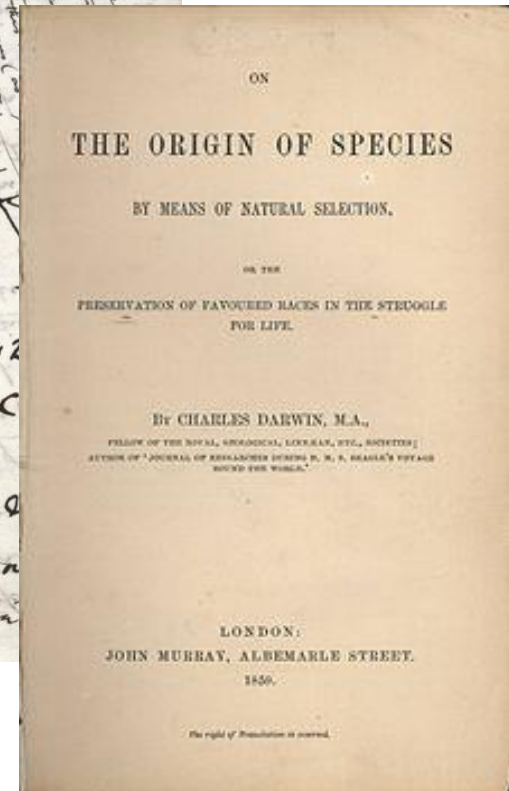
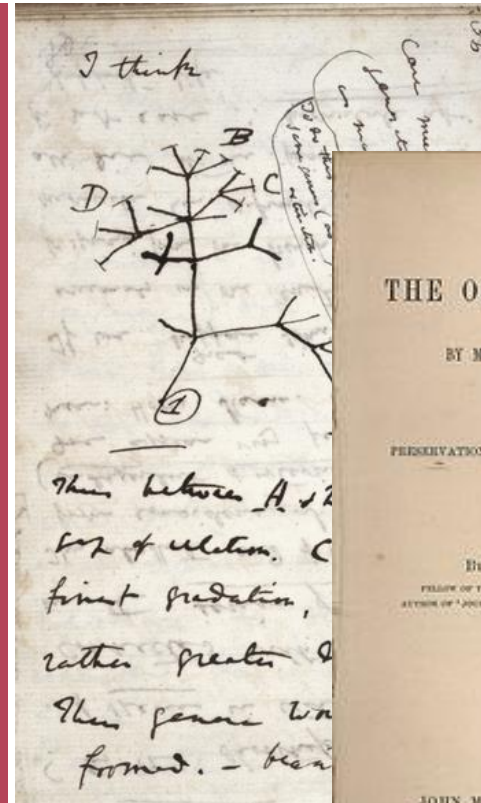
- ❑ Classifying the natural world
- ❑ Linnean hierarchical classification
- ❑ Numerical taxonomy
 - A quantitative comparative method: a multivariate approach to assess operational taxonomic units (OTUs)
 - In general, quantifying more characters is better since there is often correlation between characters





Classification and taxonomy

- ❑ Classifying the natural world
- ❑ Linnean hierarchical classification
- ❑ Numerical taxonomy
- ❑ Cladistics
 - Explicitly accounts for evolutionary history: affinities are based on lines of descent (and modification)





Classification and taxonomy

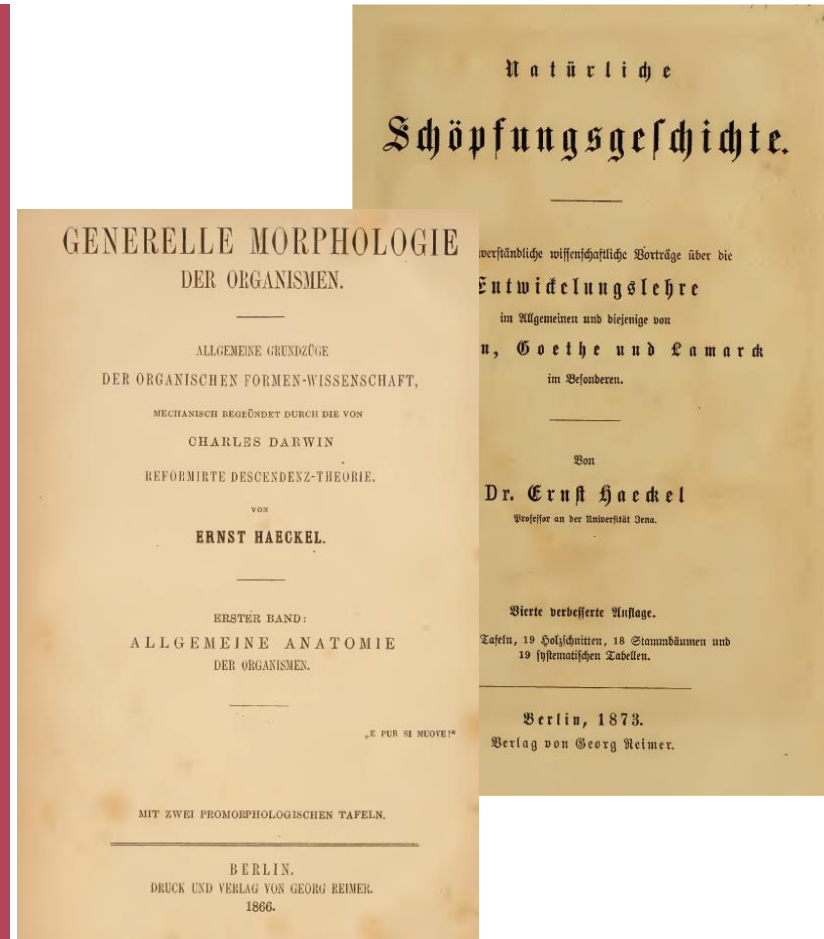
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- ❑ Linnean hierarchical classification
- ❑ Numerical taxonomy
- ❑ **Cladistics**
 - Explicitly accounts for evolutionary history: affinities are based on lines of descent
 - Characters should *only* reflect evolutionary history and not common function





Classification and taxonomy

- ❑ Classifying the natural world
- ❑ Linnean hierarchical classification
- ❑ Numerical taxonomy
- ❑ Cladistics
- ❑ Phylogenetics
 - Explicitly accounts for evolutionary history: affinities are based on lines of descent
 - All traits considered should be heritable
 - Phylogenetic methods rely on specific evolutionary models (e.g. rate of change)





Classification and taxonomy



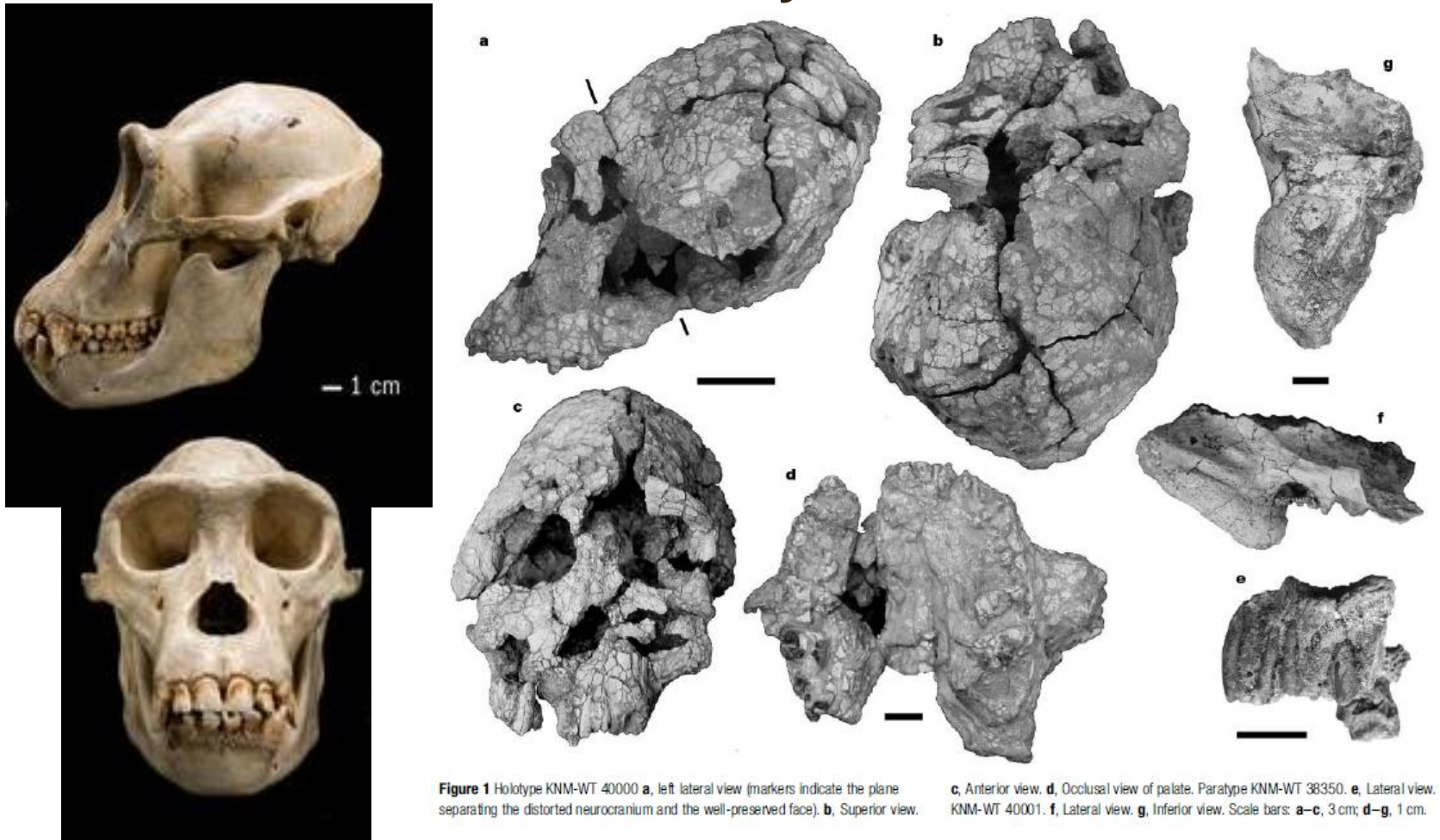


Modern human fossils

When and where do we see anatomically modern fossils?



Classification and taxonomy





What (or who) is the modern human holotype?

20 MAMMALIA PRIMATES. Homo.

I. PRIMATES.

*Dentes Primores superiores IV, paralleli.
Mammæ Pectorales II.*

I. HOMO noſce Te ipſum (*)

Sapens. 1. H. diurnus; *varians cultura, loco.*
Tetrapus, mutus, hirsutus.
Juuenis Urſinus lib. onas. 1661.
Juuenis Lupinus heſſenſis 1314.
Juuenis Ovinus hibernus. Tab. obf. II. 9.
Juuenis Hannoveranus.
Pueri 2 Pyrenaici. 1719.
Johannes Leodicenſis.

America-2. rufus, cholericus, reſtus.
nus. *Pilis nigris, reſtis, craſſis; Naribus patulis, Facie ephel-
litica, Mento ſubimberbi.*
Pertinax, hilaris, liber.
Pingit ſe lineis dædaleis rubris.
Regitur Conſuetudine.

β al-

(*) Noſce ſe Iſum gradus eſt primus ſapientiæ, diſtumque Solonis, quon-
dam ſcriptum litteris aureis ſupra Dianæ Templum. *Mus. ADOLPHI,
FRID. Praſat.*

Prologus. Te conſiderans ſeruis, interueniens ſolus, diſcedis cuncta, ſed
adoleſcente in perfeſſiſſimam, ſaultatibus inſtructam fare omnibus pluri-
busque, quam reliqua cuncta. *Nudum in nuda humo, natali die, abiecit
natura ad uagitus ſtatim & ploratum, manibus pedibusque devinciendum Ani-
mal ceteris imperatum; cui ſcire nihil ſine doſtrina; non ſivi, non ingre-
di, non veſci, non aliud natura ſponte, Plin. Vider itaque qualem vitam no-
bis verum natura promiſit, quæ primum naſcentium omen ſictum eſſe voluit.*
Seneca.

Dieteticæ: Te ſanitate & tranquillitate, ſi noveris, felicem: *Moderatis conſer-
vandam, Niniis deſtruendum, Variatis aſſiciendum, Inſuetis frangendum,
Conſuetis indurandum; polyphagum Calina inſtrutiſſima, per errores gra-
tiſſima, igne vinoque horrenda, Parvo famer conſtat, magno ſoſtidiſſim.*
Seneca.

Pathologicæ: Te tumidam uſque dum crepueris bullam, piloque pendulam in
puncto fugientis temporis. *Nilil enim homine imbecilliſſus terra alie. Homer.*
*Nulli vita fragilior; nulli tot Morbi, tot Cura, tot Pericula. Breve uniuerſum
utique ævi tempus: Pars æque morti ſimilis exigitur; nec reputant Infantie
anni, qui ſenſu carent; nec Senectæ in penam vivaces: bebetent Senſus, tor-
pent Membra, premoriantur Viſus, Inceſſus, Dentis, Ciborum in-
ſtrumenta. Plin. Sic magna pars mortis jam præterit, quidquid ætatis vero
eſt ilors tenet. Totum denique hunc, quem vides populam, quoniam cogitas
eſſe; cito natura revocavit & condet; Mors omnis æque vocat; iratis Diis pro-
pitiſque moriendum. *Senec. II: 59.**

*Homo: know thyself**

**know your wisdom, as told
by Solon, written on golden
letters on the Diana Temple*



What (or who) is the modern human holotype?

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Mammæ Pectorales II.

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Sapiens. 1. H. diurnus; *varians cultura, loca.*

terrapus, maris, hircinus.
Juvenis Ursinus lithonius. 1661.
Juvenis Lupinus hesperis 1334.
Juvenis Ovinus hibernus. Tabl. obs. II. 9.
Juvenis Hannoveranus.
Pueri 2 Pyrenaici. 1719.
Johannes Leodicensis.

America-2. rufus, cholericus, rectus.
nus. Pili nigri, rectis, crassis; Naribus patulis, Facie ephelctica, Mento subimberbi.
Pertinax, hilaris, liber.
Pingit se lineis dædaleis rubris.
Regitur Consvetudine.

β al-

(*) Nosse Se Ipsum gradus est primus sapientiæ, diuimque *Solanis*, quondam scriptum literis aureis supra *Dianæ* Templum. *Mus. ADOLPHI, FRID. Præfat.*

Physiologicæ: Te contextum Nervis, intertextum Fibris, Machina tenella, sed adolecente in perfectissimam, facultatibus instructam fere omnibus pluribusque, quam reliqua cuncta. *Nudum in nuda humo, natali die, abiecit natura ad vagitus statim & ploratum, manibus pedibusque devinciendum Animal ceteris imperatum; cui scire nihil sine doctrina; non firi, non ingredi, non vesci, non aliud natura sponte, Plin. Vider itaque qualem vitam nobis verum natura promisit, quæ primum nascentium omen fœtum esse voluit. Seneca.*

Dieteticæ: Te sanitate & tranquillitate, si noveris, felicem: *Moderatis* conservandum, *Nimis* destruendum, *Variatis* efficiendum, *Insvetis* frangendum, *Consvetis* indurandum; polyphagum *Calina* instructissima, per errores gratissima, igne vinoque horrenda. *Parvo famer constat, magno sordidum. Seneca.*

Pathologicæ: Te tumidam usque dum crepueris bullam, piloque pendulam in puncto fugientis temporis. *Nilil enim homine imbecillius terra alit. Homer. Nulli vita fragilior; nulli tot Morbi, tot Cura, tot Pericula. Breve universum utique ævi tempus: Pars æque morti similis exigitur; nec reputant Infantie anni, qui sensu carent; nec Senectæ in penam vivaces: bebescent Sensus, torpent Membra, premoriuntur Visus, Auditus, Incessus, Dentis, Ciborum instrumenta. Plin. Sic magna pars mortis jam præterit, quidquid ætatis vero est Idors tenet. Totum denique hunc, quem vides populam, quoniam cogitas esse; cito natura revocavit & condet; Mors omnes æque vocat; iratis Diis proptiusque moriendum. Senec. II: 59.*

sapiens: culture, light



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Juvenis Lipsiensis. Lich. Mus. 1763.

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litica, Mento subimberbi.

2. errina, imans, nōci.

Pingit se lineis dædaleis rubris.

Regitur Confvetudine.

β al-

(*) Nōsse Se Ipsum gradus est primus sapientiæ, diūmque *Solanis*, quon-
dam icripum litteris aureis supra *Dianæ* Templum. *Mus. ADOLPHI,*
FRID. Præfat.

Physiologicæ: Te contextum Nervis, intertextum Fibris, Machina tenella, sed
adoleſcente in perfectissimam, facultatibus instructam fere omnibus pluri-
busque, quam reliqua cuncta. *Nudum in nuda humo, natali die, abjecta*
natura ad vagitus statim & ploratum, monibus pedibusque devinciendum Ani-
mali ceteris imperatum; cui scire nihil sine doctrina; non firi, non ingre-
di, non veſci, non aliud natura sponte, Plin. Vider itaque qualem vitam no-
bis verum natura promiſit, quæ primum neſcentium omen fictum esse voluit.
Seneca.

Dieteticæ: Te ſanitate & tranquillitate, ſi noveris, felicem: *Moderatis conſer-*
vandum, Nivis deſtruendum, Variatis aſſiciendum, Inſvetis frangendum,
Confvetis indurandum; polyphagum Calina inſtrutiſſima, per errores gra-
tiſſima, igne vinoque horrenda, Parvo famer conſtat, magno ſoſtidiūm.
Seneca.

Pathologicæ: Te tumidam uſque dum crepueris bullam, piloque pendulam in
puncto fugientis temporis. *Nilil enim homine imbecillius terra alie. Homer.*
Nulli vita fragilior; nulli tot Morbi, tot Cura, tot Pericula. Breve univerſum
utique ævi tempus: Pars æque morti ſimilis exigitur; nec reputant Infantie
anni, qui ſenſu carent; nec Senectæ in penam vivaces: bebecunt Senſus, tor-
pent Membra, præmoriuntur Viſus, Auditus, Inceſſus, Dentis, Ciborum in-
ſtrumenta. Plin. Sic magna pars mortis jam præterit, quidquid ætatis vero
eſt ilors tenet. Totum denique hunc, quem vides populam, quonique cogitas
eſſe; cito natura revocavit & condet; Mors omnis æque vocat; iratis Diis pro-
pitiusque moriendum. Senec. II: 59.

sapiens ferus: speechless,
hairy

sapiens americanus: red,
choleric/reactive,



What (or who) is the modern human holotype?

20

MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores superiores IV, paralleli.
Mammæ Pectorales II.

1. HOMO nōsse Te ipsum (*)

Sapiens. 1. H. diurnus; *varians cultura, loc.*
Ferus. tetrapus, mutus, hirsutus.

Juvenis Ursinus lith. mus. 1661.
Juvenis Lupinus hesperis 1374.
Juvenis Ovnus hibernus Tulf. obs. 17. 9.
Juvenis Hannoveranus.
Pueri 2 Pyrenæici. 1719.
Johannes Leodicensis.

America-2. rufus, cholericus, rectus.
nus. *Pilis nigris, rectis, crassis; Naribus patulis; Facie ephelica, Mento subimberbi.*
Pertinax, hilaris, liber.
Pingit se lineis dædaleis rubris.
Regitur Conſuetudine.

β al-

(*) Nōsse Se Ipsum gradus est primus ſapientiæ, dictumque *Solanis*, quondam ſcriptum litteris aureis ſupra *Diane* Templum. *Muf. ADOLPH. FRID. Præfat.*

Phyſiologie: Te, contextum Nervis, intertextum Fibris, Machina tenella, fed adoleſcente in perfectiſſimam, ſculptatibus inſtrudam fere omnibus pluri- busque, quam reliqua cuncta. *Nudum in nuda humo, natali die, abſeipit natura ad quæritur ſtatim & ploratum, manibus pedibusque devinciendam Animal cæteris imperaturum; cui ſcite nihil ſine dōctrina; non ſari, non ingredi, non veſci, non aliud natura ſponte, Plin. Videt itaque qualem vitam nobis verum natura promiſiſſi, que primam naſcentium omni ſerum eſſe voluit. Seneca.*

Dieteticæ: Te ſanitate & tranquillitate, ſi noveris, felicem: *Moderatis conſervandum, Nimiis deſtrudendum, Variatis aſciendum, Inſuetis frangendum, Conſuetis indurandum;* polyphagum Culina inſtruſſiſſima, per errores gra- tiſſima, igne vinoque horrenda. *Parvo fames conſtat, magno ſaſſidiam.* Seneca.

Pathologicæ: Te tumidam uſque dum crepueris bullam, piloque pendulam in puncto fugientis temporis. *Nihil enim homine imbecillius terra alic. Homer. Nulli vita fragilior; nulli tot Morbi, tot Cæcæ, tot Pericula. Breve univoſum utique ævi tempus: Pars æqua morti ſimilis exigitur; nec reputantur Infantis ævi, qui ſenſu carent; nec Senectæ in penam vivaces; hebetantur Senſus, torpent Membra, præmoriantur Viſus, Auditus, Inceſſus, Dentis, Ciborum in- ſtrumenta. Plin. Sic magna pars mortis jam præterit, quidquid ætatis retro eſt illos tenet. Totum denique hunc, quem vides populum, quousque cogitas eſſe; cito natura revocavit & condet; Mors omnes æque vocat; iratis Diis propitiisque moriendum. Senec. II: 19.*

MAMMALIA PRIMATES. Homo.

21

Euro- paus. β. albus, fanguineus, toroſus.
Pilis flavefcentibus prolixis. Oculis cæruleis.
Levis, acutiſſimus, inventor.
Regitur Veſtimentis arctis.
Regitur Rintibus.

Aſiati- cus. γ. luridus, melancholicus, rigidus.
Pilis nigricantibus Oculis fuſcis.
Severus, faſtuoſus, avarus.
Regitur Indumentis laxis.
Regitur Opinionibus.

B 3

δ. ni-

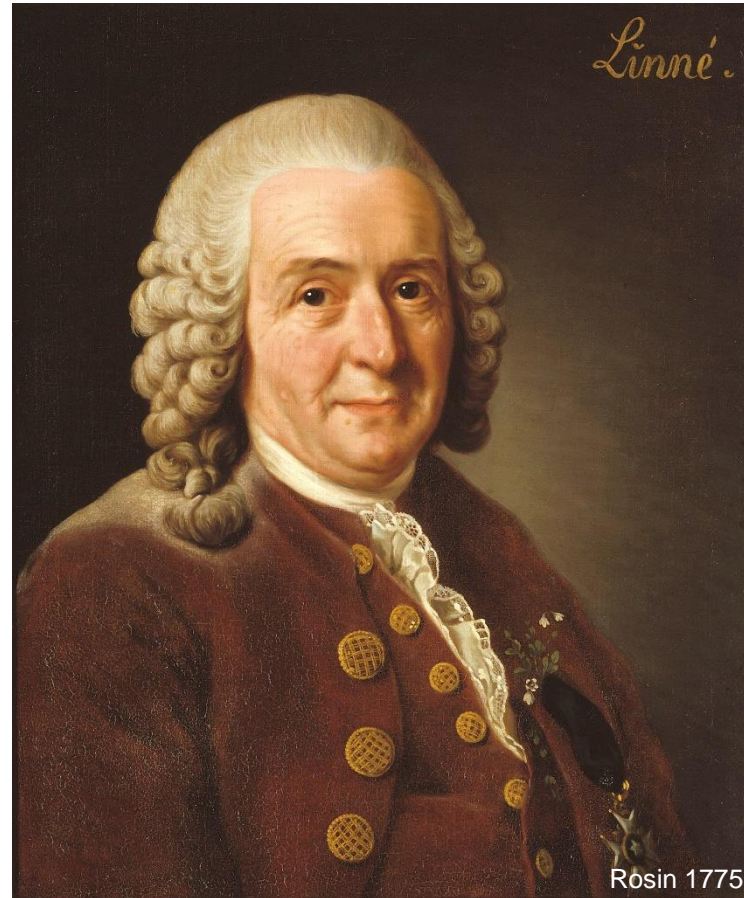
Naturaliter: Te audacis naturæ miraculum, Animalium Principem, cujus caſſa cuncta genuit natura, eſſe animal ſens, ridens, meliodum, loquens, docile, judicans, admirans, ſapientiſſimum; ſed fragile, nudum, ſuapte natura inerme, ad omnem fortunæ contumeliam proſectum, alienæ optis indigens, anxie mentis ſollicitæque rutilæ, precariis ſpiritus, pertinacis ſpei, querule viæ, torde ſapientie. Temporis annihiliari emortui con- ſtantiam, præſentis vividè diſperdatorem, futuri dubii æſtimatorem in vita volueri, præſidiſſima, irrevocabili. ſic optima quoque dies miseris mor- talibus ævi prima fugit; alium ad quotidianum opus laborioſa Egeitas vocat; alium Luxus incareerat. Atque ſuffocet; alium Ambitio num- quam quæta ſollicitat; alius Divitiis, quas optaverat, meruit, & voto la- boræ ſuo; alium Solitudo, alium ſemper vitæ ſubulum obſidens turba. Hic ſe habere dicit Liberos, hic ſe perdidit; Lacrymæ nobis deerrunt antequam cauſa dolendi. Sed quousque nos malos noſtra mala rapere: circumferre porcum, tu te in ignotos, iratos ſine injuria, ſerarum more occidere quem non oderimus, ſecundos oprate ventos, quorum felicitas eſt ad bella p rterre; patium videlicet ad mortes noſtras terra late patet. Senec. *Cætera animantia congregari contra diſſimilia, at Homini pluriſima ex bo- mine mala Plin.*

Politice: Te recti loco tenere errorem publicum factum, qui te vix exitum conſuetudinis larva induit, nutrit, educat. alit, regit, ſecundum quam honeſtus, fortis, ſapiens, moratus, pius exitimaris; Cum gubernatus Opinio- nem vivas ad Conſuetudinem, nec ad Rationem. Te, inter perituros conſtitutum, cum nulli contigit impune naſci. Beneficii loco petere, ut ultimus cervicem præbeas, dum interim, dulci fortunæ ebrius, colligen- do in cratium Lapillos fortunæ certas, dulci in furorem ageris, aliter theoreticæ pios odio perſequeris, quanosque tumultus excitas, non ut ſer- vias, ſed cui; nugis irrevocabile tempus conſumis; immortalia æternæque animo volutas, de feris nepotibus pronepotibusque diſponis, novas ſpes oblitus conditionis Tue ponis, cum interea longa conantem mors op- primit, at in agone oculis aperiens (αυτοφρονος) ſomnium primo obſervas; Sic vivimus ut immortales & morimur ut mortales. Senec.

Moraliter: Te ſub rudi larva Ineptum, Læcivum, Imitatorem, Ambitioſum, Prodigium, Sollicitum, Aſtutum, Auſterum, Invidium, Avarum, transforma- ti in Attentum, Caſtum, Conſideratum, Modeſtum, Sobrium, Tranquil- lum, Sincerrum, Mitem, Beneficum, ſuis Contentum. *Unī animantium*



What (or who) is the modern human holotype?





What do people living today look like?

General anatomy:

- ❑ Globular head
- ❑ Long limbs
- ❑ Narrow thorax

However, variation across world populations due to drift and adaptations.

Cranial and pelvic structure evolves in large portion neutrally, while limbs (and likely thorax) are more plastic and subject to adaptation.

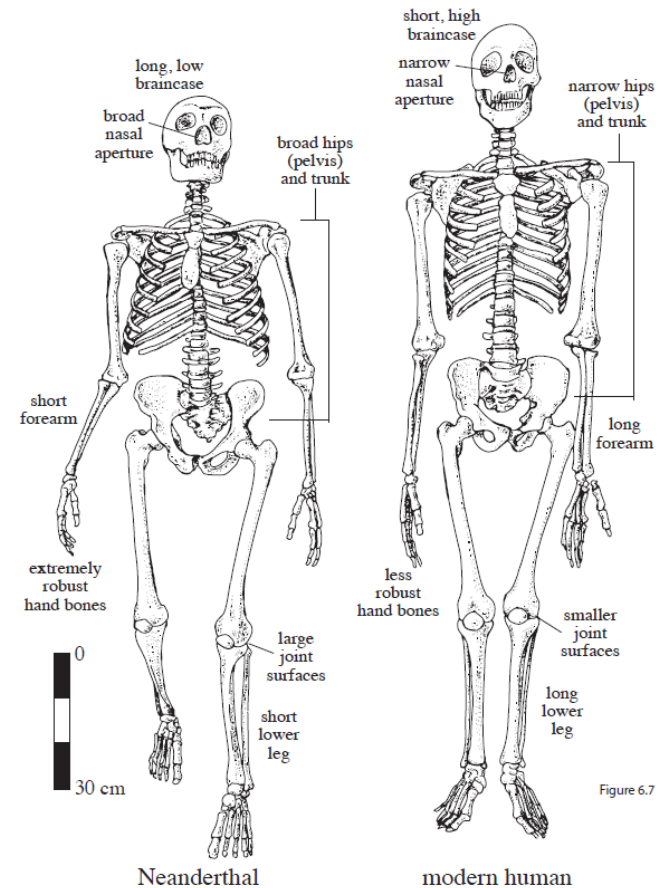


Figure 6.7

Klein 2009



What do people living today look like?

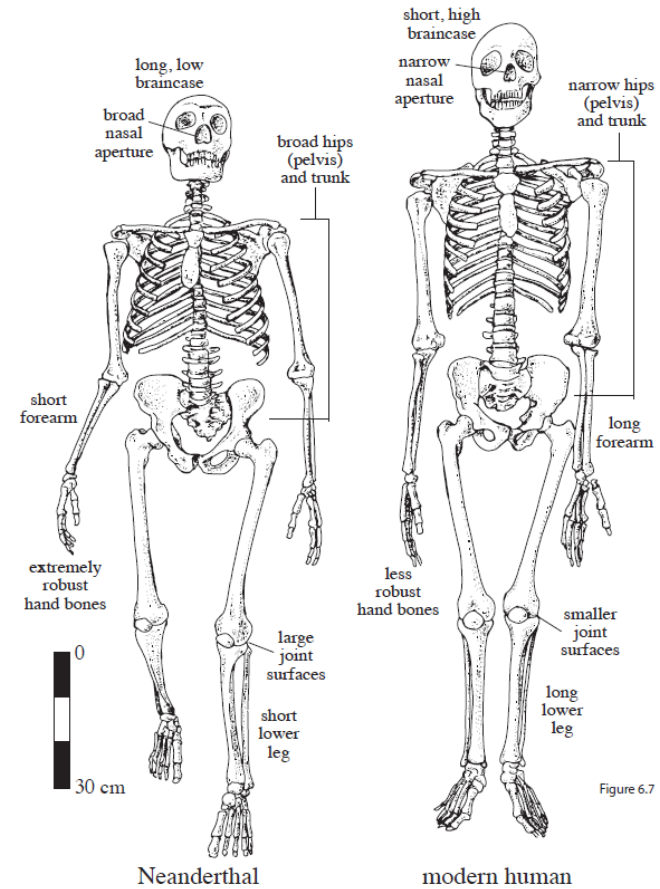
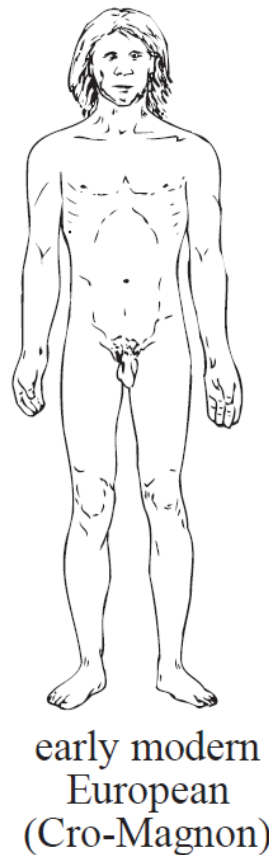
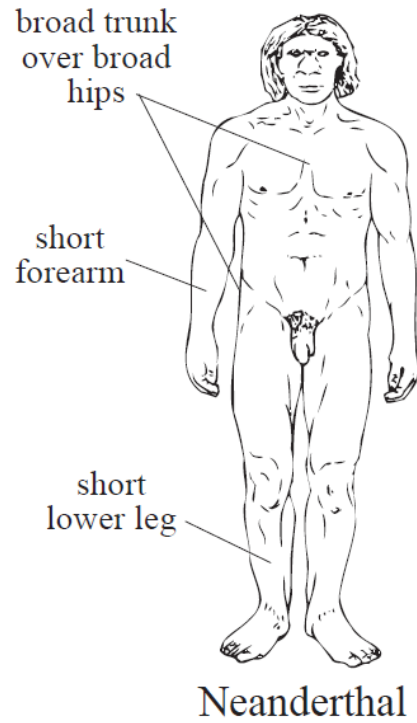


Figure 6.7

Klein 2009



What do people living today look like?

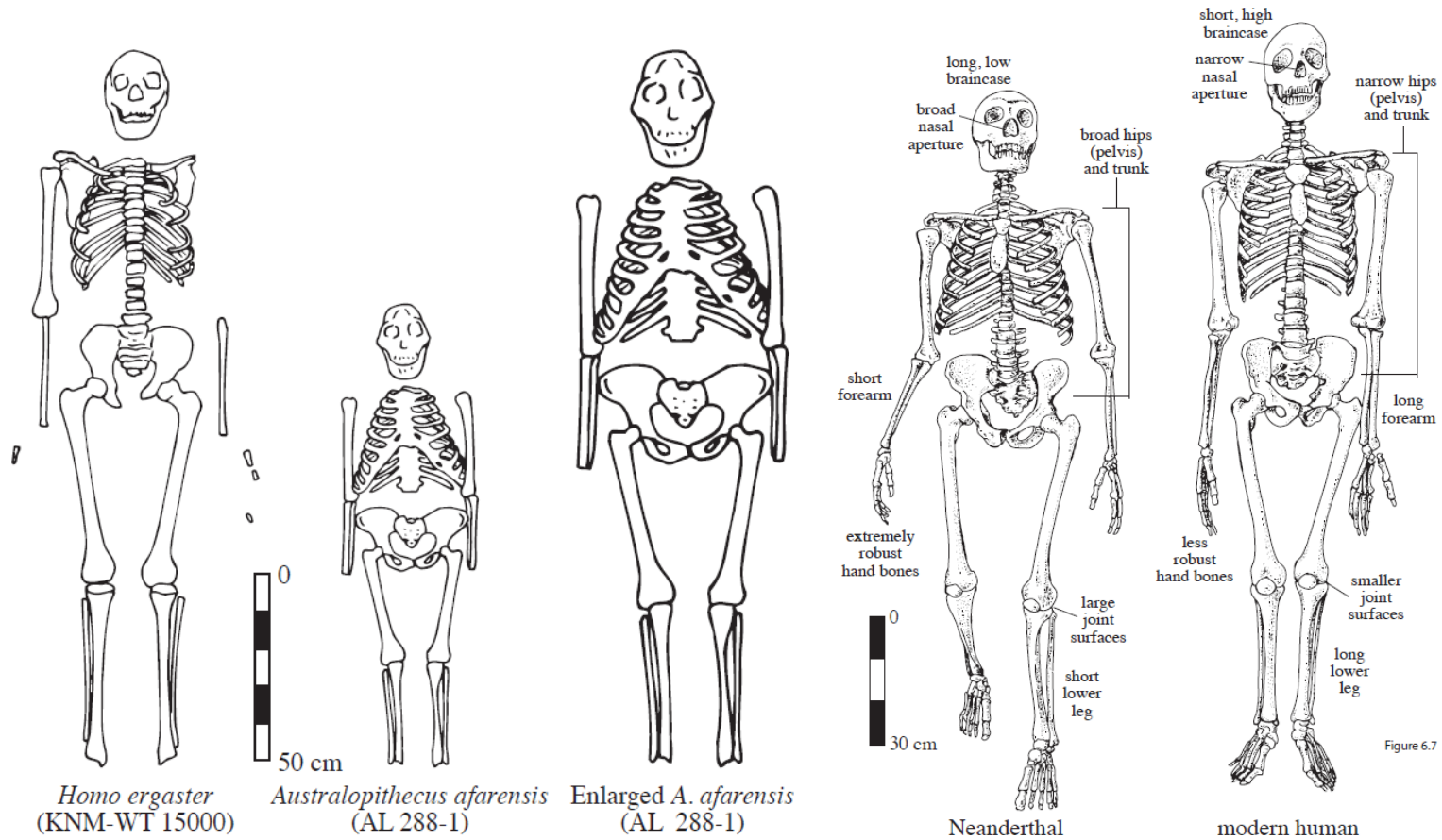


Figure 6.7

Klein 2009



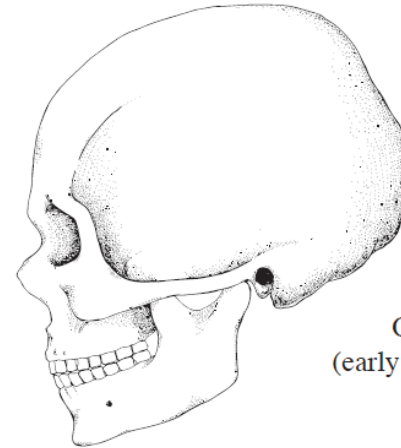
What do people living today look like?

General anatomy:

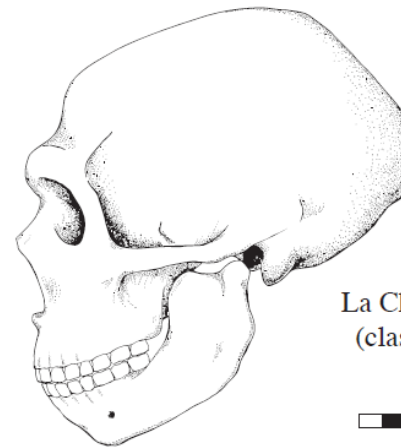
- ❑ Globular head
- ❑ Long limbs
- ❑ Narrow thorax

However, variation across world populations due to drift and adaptations.

Cranial and pelvic structure evolves in large portion neutrally, while limbs (and likely thorax) are more plastic and subject to adaptation.



Cro-Magnon 1
(early modern European)



La Chapelle-aux-Saints
(classic Neanderthal)

Figure 7.1

Klein 2009



What do people living today look like?

Cranial anatomy:

- ❑ **Globular neurocranium**
 - Rounded occipital bone
 - Elongated parietal bones
 - Bossed frontal bone
 - Mandibular chin

- ❑ **Orthognathic face**

Note: some anatomical variation due to sexual dimorphism

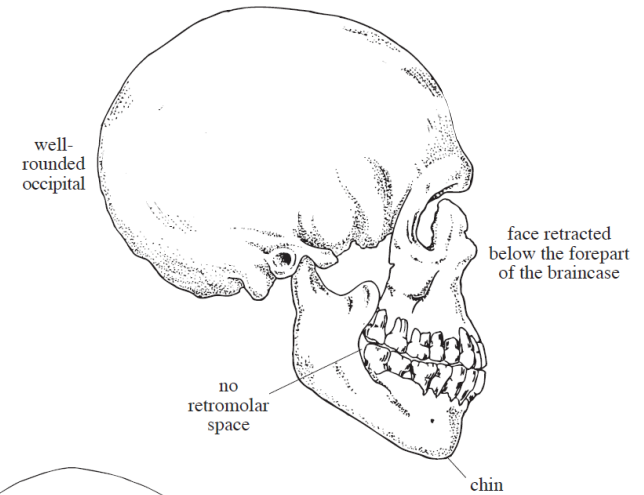


Figure 6.30

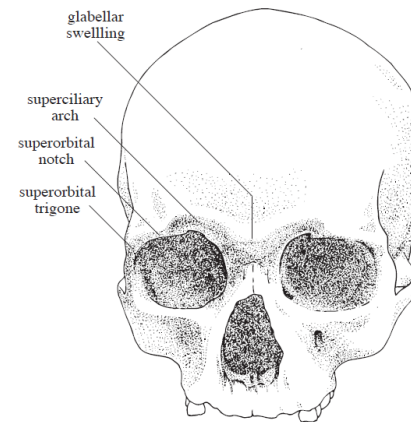


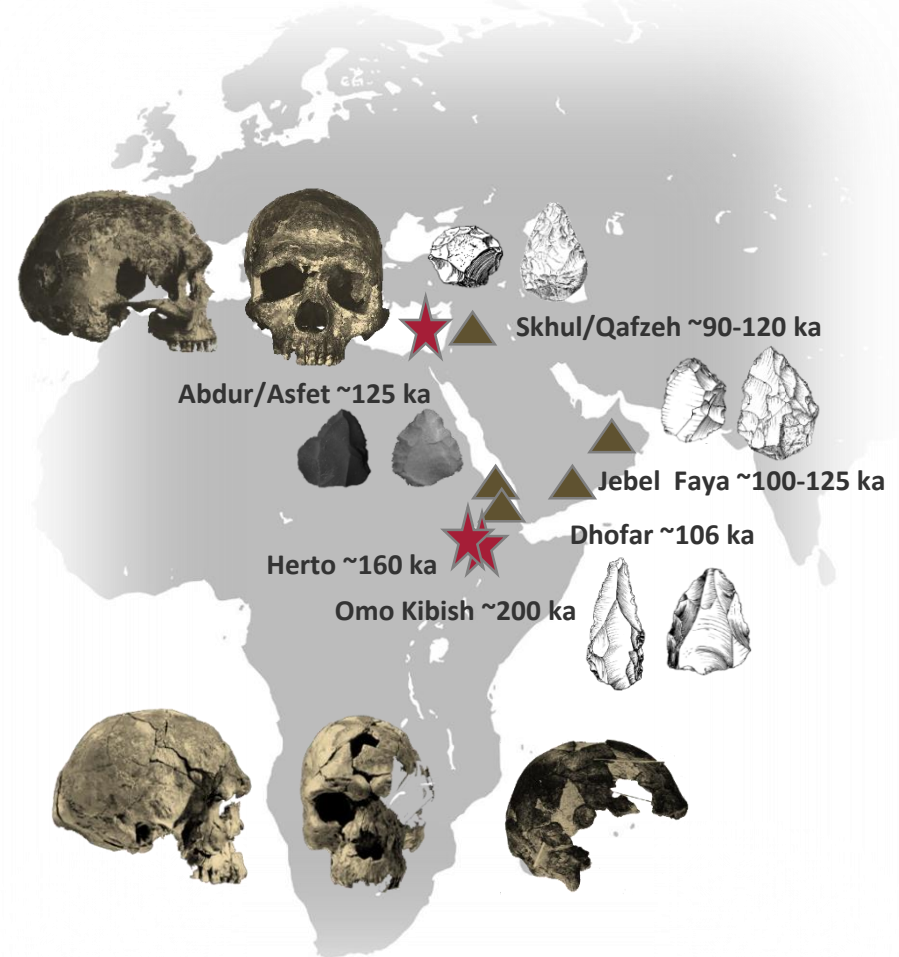
Figure 7.4

Klein 2009



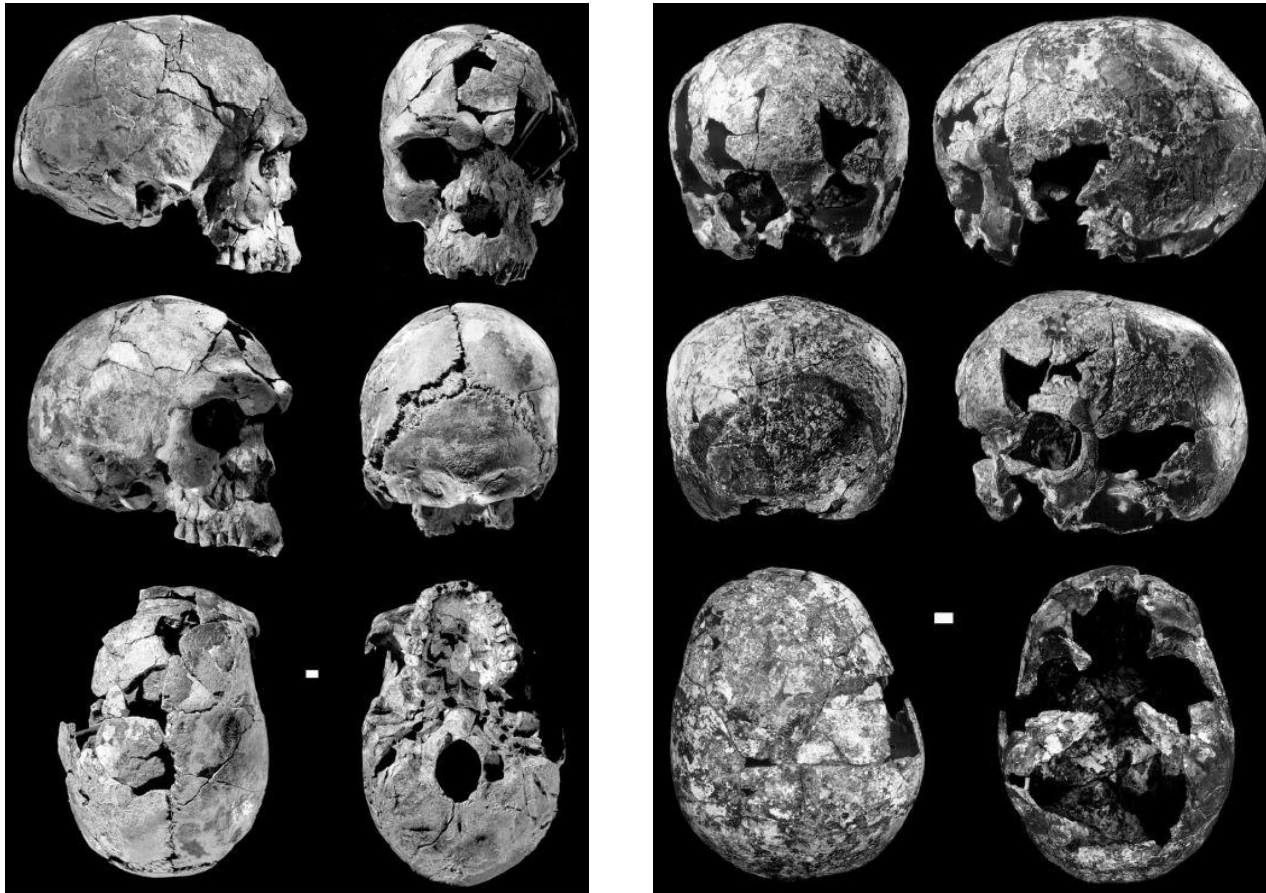
The fossil record of Africa and the Levant

- ❑ Omo Kibish, Ethiopia, ~200 ka
- ❑ Herto Bouri, Ethiopia, ~160 ka
- ❑ Skhul, Israel/Palestine, ~90-120 ka
- ❑ Qafzeh, Israel/Palestine, ~90-120 ka





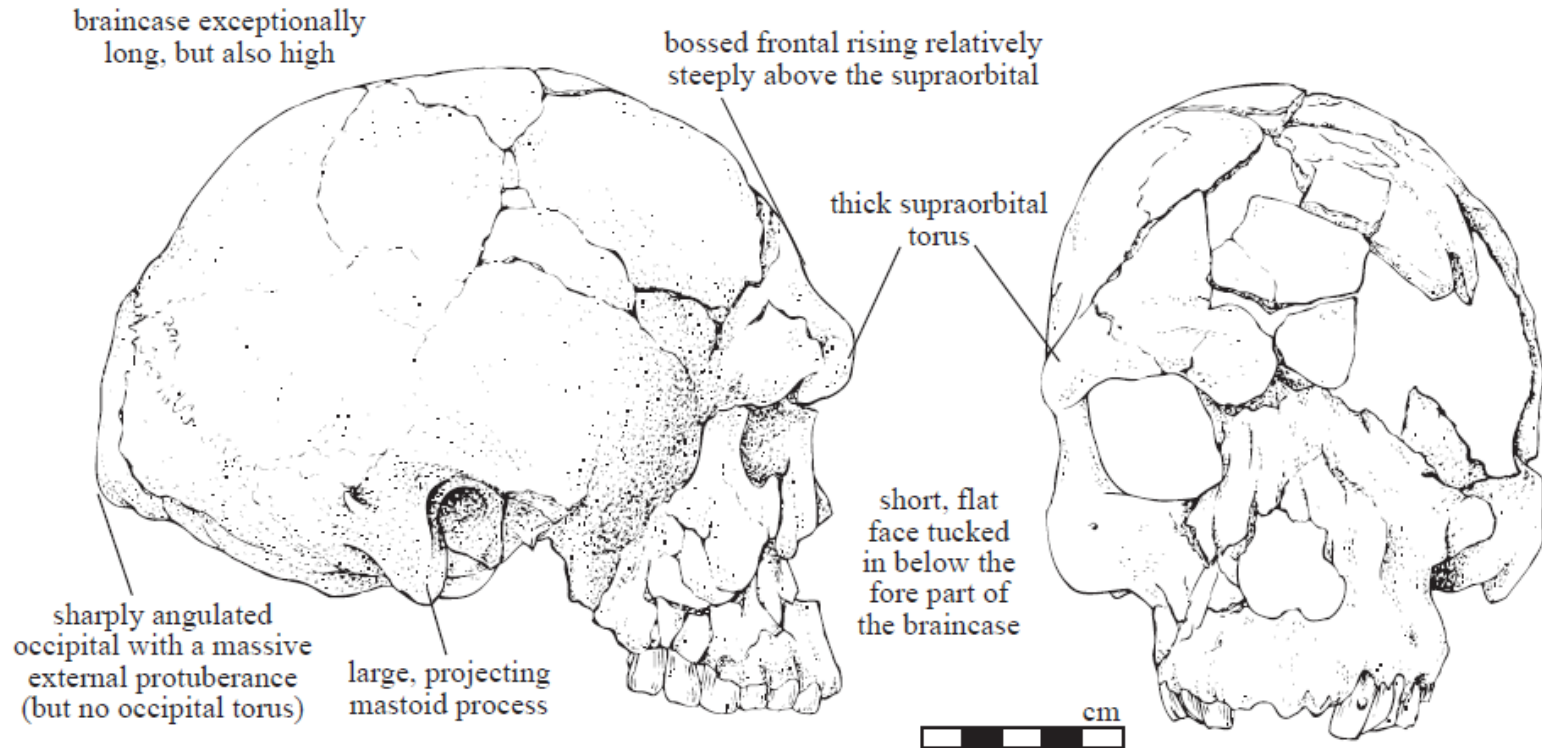
What (or who) is the modern human holotype?



White et al. 2003



What (or who) is the modern human holotype?



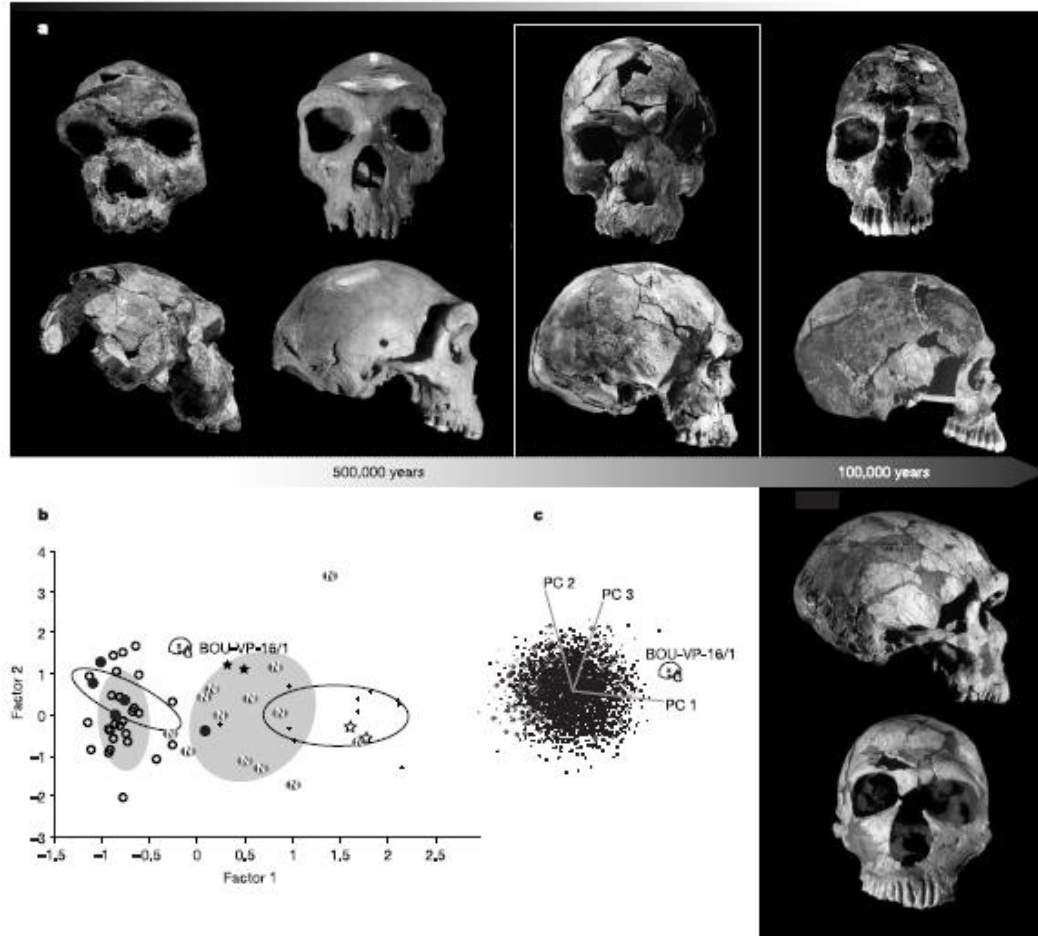
Herto BOU-VP-16/1

Figure 6.26

Klein 2009



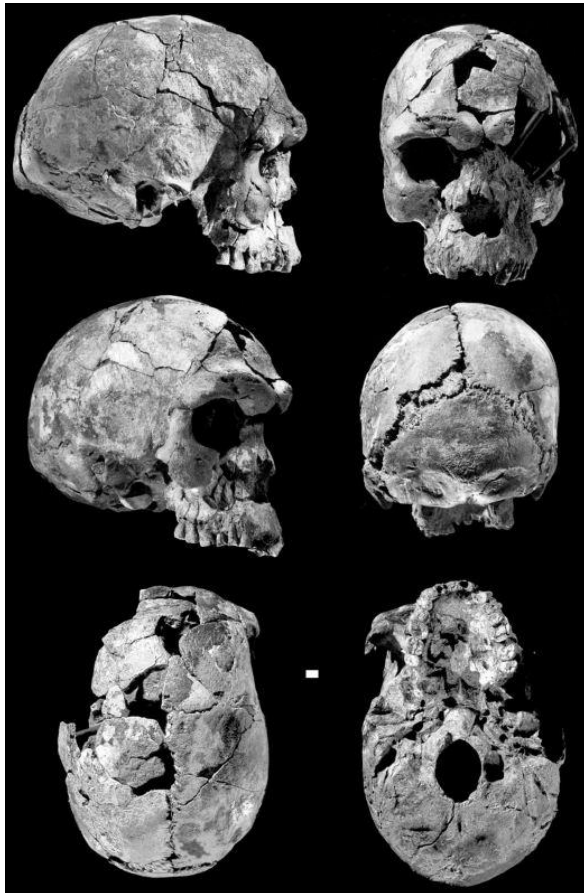
What (or who) is the modern human holotype?



White et al. 2003



What (or who) is the modern human holotype?



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 ⁴⁰Ar/³⁹Ar 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.

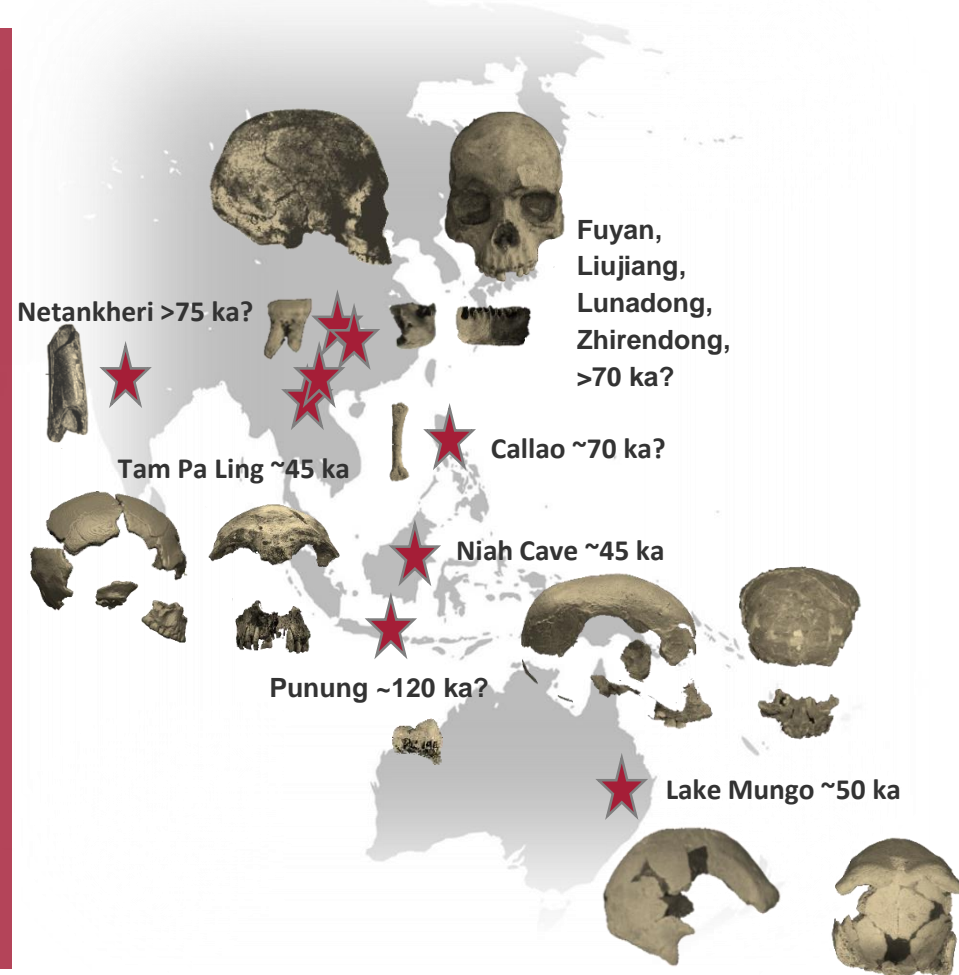
Received 21 November 2002; accepted 14 April 2003; doi:10.1038/nature01669.

White et al. 2003



The fossil record of Eurasia and Australia

- ❑ Tam Pa Ling, Laos ~45 ka
- ❑ Niah Cave, Borneo ~45 ka
- ❑ Lake Mungo, Australia ~50 ka





Classification and taxonomy

- ❑ Classifying the natural world
- ❑ Linnean hierarchical classification
- ❑ Numerical taxonomy
- ❑ Cladistics
- ❑ Phylogenetics

Are modern humans:

- ❑ *Homo sapiens*
- ❑ *Homo sapiens idaltu*
- ❑ *Homo sapiens sapiens* ?

What about the Neanderthals?

What about the ergasterines / *erectus*?



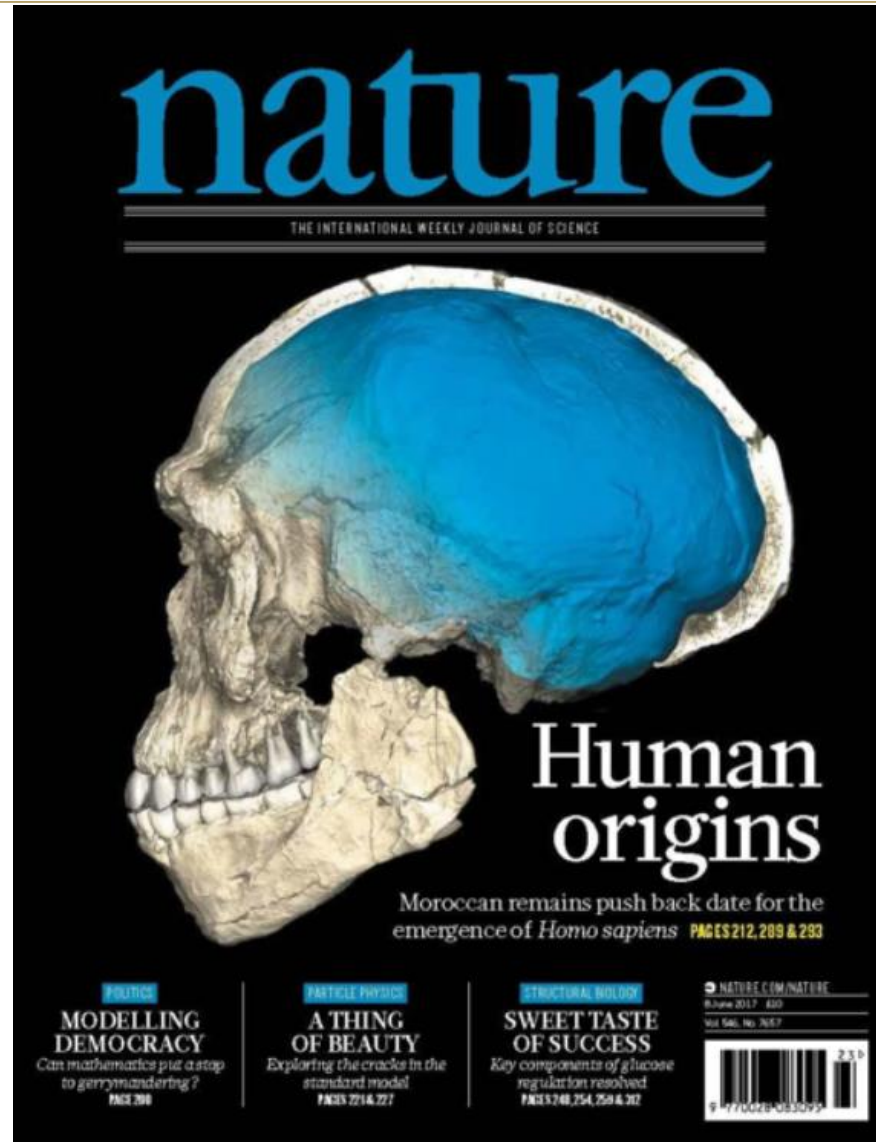
White et al. 2003



Classification and taxonomy



Hublin et al. 2013





Populations and demes

Should we think about populations rather than species?



Classification and taxonomy

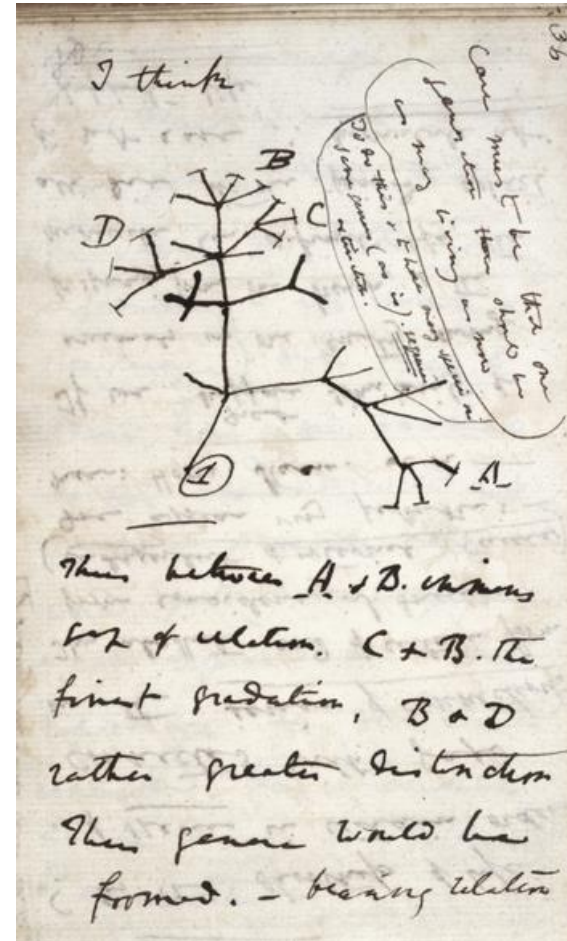
- ❑ Classifying the natural world
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What about the Neanderthals?

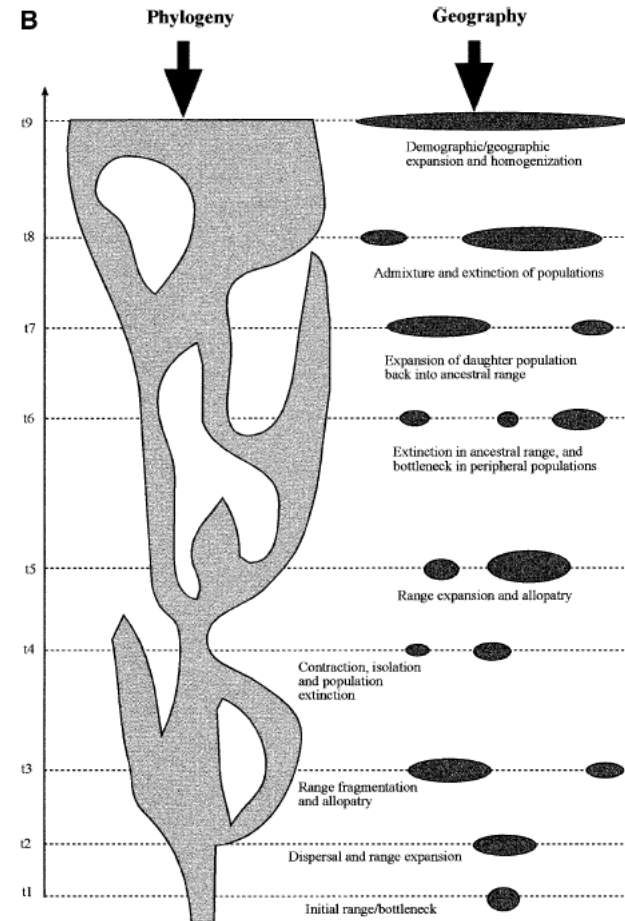
What about the ergasterines / *erectus*?





Populations and demes

- ❑ A population is bound by common external characters (ecological niche, behavior) that retain internal similarities
- ❑ A deme generally refers to a local population of a polytypic species that can interbreed with one another but retain a distinct gene pool
- ❑ When demes are isolated for a long time, they can become distinct subspecies
- ❑ Geographical constraints are implicit

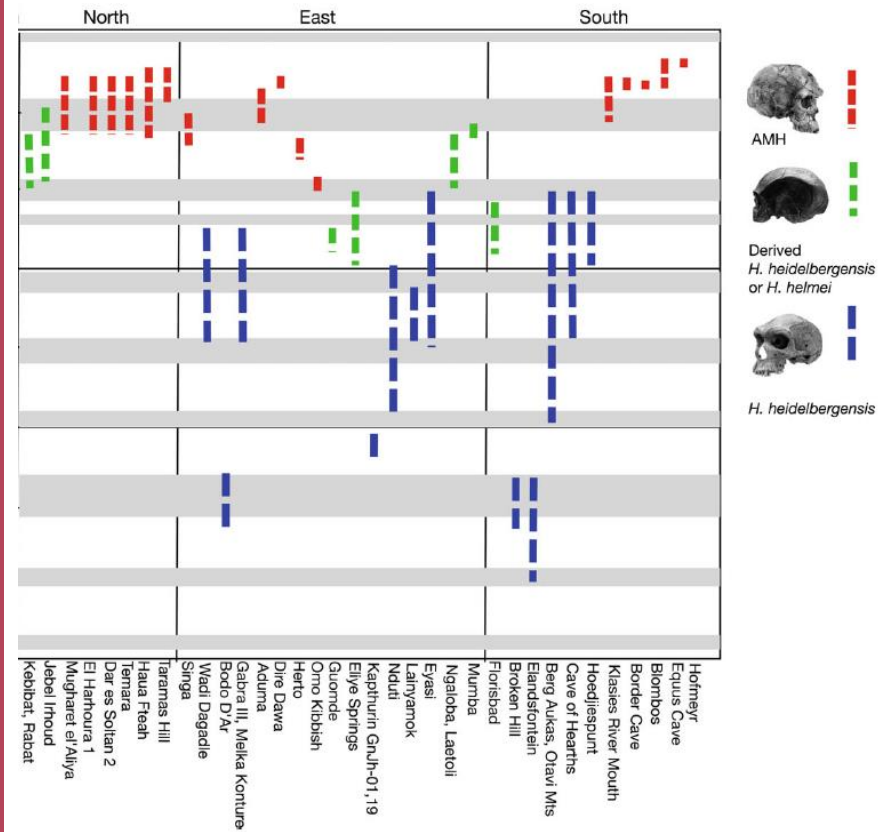


Mirazón Lahr & Foley 1998



Populations and demes

- ❑ Paleo-demes refer to chronologically and spatially constrained groups of fossils
- ❑ Accurate dating is crucial for formulating paleo-demes

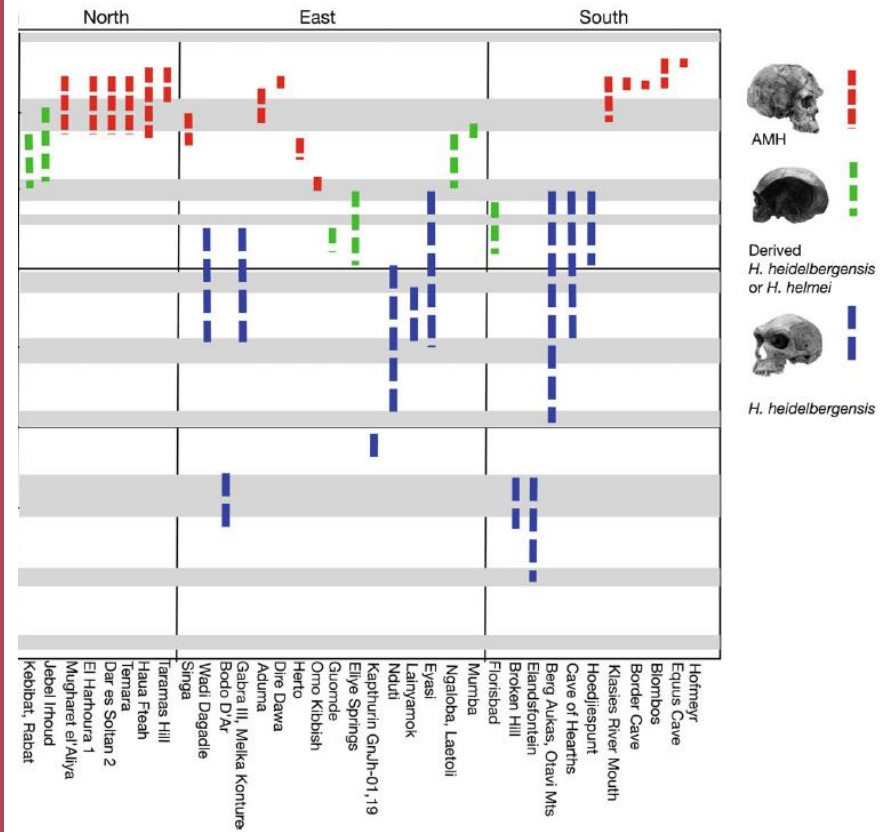


Mirazón Lahr & Foley 1998



Populations and demes

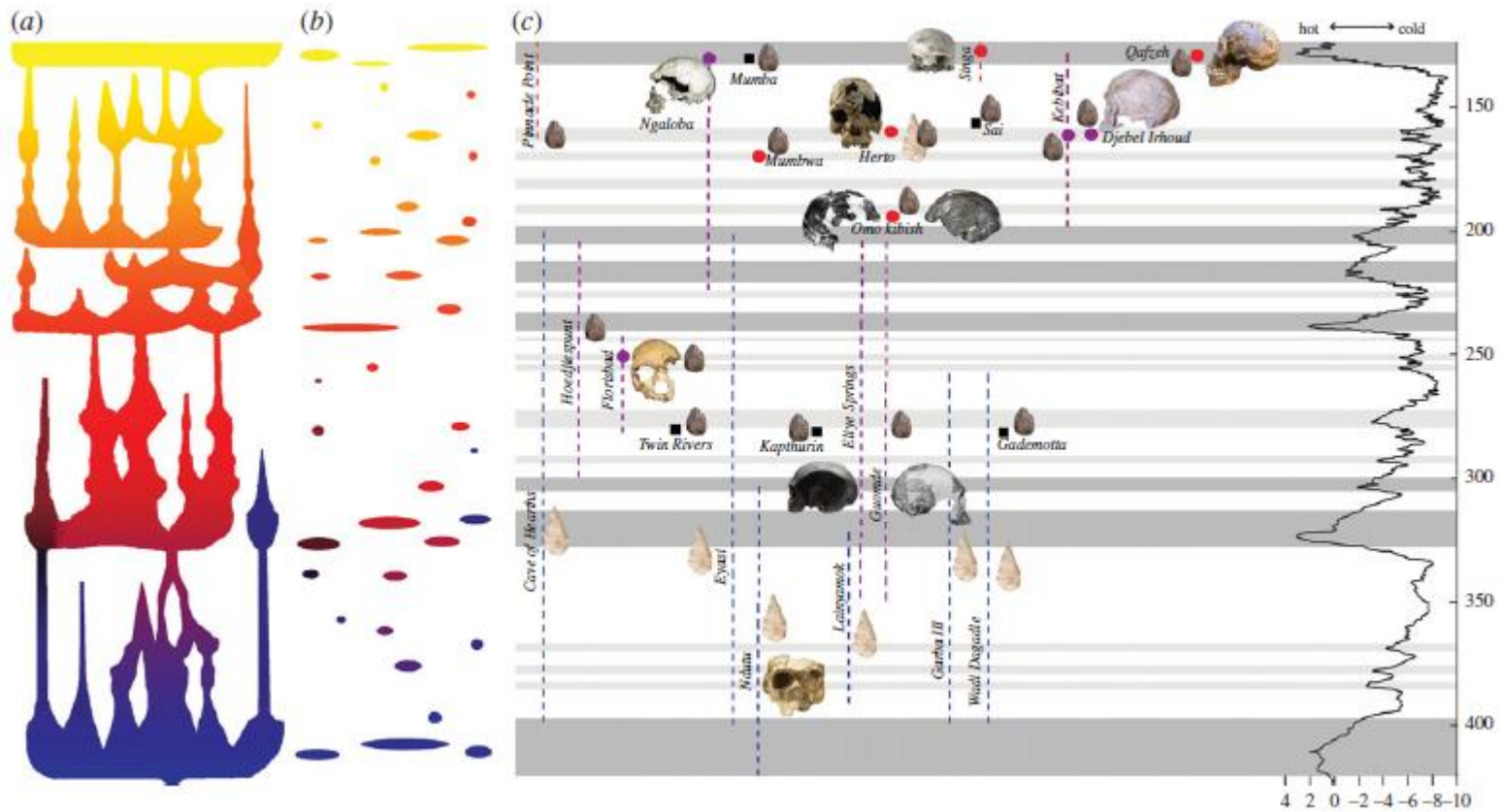
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Mirazón Lahr & Foley 1998

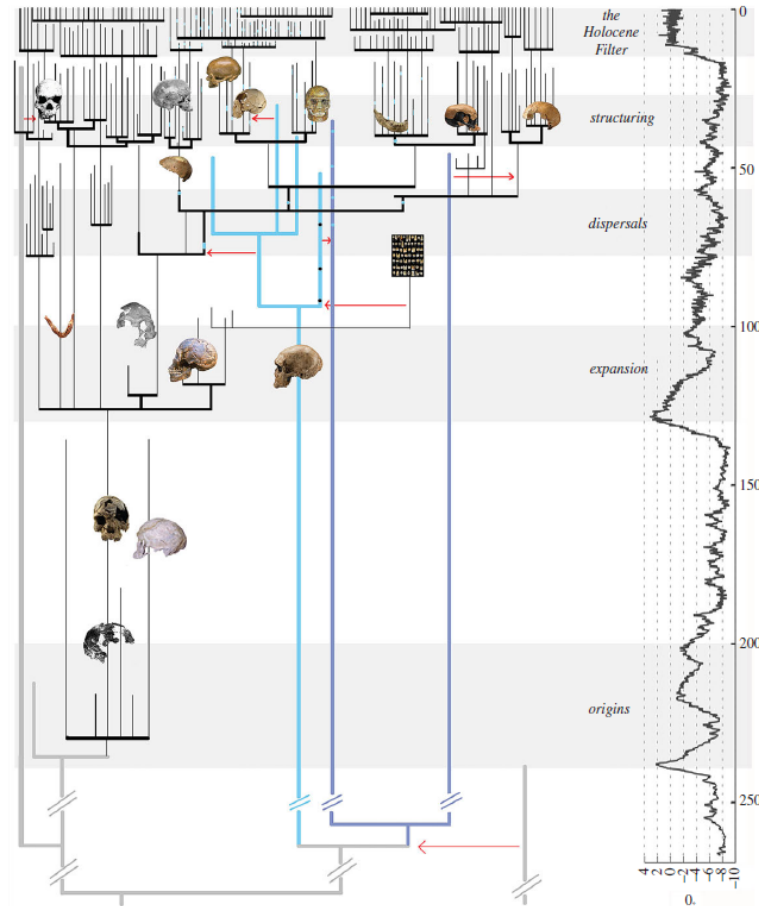


Populations and demes





Populations and demes



Mirazón Lahr 2016



For next week's lecture:

- ❑ **Genomics of modern human origins**
How does (ancient) DNA inform the debates on modern human origins?
- ❑ **Models of anthropogeny**
What model of modern human origins is best supported with the current fossil and genomic evidence?
- ❑ **Modern human dispersals**
When, how, and why did anatomically modern humans disperse out of Africa?

