









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?







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







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

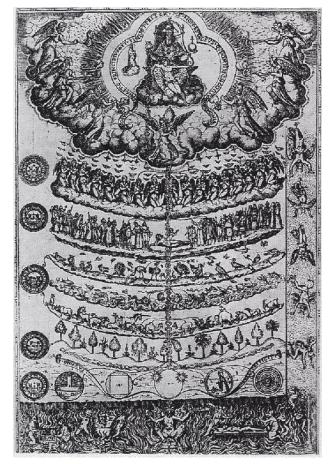






- ☐ Classifying the natural world
- Classification based on perceived organismal complexity
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Aristotle's Great Chain of Being, Plato's Academy, 4th Century Greece



Valades, Didacus. 1579. Rhetorica Christiana.







☐ 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)







Linnean hierarchical classification

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

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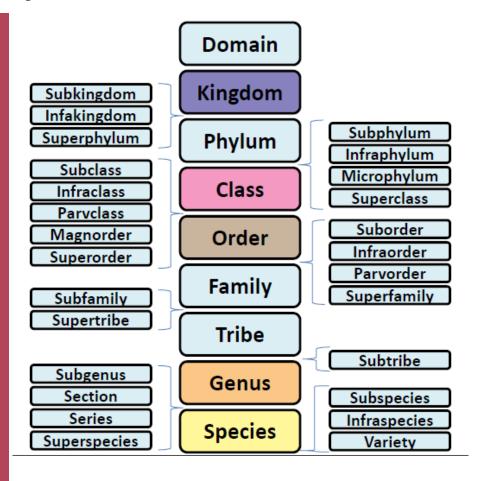
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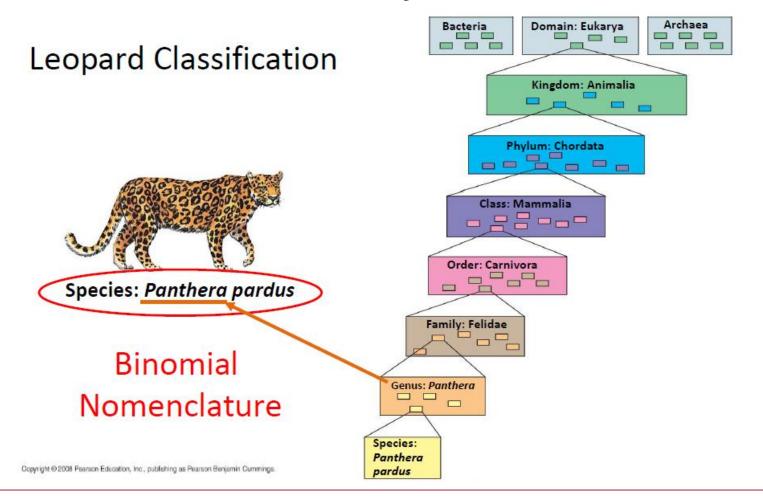
- Classifying the natural world
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- Sub-categories increasingly used

















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- Type specimens

Papilio agamemnon Linnaeus, 1758

Scalebar = 1 cm





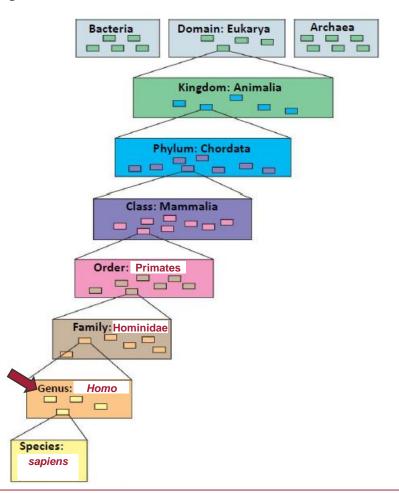
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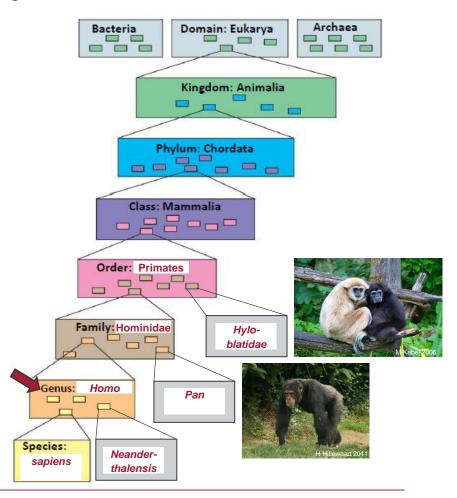








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- Linnean hierarchical classification
- Classification based on observations and physical affinities
- Development of binomial nomenclature
- Establishment of International Commission on Zoological Nomenclature (ICZN) in 1895
- Sub-categories increasingly used
- Type specimens

articles

New hominin genus from eastern Africa shows diverse middle Pliocene lineages

Meave G. Leakey". Fred Spoort, Frank H. Brownt. Patrick N. Gathogot. Christopher Kiarie". Louise N. Leakey" & lan McDougall

- Division of Palaeontology, National Museums of Kenya, P.O. Box 40658, Nairobi, Kenya † Department of Anatomy & Developmental Biology, University College London, WC1E 6], 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 Pilocene ancestral lineage, best represented by Australopithecus afarensis, which gave rise to a radiation of taxa in the late Pilocene. 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 o Plio-Pleistocene hominin phylogeny.

The eastern African hominin record between 4 and 3 Myr is bone with a more cylindrical articular eminence and deeper 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 hominins³⁻². face, particularly the moderate subnasal prognathism, sagittally and This apparent lack of diversity in the middle Pliocene contrasts transversely flat nasoalveolar clivus, anteriorly positioned maxillary 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

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 recov-

ered 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 nasoalveolar clivus; nasoalveolar clivus long and both transversely and sagittally flat, without marked juga; 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 (I^1 and I^2) roots near equal in size; upper premolars (P^3 , P^4) mostly three-rooted; upper first and second molars (M^1 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

mandibular fossa. It differs from A. anamensis, A. afarensis A. africanus and A. garhi in the derived morphology of the lower 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, 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. Etymology. From the Greek platus, meaning flat, and opsis, meaning face; thus referring to the characteristically flat face of this

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 Kenva (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, 8m 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

NATURE VOL 410 22 MARCH 2001 www.nature.com







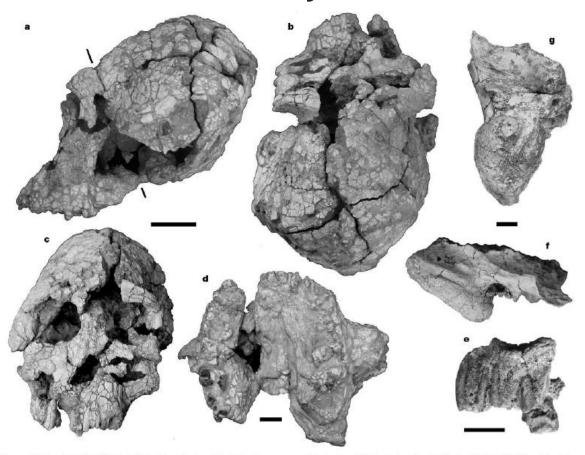


Figure 1 Holotype KNM-WT 40000 a, left lateral view (markers indicate the plane separating the distorted neurocranium and the well-preserved face). b, Superior view.

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.







features.

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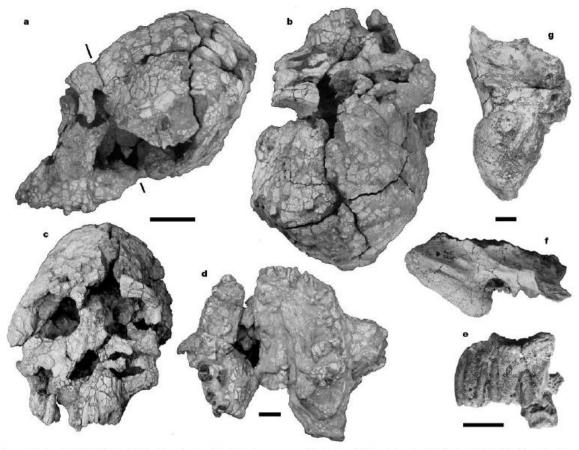


Figure 1 Holotype KNM-WT 40000 a, left lateral view (markers indicate the plane separating the distorted neurocranium and the well-preserved face). b, Superior view.

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 pars: a-c, 3 cm; d-g, 1 cm.







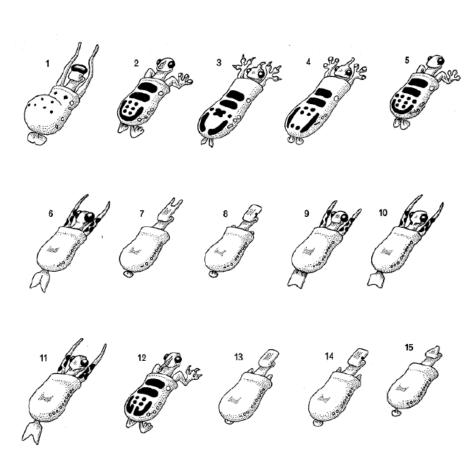
- Classifying the natural world
- ☐ Linnean hierarchical classification
- □ Numerical taxonomy
- □ Cladistics
- □ Phylogenetics







- ☐ Classifying the natural world
- ☐ Linnean hierarchical classification
- □ Numerical taxonomy
- A quantitiative 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

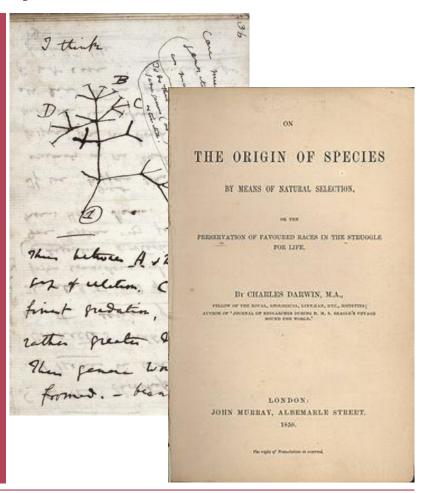








- ☐ Classifying the natural world
- ☐ Linnean hierarchical classification
- □ Numerical taxonomy
- □ Cladistics
- Explicitly accounts for evolutionary history: affinities are based on lines of descent (and modification)









- ☐ Classifying the natural world
- ☐ 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

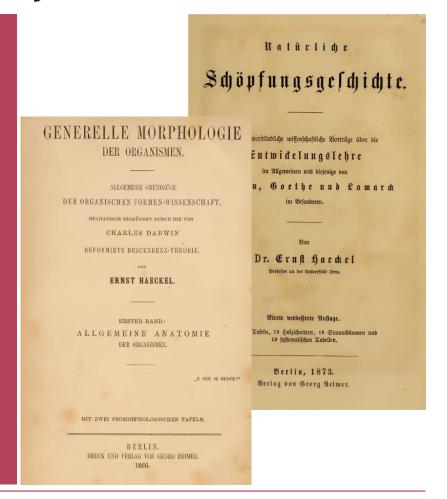








- Classifying the natural world
- ☐ Linnean hierarchical classification
- □ Numerical taxonomy
- □ Cladistics
- Phylogenetics
- Explicitly accounts for evolutionary history: affinities are based on lines of descent
- All traits considered should be heritable
- Phylogenetic methods rely on specific evolutionary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



















Modern human fossils

When and where do we see anatomically modern fossils?



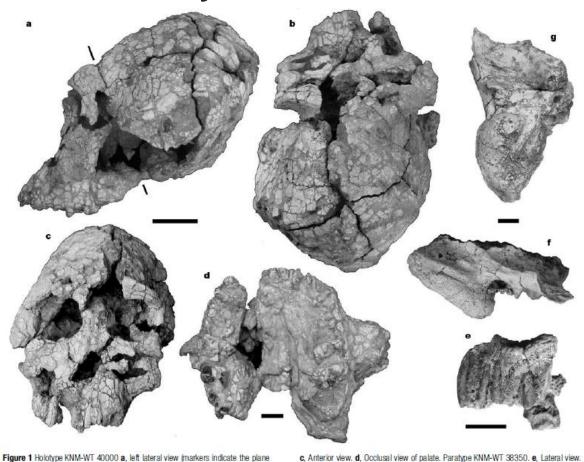


separating the distorted neurocranium and the well-preserved face). b, Superior view.



Classification and taxonomy





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KNM-WT 40001. f, Lateral view. g, Inferior view. Scale bars: a-c, 3 cm; d-g, 1 cm.







MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores superiores IV, paralleli. Mamma Pectorales 11.

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r. HOMO nofce Te ipfum (*)
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Regitur Consvetudine.

Sapiens.

1. H. diurius; varians cultura, local tetrapus, mutus, hirfutus.

Juvenis Urfinus lichainus, 1661,

Juvenis Lupinus bessensis, 1344,

Juvenis Ovinus hibernus, Talp. obs. IP., 9

Juvens Hannoveranus,

Pueri 2 Pyrenaici, 1719,

Johannes Leodicensis.

America-2. rufus, cholericus, rectus.

Pilis nigris, rectis, crassis; Naribus patulis, Facie ephelitica, Mento subimberbi.

Pertinax, hilaris, liber.

Pingis se lineis dædaleis rubris.

B al-

(*) Nosse Se Irsum gradus est primus sapientiæ, dictumque Solonis, quondam scriptum litteris aureis supra Diana Templum. Mas. ADOLPH, FRID. Frasat.

adolescente in perfectissimam, facultatibus instructam sere amibus pluribusque, quam reliqua cuncta. Nudam in nuda bumo, natali die, abjecit natura ad vagitus statim el ploratum, monibus pedibusque devinciendom Animal cateris imperaturum; cui scire nibil sine dostrina; non sari, non ingredi, non vosci, non aliud natura sponte, Plin. Vides itaque qualem vitam nobis verum natura promist, qua primum nascentium omen sietum esse voluit.

Districe: Te fanitaté & tranquillitate, si noveris, selicem: Moderatis conservandum, Nimis destruendum, Vaniatis efficiendum, Inspetis frangendum, Conspetis indurandum; polyphagum Culina instructifium, per errores gratissima, igne vinoque horrenda. Parvo sames constar, magno sastiam.

Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil emim homine imbecillius terra alti. Homer. Nulli vita fragilio; inuli tot Morbi, tot Care, tot Pericula. Bruee sinversion ntique avi tempus: Pars aqua morti similis exigitur; nec reputanta Infantia anni, aqi lensis carent; nec Senetice in param vivuaces: behescust Senis, torpent Membra, pramarimntur Vijus, Anditus, Incossis, Dentes, Ciborum instrumenta, Plin. Sic magna pars mortis jam prateriit, quidquid attais vetvo self Mors tenet. Totum denique innec, quem vides populum, quosique cogitas esci cito natura revocavit U condet; Mors omnes aque vocat; ivatis Diis propitiisque moriendum. Senec, II: 59.

Homo: know thyself*

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







MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores superioces IV, paralleli. Mamma Pectorales 11.

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* HOMO notes To iptum (*)
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20

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

Juvenis Urfinus lithannes. 1661.

Juvenis Lupinus heffenfis 1344. Juvenis Ovinus hibernus. Talp. obs. I.F. 9

Juvents Ov.nus bivernus. Intp. obj. 12.
Juvents Hannoveranus.

Pueri 2 Pyrenaici. 1719, Johannes Leodicensis.

America-2. rufus, cholericus, rectus.

Pilis nigris, rectis, craffis; Naribus patulis, racie ephe-

litica, Mento subimberbi.

Pertinax, hilaris, liber.

Pingit se lineis dædaleis rubris.

Regitur Consvetudine.

B al-

(*) Nosse Se Irsum gradus est primus sapientie, dictumque Solonis, quondam scriptum litteris aureis supra Diane Templum. Mul. ADOLP H.

Physiologic: Te contextum Nervis, intertextum Fibris, Machina tenella, sed adolescente in persedissimam. seoultatibus instructam sere omnibus pluribusque, quam reliqua cuncta. Nudum in nuda bumo, natali sie, abjecit natura ad vagitus statim of ploratum, manibus pedibusque devinciendum Animal cateris imperaturum; cui seire nibil sine dostrina; non sari, non ingredi, non vesci, non aliud natura sponte, Plin. Vides itaque qualem vitam nobit verum natura promisit, que primum nascentium omen sietum esse voluit.

Districe: Te fanitaté & tranquillitate, si noveris, selicem: Moderatis conservandum, Nimis destruendum, Vaniatis efficiendum, Inspetis frangendum, Conspetis indurandum; polyphagum Culina instructifium, per errores gratissima, igne vinoque horrenda. Parvo sames constar, magno sastiam.

Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil emim homine imbecillius terra alti. Homer. Nulli vita fragilio; inuli tot Morbi, tot Care, tot Pericula. Bruee sinversion ntique avi tempus: Pars aqua morti similis exigitur; nec reputanta Infantia anni, aqi lensis carent; nec Senetice in param vivuaces: behescust Senis, torpent Membra, pramarimntur Vijus, Anditus, Incossis, Dentes, Ciborum instrumenta, Plin. Sic magna pars mortis jam prateriit, quidquid attais vetvo self Mors tenet. Totum denique innec, quem vides populum, quosique cogitas esci cito natura revocavit U condet; Mors omnes aque vocat; ivatis Diis propitiisque moriendum. Senec, II: 59.

sapiens: culture, light







MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores superiores IV, paralleli. Mamma Pectorales 11.

1. HOMO nofce Te infum (*)

Sapiens. 1. H. diurnus; varians cultura, loce. Ferus. tetrapus, mutus, hirfutus.

Juvenis Lupinus hessensis 1344 Juvenis Ov.nus hibernus. Tulp. obs. IP. 9 Juvenis Hannoveranus.

Pueri 2 Pyrenaici. 1719. Fohannes Leodicentis

America-A. rufus, cholericus, rectus.

***Pilis nigris, rectis, craffis; Naribus patulis, Facie ephelitica, Mento subimberbi.

Pingit se lineis dædaleis rubris.

Regitur Consvetudine.

B al-

(*) Nosse Se Irsum gradus est primus sapientie, dictumque Solonis, quondam scriptum litteris aureis supra Diane Templum. Mul. ADOLP H.

Physiologic: Te contextum Nervis, intertextum Fibris, Machina tenella, sed adolescente in persedissimam. seoultatibus instructam sere omnibus pluribusque, quam reliqua cuncta. Nudum in nuda bumo, natali sie, abjecit natura ad vagitus statim of ploratum, manibus pedibusque devinciendum Animal cateris imperaturum; cui seire nibil sine dostrina; non sari, non ingredi, non vesci, non aliud natura sponte, Plin. Vides itaque qualem vitam nobit verum natura promisit, que primum nascentium omen sietum esse voluit.

Sietteta: Te fanitaté & tranquillitate, si noveris, selicem: Moderatis conservandum, Nimisi destruendum, Variatis efficiendum, Inspetis frangendum, Conspetis indurandum; polyphagum Culina instructissum, per prores gratissum, igne vinoque horrenda. Parvo fames consta, magno fastissum.

Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil emim homine imbecillius terra alti. Homer. Nulli vita fragilio; inuli tot Morbi, tot Care, tot Pericula. Bruee sinversion ntique avi tempus: Pars aqua morti similis exigitur; nec reputanta Infantia anni, aqi lensis carent; nec Senetice in param vivuaces: behescust Senis, torpent Membra, pramarimntur Vijus, Anditus, Incossis, Dentes, Ciborum instrumenta, Plin. Sic magna pars mortis jam prateriit, quidquid attais vetvo self Mors tenet. Totum denique innec, quem vides populum, quosique cogitas esci cito natura revocavit U condet; Mors omnes aque vocat; ivatis Diis propitiisque moriendum. Senec, II: 59.

sapiens ferus: speechless, hairy

sapiens americanus: red, choleric/reactive,



20





What (or who) is the modern human holotype?

MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores superiores IV, paralleli. Mamma Puctorales 11.

r. HOMO nofce Te ipfum (*)

Sapiens.

Ferus.

H. diurnus; varians cultura, local tetrapus, mutus, hirfutus.

Juvenis Urfinus lichamas. 1661.

Juvenis Lupinus heffenfis 1344.

Juvenis Ov.nus hibernus. Tali. obf. IF. 9.

Juvenis Hannoveranus. Pueri 2 Pyrenaici. 1719. Johannes Leodicenfis.

America-2. rufus, cholericus, rectus.

nus. Pilis nigris, rectis, craffis; Naribus patulis, Pacie ephe-

litica, Mento subimberbi.

Pertinax, hilaris, liber.

Pingit se lineis dædaleis rubris.

Regitur Consvetudine.

B al-

(*) Nosse Se Irsum gradus est primus sapientie, dictumque Solonis, quondan scriptum litteris aureis supra Diana Templum, Muj. ADOLP H.

Physiologie: Te contextum Nervis, intertextum Fibris, Machina tenella, sed adolescente in persedissimam, seoultatibus instructam sere omnibus plunibusque, quam reliqua cuncta. Nudam in nuda bumo, natali die, abjecit natura ad vagitus statim & ploratum, manibus pedibusque devinciesdam Animal cateris imperaturum; cui seive nibil sine dostrina; non sari, non ingredi, non vosci, non alind natura sponte, Plin. Vides itaque qualem vitam nobis verum natura promisit, qua primum nascentium omen stetum esse voluit.

Dietetice: Te fanitaté & tranquillitate, si noveris, selicem: Moderatis conservandum, Nimis destruendum, Variatis afficiendum, Inspetis frangendum, Conspetis indurandum; polyphagum Culina instructifium, per errores gratissima, igne vinoque horrenda. Parco sames constan, magno sastissima.

Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncto fizientis temporis. Nibil enim homine imbecillius terra alti. Homer. Nuli vita fragilior; nulli tot Morbi, tot Care, tot Pericula. Brue mivoyssom utique evi tempus: Pavs eagus morti similis exigitur; nue reputantar Infantia anni, qui soni, cerent; nue Seuche in peram vivaces: behescust Sensia, torpent Membra, premorimitur Vijus, Anditus, Incossus, Dentes, Ciborum instrumenta. Plim. Sie magna pars mortir jam preteriit, quidquid estatis vetro est Divor tenet. Totum denique home, quem vides populum, quousque cogita est cito natura revocavit C condet; Mors omnes aque vocat; ivatis Diis propitiique moriendam. Sence, Il: 30

MAMMALIA PRIMATES. Homo.

Europaus.

B. albus, fanguineus, torosus.
Pilus flavescentibus prolixis. Oculis cæruleis.
Levis, acutifismus, inventor.
Tegicur Veitimentis arctis.
Regicur Ritibus.

Afiaticus.

Pilis nigricantibus Oculis fuscis;
Severus, fastuosus, avarus.
Tegitur Indumentis laxis.
Regitur Opinionibus.

В 3

♪ n

Naturaliter: Te audacis natura miraculum, Animalium Principem, cujus caussa cunsta cunsta genuit natura, esle animal sens, ridens, melodum, loquens, docile, pidicans, admirans, fajientissumm; sed fragile, nudum, suapte natura inerme, ad omnem fortune contumeliam projedum, aliena opis indigens, anitz mentis follicitzque tutele, precarii spiritus, pertinacis sei, querule vias, terda sapientise. Temporis annihilati emortui contuntorim, prassentis vividi dilandatorem, futuri dubii attimatorem in viu volucri, perticissima, irrevocabili, se optima quague dies miseris mortalibus avi prima sugit; shum ad quottitanum opus laboriosa Egettas vocat; alium sums incarectra. Itiliemque suffocat; alium Ambirio numquam quieta follicitat; alias Davinis, quas optacerat, metuit, & voto laborio su contuntorio alium semper vettibulum obsidens rurba, Hic se habere dalet Lib ros, hic se perdidite; Lacryune nobis decrunt antequam caussa decendi. Sed quousque nos malos nostra maia rapuere: circumserre per cutia, ru re in ignotos, tratos sine injaria, ferarum more occilere quem non oderirura, secundos optare ventos, quorum selicitats est ad bella p ritere; patum vudelicet ad mortes nostras terra lare pater, Sonec. Cettera animantia congregari contra dissimilia, as Homini pismima ex bomine mala Plin.

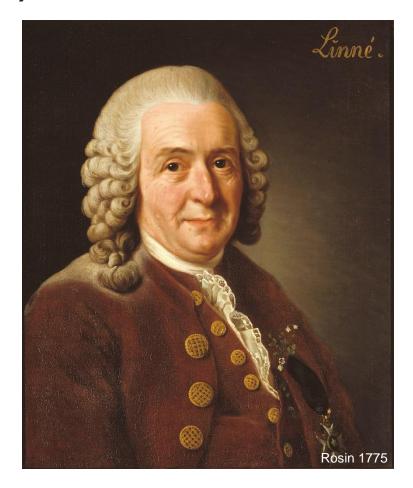
Politice: Te recht loco tenere errorem publicum factum, qui te vix enixum confverudinis larva induit, nurrit, educat. alut, regit, fecundum quam honestus, sortis, sapiens, moratus, pius existimaris; Cum gubernatus Opinione vivas ad Confverudinem, pec ad Rationem. Te, inter perituros constitutum, cum nulli centigit impune nacic, benefici loco petere, ut ultimus cervicem præbeas, dum interim, dulci fortuna ebrius, colligendo in crastinum Lapillos fortunæ cerus, verbis in furorem ageris, alter theoretiae pios odio persequeris, quantosque tumultus excitas, non ur servias, sed cui; nugis irrevocabile tempus confumis; immortalia exernaque animo volutas, de seris nepotibus pronepotibusque disponis, novas spes oblitus conditionis. Tuæ ponis, cum interea lorga conantem mors opprimit, at in agone oculos aperiens (x y 2 e x 15) somnium primo observas; Sic vivinus ut immortales id movimus ut mortales. Senec.

Moraliter: Te sub rudi larva Ineptum, Lascivum, Imitatorem, Ambitiosum, Prodigum, Solicitum, Astutum, Austrom, Invidum, Avarum, transformari in Attentum, Castum, Consideratum, Modessum, Sobrium, Tranquillum, Sincerum, Mitem, Beneficum, sini Contentum, Uni animantium













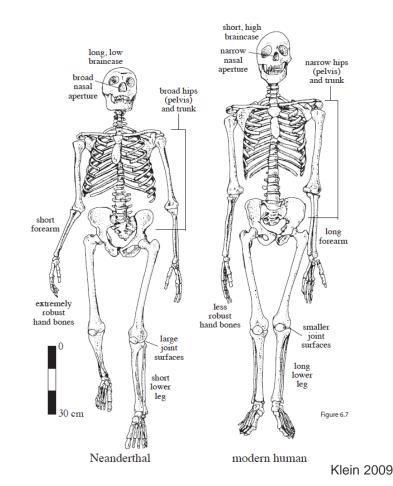


General anatomy:

- □ Globular head
- □ Long limbs
- □ Narrow thorax

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

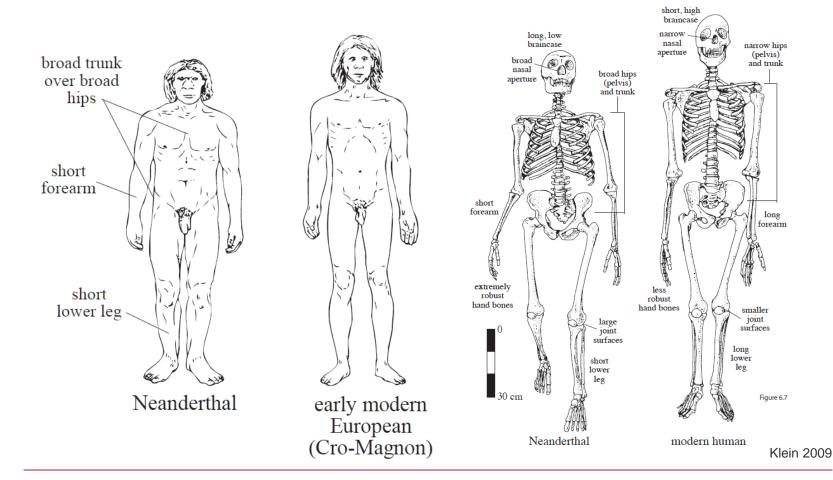
Cranial and pelvic structure evolves in large portion neutrally, while limbs (and likely thorax) are more plastic and subject to adaptation.







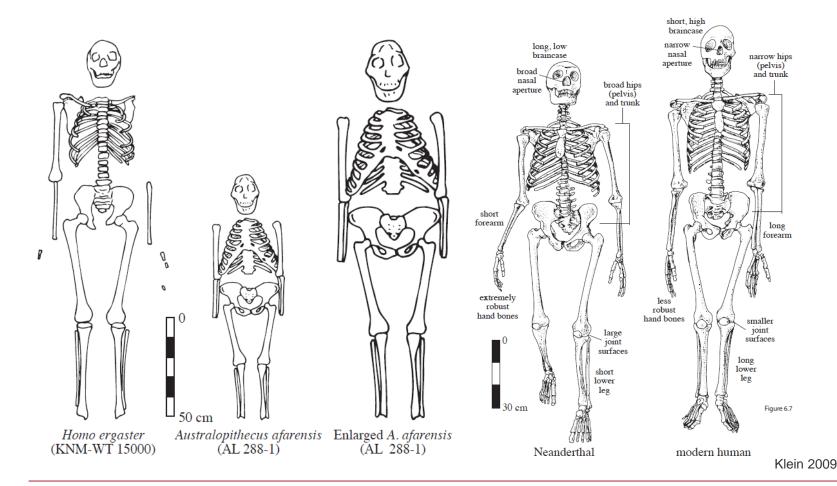
















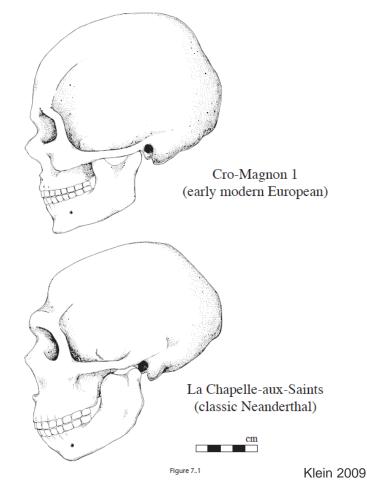


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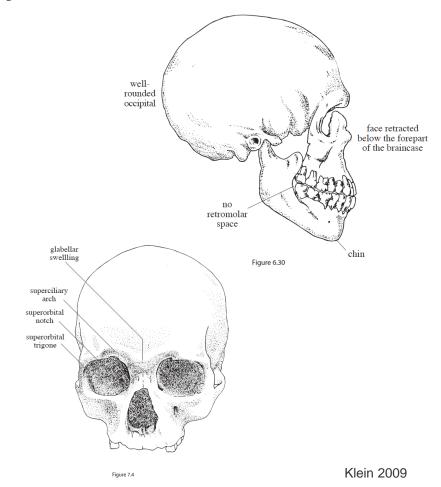


What do people living today look like?

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



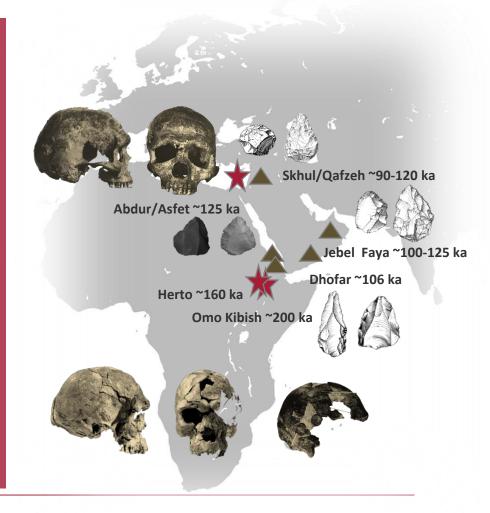






The fossil record of Africa and the Levant

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

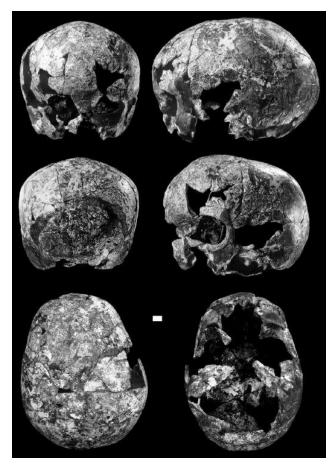








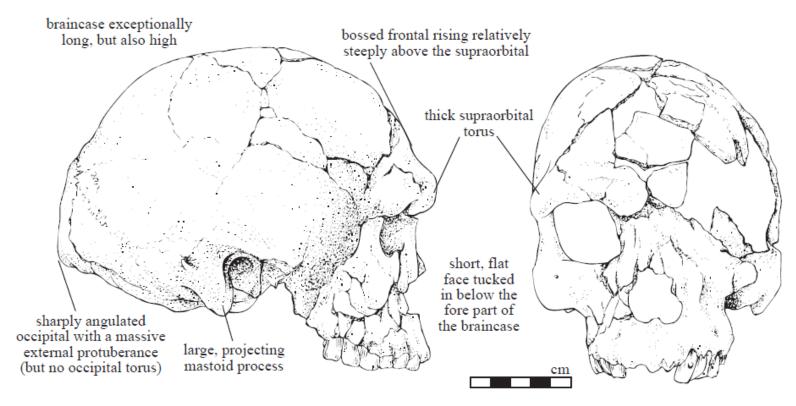












Herto BOU-VP-16/1

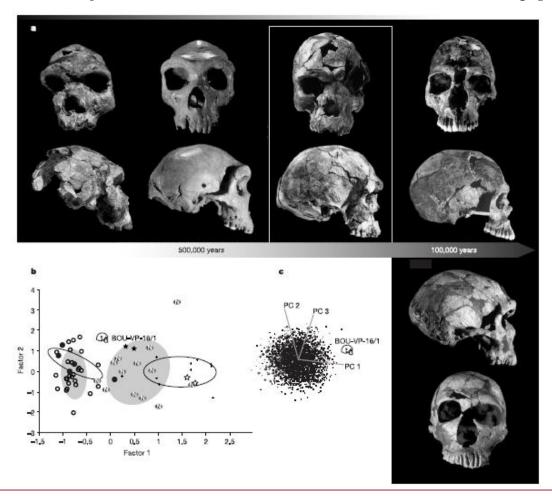
Figure 6.26

Klein 2009





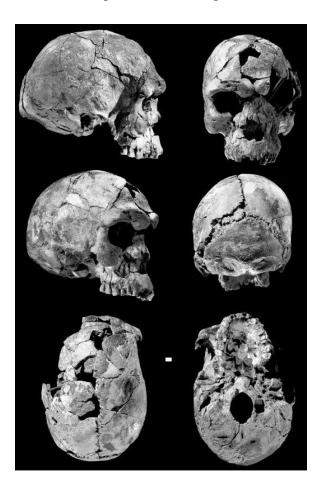












Methods

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

Etymology. The subspecies name 'idàltu' 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 top ography (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.

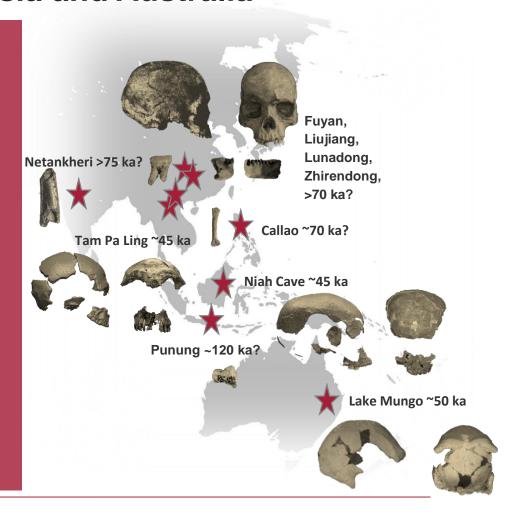






The fossil record of Eurasia and Australia

- ☐ 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?





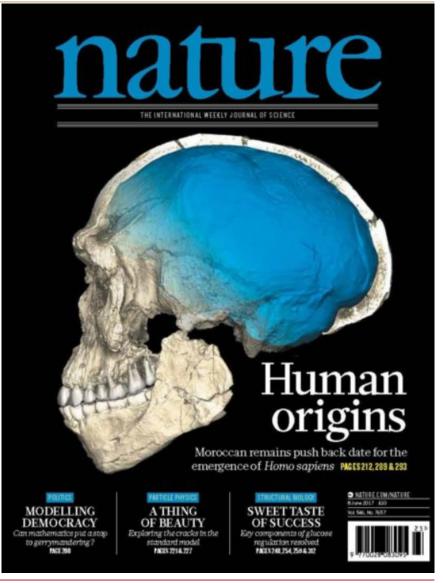




Classification and taxonomy



Hublin et al. 2013









Should we think about populations rather than species?







Classification and taxonomy

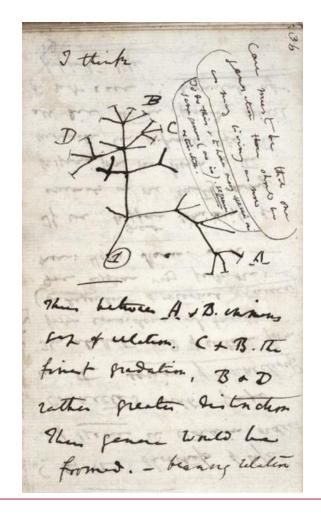
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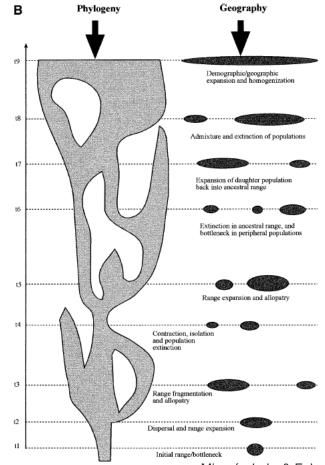








- □ A population is bound by common external characters (ecological niche, behavior) that retain internal similarities
- A deme generally refers to a local population of a polytypics species that can interbreed with one another but retain a distinct gene pool
- ☐ When demes are isolated for a long time,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



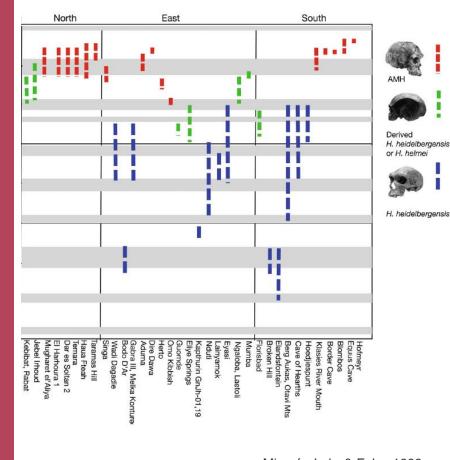
Mirazón Lahr & Foley 1998







- □ Paleo-demes refer to chronologically and spatially constrianed groups of fossils
- ☐ Accurate dating is crucial for formulating paleo-demes



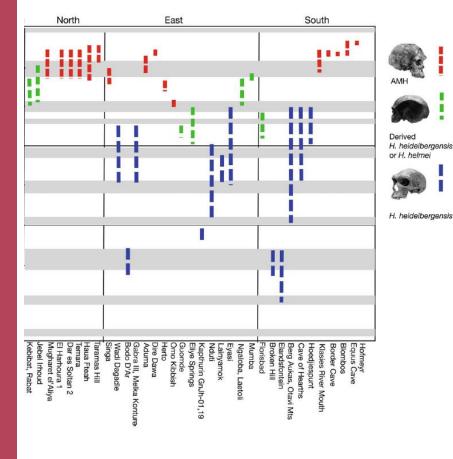
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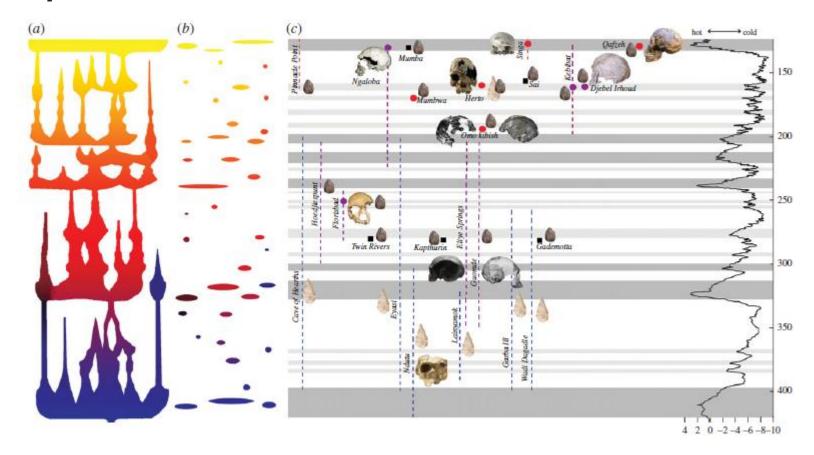


Mirazón Lahr & Foley 1998







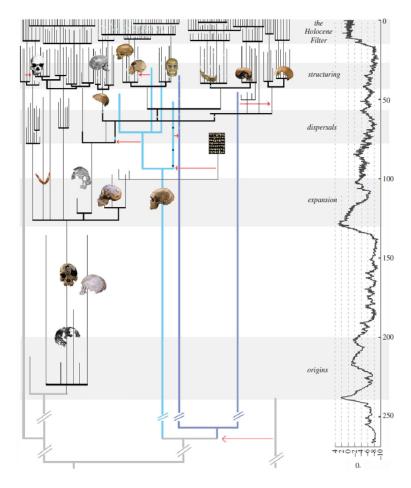


Mirazón Lahr 2016









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?
- When, how, and why did anatomically modern humans disperse out of Africa?







