







## **Modern Human Origins**

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19 Nov 2018, Lecture 5

EBERHARD KARLS

UNIVERSITÄT

TÜBINGEN







#### 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?

3 | Modern Human Origins, Lecture 5

19/11/2018







- **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

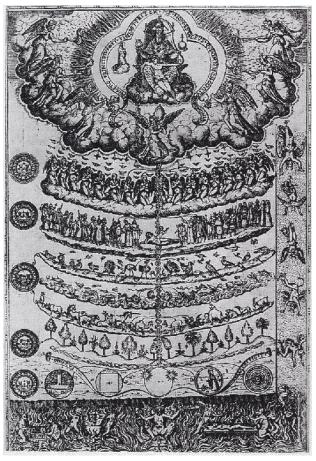






- Classifying the natural world
- Classification based on perceived organismal complexity
- Tied to metaphysical understanding of existence

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. "

عاجالة ولد فمادي

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







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

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#### Classifying the natural world

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

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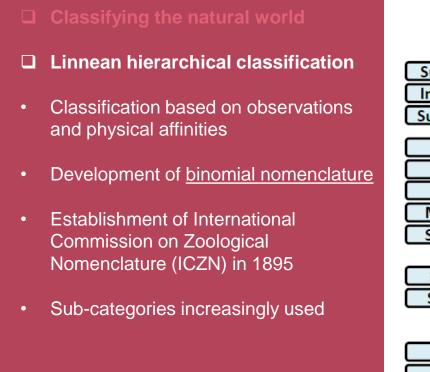
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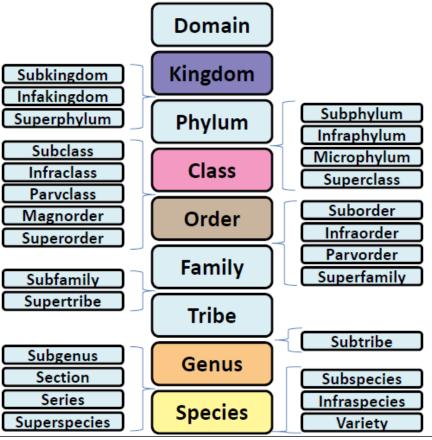
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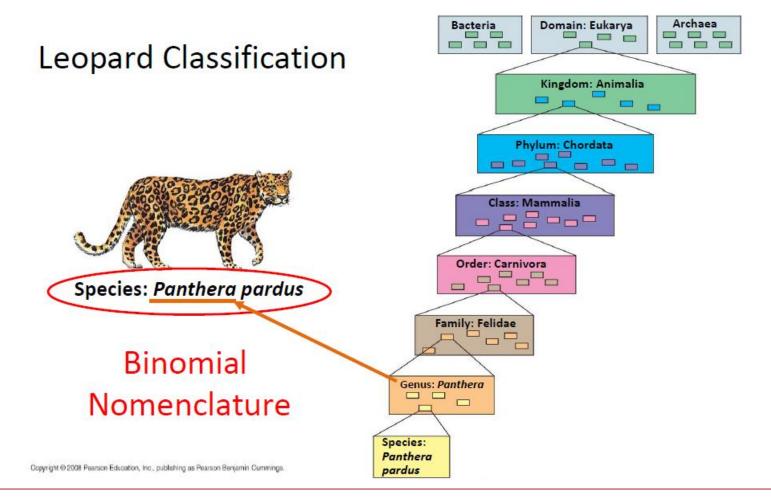


















- Linnean hierarchical classification
- Classification based on observations • and physical affinities
- Development of binomial nomenclature
- Establishment of International Commission on Zoological Nomenclature (ICZN) in 1895
- Sub-categories increasingly used
- Type specimens

#### Papilio agamemnon Linnaeus, 1758

Scalebar = 1 cm



C The Linnean Society of London

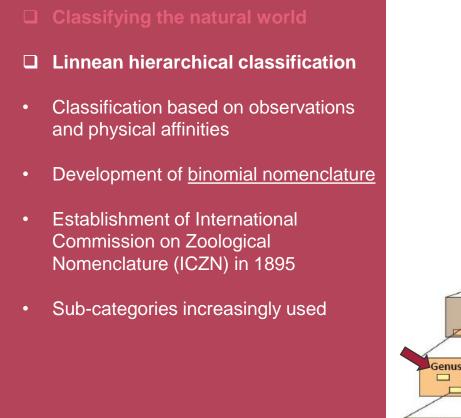


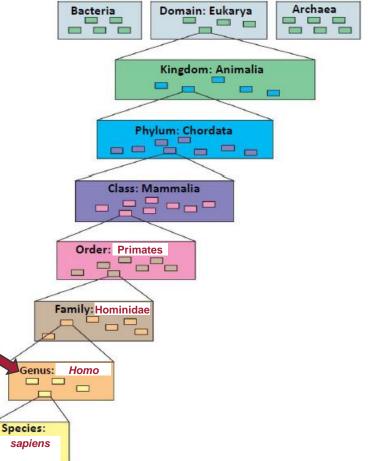
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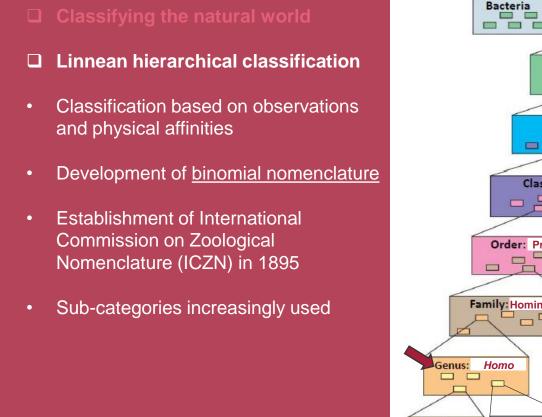


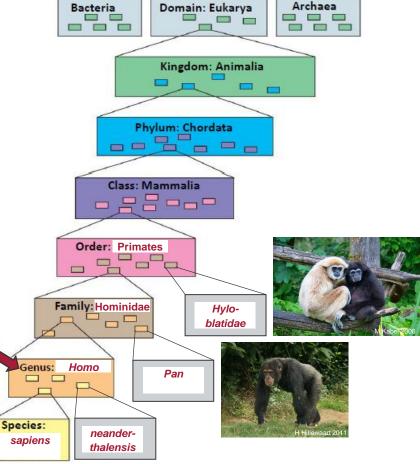










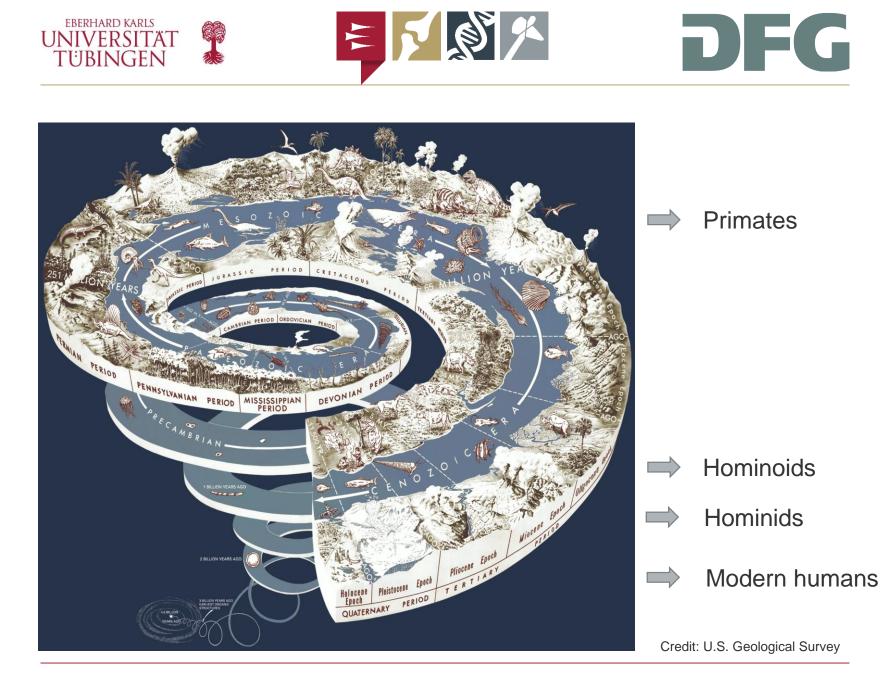








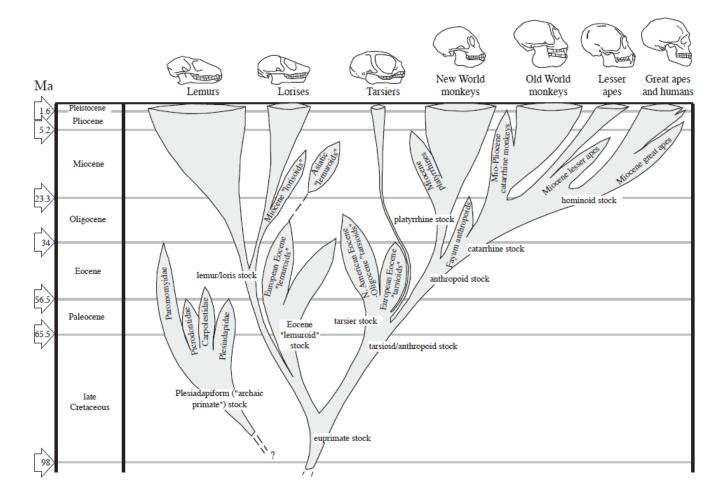
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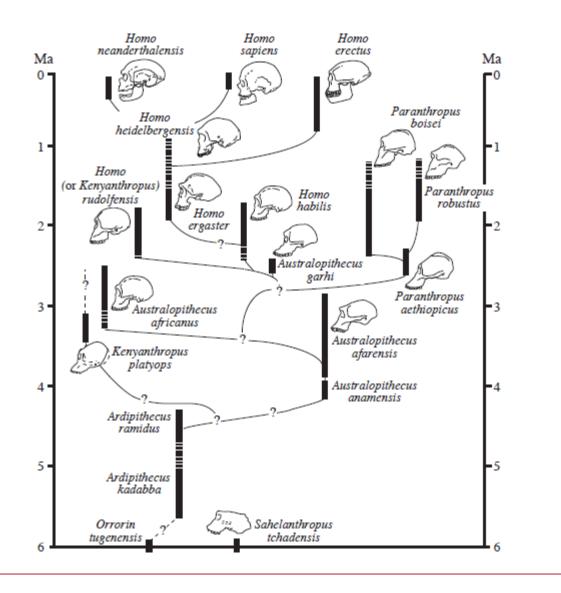


Klein 2009















articles

#### **Classification and taxonomy**

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

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

Meave G. Leakev\*. Fred Spoort, Frank H. Brownt, Patrick N. Gathogot, Christopher Kiarie\*. Louise N. Leakev\* & Ian McDougal®

Division of Palaeontology, National Museums of Kenya, P.O. Box 40658, Nairobi, Kenya Department of Anatomy & Developmental Biology, University College London, WCIE 6JJ, 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 Plocene 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 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 hominins<sup>1,2</sup>. 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 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 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<sup>1</sup> and I<sup>2</sup>) roots near equal in size; upper premolar,  $(P^3, P^4)$  mostly three-rooted; upper first and second molars (M<sup>1</sup> 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 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 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

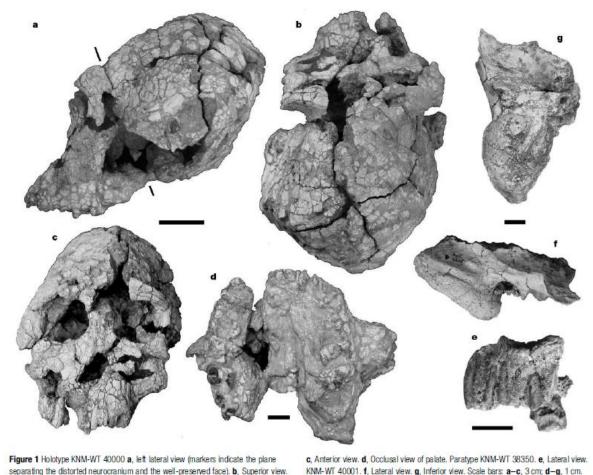
The overall size of the KNM-WT 40000 cranium falls within the range of A. afarensis and A. africanus. It is preserved in two main parts, the neurocranium with the superior and lateral orbital margins, but lacking most of the cranial base; and the face, lacking

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on the basis of its unique combination of primitive and derived indisputably assigned to *fronto* (For example, *fr. eletius s.i.* and features.

#### Description of Kenyanthropus platyops

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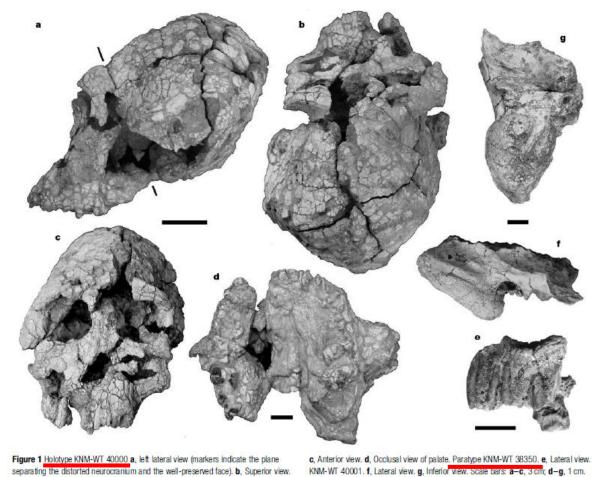
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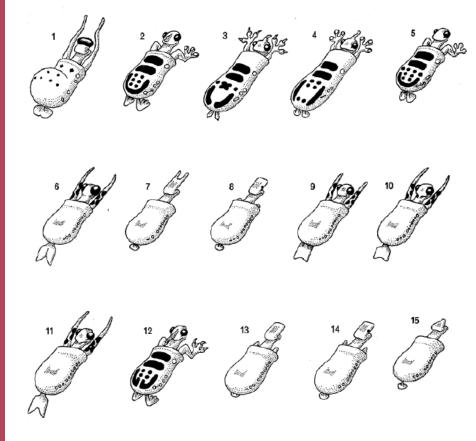
- Classifying the natural world
- Linnean hierarchical classification
- □ Numerical taxonomy
- □ Cladistics
- Phylogenetics







- Classifying the natural world
- Linnean hierarchical classification
- □ Numerical taxonomy
- A quantitiative comparative method: a multivariate approach to assess <u>operational taxonomic units (OTUs)</u>
- 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)

I think ON THE ORIGIN OF SPECIES BY MEANS OF NATURAL SELECTION. ----PERSERVATION OF PAVOUEED BACES IN THE STECOOLE. FOR LIFE. between A 12 of ulition . - + gradation By CHARLES DARWIN, M.A., PELLOW OF THE BOYAL SPONDERAL LOCKARA, STC., SATURDAY, DOCUME, OF REPAIRING STRENG P. N. P. BRANDA'S VOTING rather greater & Then genne ton formed. - been LONDON: JOHN MURRAY, ALBEMARLE STREET. 1859. the right of Presidence is second







- 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

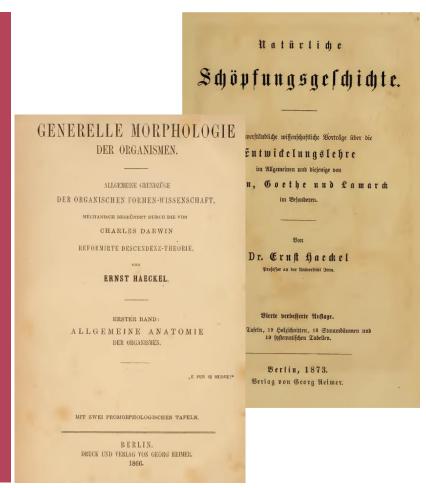








- Classifying the natural world
- Linnean hierarchical classification
- Numerical taxonomy
- Cladistics
- Phylogenetics
- Explicitly accounts for evolutionary history: affinities are based on lines of descent
- All traits considered should be heritable
- Phylogenetic methods rely on specific evolutionary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

















# Modern human fossils

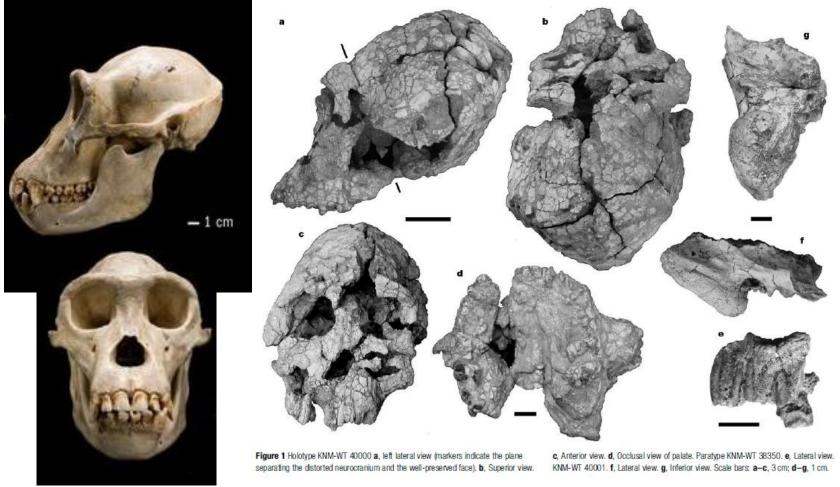
When and where do we see anatomically modern fossils?

29 | Modern Human Origins, Lecture 5















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MAMMALIA PRIMATES. Homo.

Dentes Primores fuperiores IV, paralleli. Mamma Pecierales 11.

r. HOMO nofce Te ipfum (\*)

Sapiens. I. H. diurnus; varians cultura, loce Ferus. tetrapus, mutus, hirfutus. Juvenis Urfinus lithannus. 1661. Juvenis Lupinus beffenfis 1314. Juvenis Ov.nus hibernus. Taly. obf. IF. 9 Juvenis Hannoveranus. Pueri 2 Pyrenaici. 1719. Johannes Leodicenfis.

America-2. rufus, cholericus, rectus.

Pilis nigris, rectis, craffis; Naribus patulis, racie ephexus. litica, Mento fubimberbi. Pertinax, hilaris, liber. Pingit se lineis dædaleis rubris. Registur Confvetudine.

B al-

(\*) Nosse Se IPSUM gradus eft primus fapientie , diclumque Solonis, quondain fcriptum litteris aureis fupra Dianae Templum. Mus. ADOLPH. FRID. Frafat.

- adolescente in perfectifimam, facultatibus instructam fere omnibus pluribusque, quam reliqua cuncta. Nudum in nuda humo, natali die, abjecit Disquit, quaiti fatim U ploratum, manibar palibarque devinciendam Ani-mai cacteris importaturam ; cui feire nibil fine dollrina; non fari, non ingr-di, non voici, non alima natura florate. Plin. Vider itaque qualem vitam nobis verum natura promifit, qua primum nascentium omen fleium effe voluit. Seneca,
- Diatetice : Te fanitate & tranquillitate, fi noveris, felicem : Moderatis confervandum, Nimiis destruendum, Variatis afficiendum, Infvetis frangendum, Confectis indurandum ; polyphagum Culina infructifiima, per errores gra-tiffima, igne vinoque horrenda. Parvo fames conftat, magno fastidiam. Seneca.
- Pathelogie: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil eurim komine imbecillius terra alit. Homer. Nulli via fragilior; sulli tot Morbi, tot Curea, tot Pericula. Brece amiverfam ntique avi tempus : Pars aqua morti fimilis exigitur ; nec reputantar Infantia anni, qui fenfu carent; nec Senecte in panam vivaces: bebefcunt Senfus, torpent Membra, præmoriuntur Vijus, Auditus, Inceffus, Dentes, Ciborum inoff Monera, Plin. Sic magna pars mortis jam prateriit, quidquid etatis retro eff Mors tenet. Totum denique inne, quem vides populum, quousque cogias effe ; cito natura revocavit & condet ; Mors omnes aque vocat ; iratis Diis propitiisque moriendum. Senec. II: 59.

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

*Homo*: know thyself\*

I. PRIMATES.







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MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores fuperiores IV, paralleli. Mamme Peciforales 11.

\* HOMO notes To infum (\*)

Sapiens. 1. H. diurnus; varians cultura, bec. Fuvenis Urfinas lith...mas. 1661. Juvenis Lupinus beffenfis 1344. Juvenis Ov.nus hibernus. Talg. obf. IFF. 9 Juvenis Hannoveranus. Pueris Pyrenaici. 1719, Johannes Leodicenfis.

America-2. rufus, cholericus, rectus.

nus, Pilis nigris, rectis, craffis; Naribus patulis; racie ephelitica, Mento fubimberbi. Pertinax, hilaris, liber. Pingit fe lineis dædaleis rubris. Regitur Confvetudine.

B al-

- (\*) Nosse Se Irsum gradus eft primus fapientie, diflumque Solanir, quondam feriptum litteris aureis fupra Diane Templum, Mul. ADOLPH, FRID. Prefat.
- Phyfiologice: Te contextum Nervis, intertextum Fibris, Machina tenella, fed adoleicente in perfectifilmam, facultatibus intructam fere omnibus pluribusque, quam reliqua cunche. Nudam in nuda humo, natai die, abjecit natura ad vagitus fiatim & ploratum, manibus patibusque devinciendam Auimal cateris imperaturum; cui foire nibil fine dolfrinar: non fin; non ingredi, non vojci, non aliud natura sponte, Plin. Vides itaque qualem vitam nobis verum natura promifit, que primum nascentium omen steum esse
- Distettice : Te faniaté & tranquilliate, fi noveris, felicem : Moderatis confervandum, Nimiis defiruendum, Variatis efficiendum, Infectis frangendum, Confoctis indurandum; polyphagum Culina infructifitma, per errores gratifitma, igne vinoque horrenda, Parzo fames conflat, magno foftidism. Seneca.
- Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil enim homine imhecilluss terra alit. Homer. Nulli vita fragilior; subli to Morbi, tet Ceres, tet Pericala. Breve smisurfina utique avi tempus: Pars aqua morti fimilis exigitar; nee reputantar Infantie anni, qui fenfu cartet; nee Scuedia in parama vivaces; bebefcunt Scufus, torpent Membra, pramoriantar Vijus, Anditus, Incoffus, Denter, Ghorum inframenta, Plin. Sie magna pars morti jam prateriti, quidquid etatis retro eff Mors tenet. Totum denique hanc, quem vides populan, quouque cogitat dfi; cito natura revocasit & condet; Mors omnet eque vecat; ivatis Diis propitizigne moriendam. Stree, II: 19.

#### sapiens: culture, light







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MAMMALIA PRIMATES. Homo.

I. PRIMATES.

Dentes Primores fuperiores IV, paralleli. Mamma Peciforales 11.

r. HOMO nofce Te iphun (\*)

Saplens. Ferus.	1. H. diurnus; varians cultura, loce. tetrapus, mutus, hirfutus.
	Juvenis Lupinus beffenfis 1344 Juvenis Ovinus hibernus. Talp. obf. 16. 3 Juvenis Hannoveranus. Pueri 2 Pyrenaici. 1719. Johannes Leodicenfie.
America-:	. rufus, cholericus, rectus.

nus. Pilis nigris, rectis, craffis; Naribus patulis; Facie ephelitica, Mento lubimberbi.

Pingit se lineis dædaleis rubris. Regitur Consvetudine.

B al-

- (\*) Nosse Se Irsum gradus eft primus fapientie, diclumque Solonir, quondam feriptum litteris aureis lupra Diana Templum. Mul. ADOLPH, FRID. Prafat.
- Phyfiologice: Te contextum Nervis, intertextum Fibris, Machina tenella, fed adoleicente in perfectifilmam, facultatibus intructam fere omnibus pluribusque, quam reliqua cunche. Nudam in nuda humo, natai die, abjecit natura ad vagitus fiatim & ploratum, manibus patibusque devinciendam Auimal cateris imperaturum; cui foire nibil fine dolfrinar: non fin; non ingredi, non vojci, non aliud natura sponte, Plin. Vides itaque qualem vitam nobis verum natura promifit, que primum nascentium omen steum esse
- Distetice : Te faniaté & tranquilliate, fi noveris, felicem : Moderatis confervandum, Nimiis deftruendum, Variatis efficiendum, Infretis frangendum, Confostis indurandum; polyphagum Culina infructifitma, per errores gratifitma, igne vinoque horrenda, Parvo famer conflat, magno fostidism. Seneca.
- Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nibil enim homine imhecilluss terra alit. Homer. Nulli vita fragilior; subli to Morbi, tet Ceres, tet Pericala. Breve smisurfina utique avi tempus: Pars aqua morti fimilis exigitar; nee reputantar Infantie anni, qui fenfu cartet; nee Scuedia in parama vivaces; bebefcunt Scufus, torpent Membra, pramoriantar Vijus, Anditus, Incoffus, Denter, Ghorum inframenta, Plin. Sie magna pars morti jam prateriti, quidquid etatis retro eff Mors tenet. Totum denique hanc, quem vides populan, quouque cogitat dfi; cito natura revocasit & condet; Mors omnet eque vecat; ivatis Diis propitizigne moriendam. Stree, II: 19.

*sapiens ferus*: speechless, hairy

*sapiens americanus*: red, choleric/reactive,





20

MAMMALIA PRIMATES. Homo.

#### I. PRIMATES.

Dentes Primores fuperiores IV, paralleli. Mamma Préforales 11.

**r.** HOMO nofce Te ipfum (\*)

- Sapiens. 1. H. diurnus; varians cultura, loca.
- Forus. tetrapus, mutus, hirfutus. Juvenis Urfinus lithe.nmus. 1661. Juvenis Lupinus belfenfis 1314. Juvenis Ov.nus hibernus. Talp. obf. UP. 9 Juvenis Hanoveranus. Pueri 2 Pyrenaici. 1719. Johannes Leodicenfis.

America-2. rufus, cholericus, rectus.

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- (\*) Nosse Se Irsum gradus eft primus fapientiæ, diclumque Solonie, quondam feriptum litteris aureis fupra Diana Templum. Mul. ADOLPH, FRID. Prafat.
- Physiologice: Te contextum Nervis, intertextum Fibris, Machina tenella, fed adoleicente in perfectifilmam, facultatibus inflructam fere omnibus pluribusque, quam reliqua cunche. Nadam in nuda humo, natai die, abjecie natura ad vagitus statim & ploratum, manibus padibusque devinciendam Animal cateris imperaturum; cui scire nibil sine doftrina: non fari, non ingredi, non vojci, non alind natura sponte. Plin. Vides itaque qualem vitam nobis verum natura promisit, que primum nascentium omen sterum este Sentea.
- Distetice : Te fanisaté & tranquillisate, fi noveris, felicem : Moderatii confervandum, Nimiti defiruendum, Variati afficiendum, Infvetis frangendum, Confoctis indurandum ; polyphagum Culina inflructifilma, per errores gratifiima, igne vinoque horrenda. Parco famer conflas, magno faftidium. Seneca.
- Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nikil enim homine imbecillini terra alit. Homer. Nulti vita fragilior; sulli tot Morbi, tot Care, tot Pericuta. Breve miver/inn utique evi tempus: Pav equa morti fimilis exigitur; net reputranza Infantia anni, qui fenfu carent; net Sciecci en penano visuaer: belocicant Senfus, torpent Menubra, premorimitur Vijus, Anditus, Incefüs, Dentes, Giborum inflymmenta, Plim. Sie magna pav mortis jam preteriit, quidquid etatis vetro ef Mori tenet. Totum denique honc, quem vides popularin, quantque cogitai effe; cito natura revocavit & condet; Mori omnes eque vocat; ivatis Diis propititique moriendam. Sence, II: 50.

#### MAMMALIA PRIMATES. Homo.

- Europæut. B. albus, fanguineus, torofus. Pilis flavelcentibus prolixis. Oculis cæruleis. Levis, acutifimus, inventor. Tegizur Veitimentis arctis. Regizur Ritubus.
- Afiatiens. Pilis nigricantibus Oculis fufcis, Severus, faftuofus, avarus. Tegitur Indumentis laxis. Regitur Opinionibus.

Bз

J. ni-

11

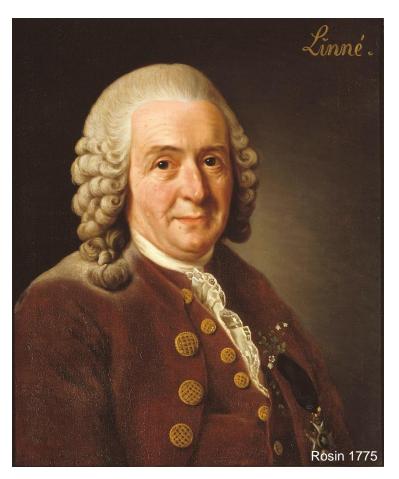
- Naturaliter : Te audacis nature miraculum, Animalium Principem, cujus culfa cuncta genuit natura, elle animal flens, ridens, melodum, loquens, docile, judicans, admirans, fajientifilmum; fed fragile, nudum, liupte natura inerme, ad omnem fortume contumeliam projectum, alienze opis indigens, anxia mentis follicitaque tuteles, precari fipritus, pertinacus fiei, querulee viae, terda fapientis. Temporis annihilati emortu contuntorum, prafontis vividi dilayidatorem, futuret dubii attimatorem in vita volueri, pretiofifima, irrevocabili, fie optima quæque dies miferis mortalibus ævi prima fogit; shum ad quotitianum opus laboriofa Egettus vocat; alium Luwe incarcerat: altilemque fufficat; alium Ambitio numgram quieta follicitat: alius Duvinis, quas optaverat, mettuit, & voco la botar duo; alumi Sointodo, alium femper vetitibulum obidens rarba, Hie fe habere d. let Lib ros, bie fe perdidille; Lacryme nobis deerunt antequam cauffe docienti, Sed quousque nos malos nofta mala rapuere: circumferte per cuia, ru re in ignotos, tratos fine injeria, ferarum more occirketz quem non oferirus, fecundos optare ventos, quorum felicitas eft ad bella printer; palum vedeicet ad mottes noftar salta rapatere: Senee, Cateta animanta congregari contua diffimilia, an Hemini piarima ex bomine mala Plin.
- Politici: Te redit loco tenere errorm publicum fschum, qui te vix enixum confvetudinis larve induit, nurrit, educat. slut, regit, fecundum quam honeftus, fortis, fgiens, moraus, pius exittimaris; Cum gubernatus Opinione vivas ad Confverudinem, nec ad Rationem. Te, inter perituros conficurum, cum nulli contigit impune nolci, benefici loco petere, ut ultimus cervicem prabeas, dum interim, dulci fortuna ebrius, colligendo in craffinum Lapillos fortunz cerus, verbis in flurorem ageris, alicer theoretise pios odio perfequeris, quantosque tumultus excitas, non ut fervias, fed cui; nugis irrevocabile tempus confumis; immorralia exernaque animo voluras, de feris nepotibus pronepotibusque diffonis, novas fpes oblitus conditionis Tuz ponis, cum interta lorga conantem mors opprimit, at in agone oculos aperiens ( $\alpha \times J \in M \times 0$ ) fomnium primo obfervas; Sic visimau at immertales ( $\alpha$  mormat at mortalet. Senec.
- Moraliter : Te fub rudi larva Ineptum, Lafeivum, Imitetorem, Ambitiofum, Prodigum, Solicitum, Aftbrum, Aufterum, Invidum, Avarum, transformari in Attentum, Cafthum, Confideratum, Modeflum, Sobrium, Tranquillum, Sincerum, Mitern, Beneficum, fuis Contentum. Uni animanism

B al-















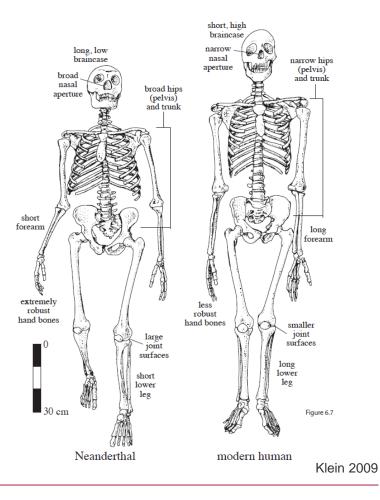
### What do people living today look like?

#### **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.

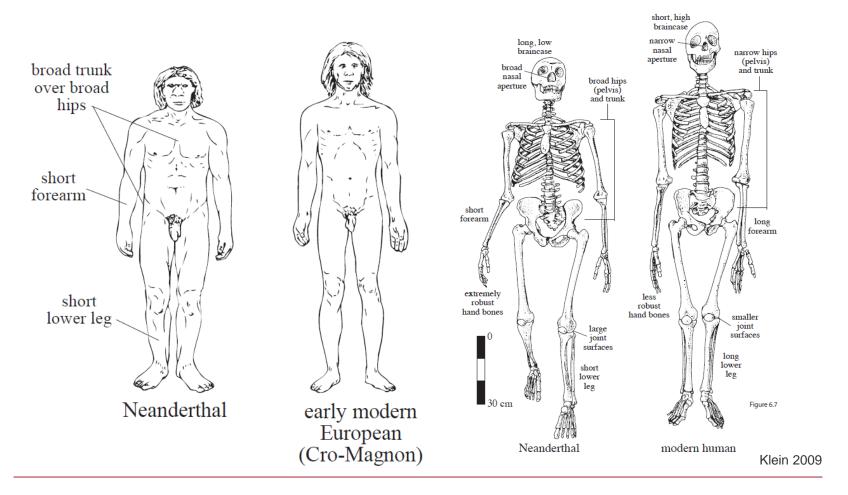








# What do people living today look like?

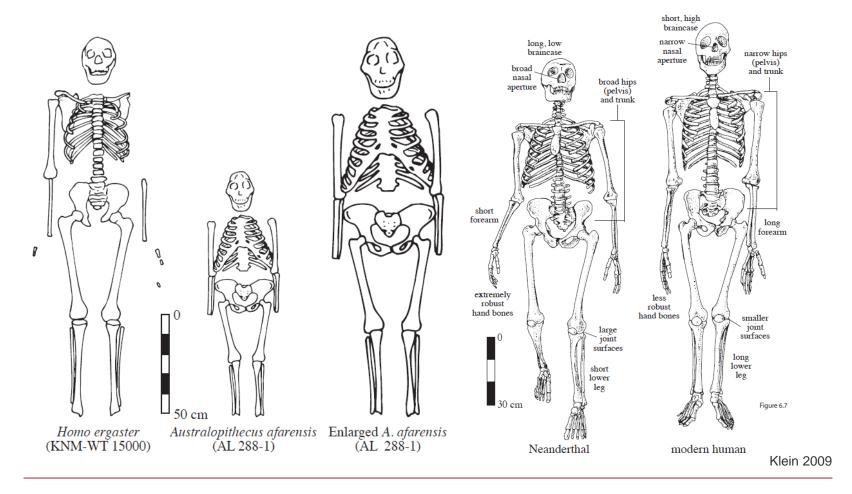








# What do people living today look like?









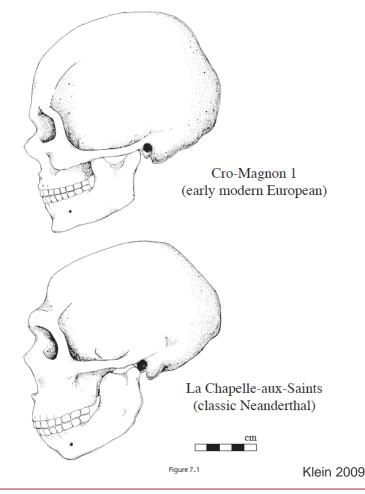
# What do people living today look like?

#### 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 on an evolutionary scale and change on an ontogenetic scale.





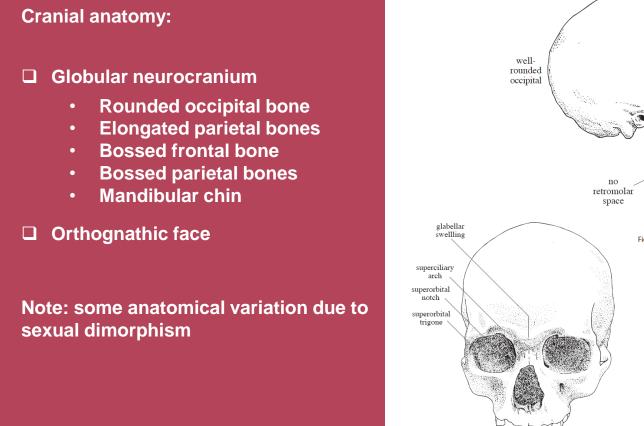


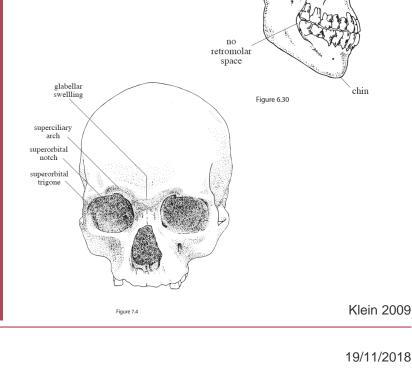


face retracted below the forepart

of the braincase

# What do people living today look like?



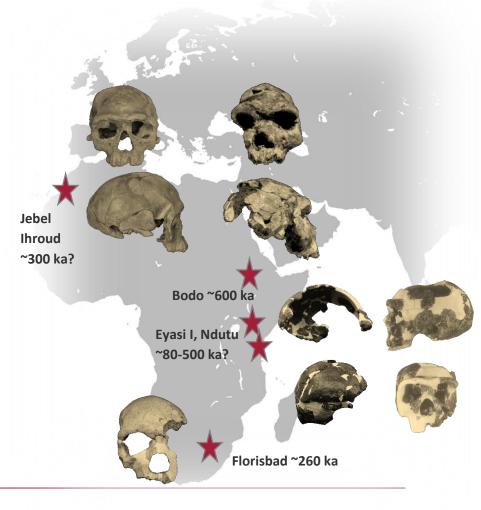








- Genomics: divergence of modern humans and Neanderthals ~400-800 ka
- Human paleontology: "Muddle in the Middle [Pleistocene]"
  - Mix of plesiomorphic (primitive) and apomorphic (derived) features
  - "Archaic" Homo sapiens









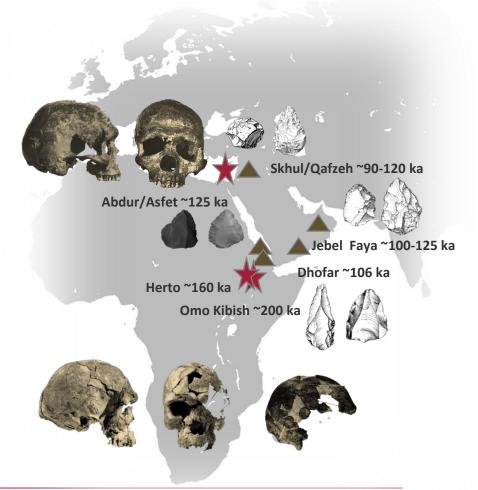








- Omo Kibish, Ethiopia, ~200 ka
- □ Herto Bouri, Ethiopia, ~160 ka
- □ Skhul, Israel/Palestine, ~90-120 ka
- □ Qafzeh, Israel/Palestine, ~90-120 ka















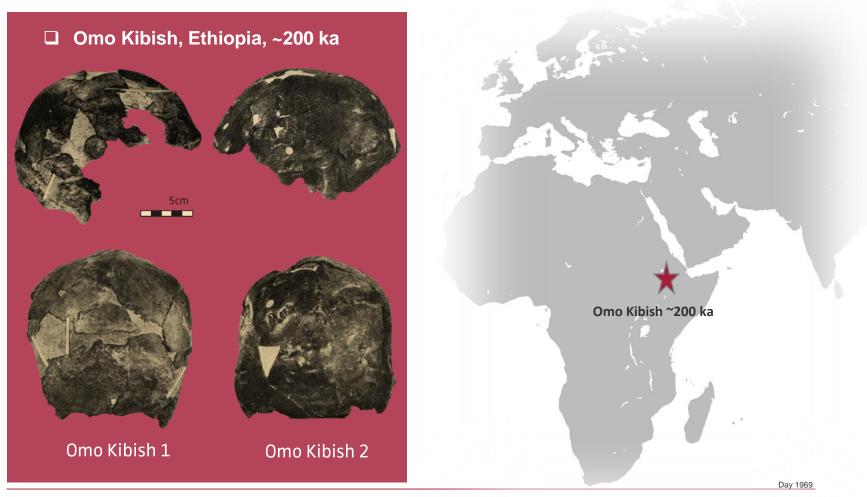






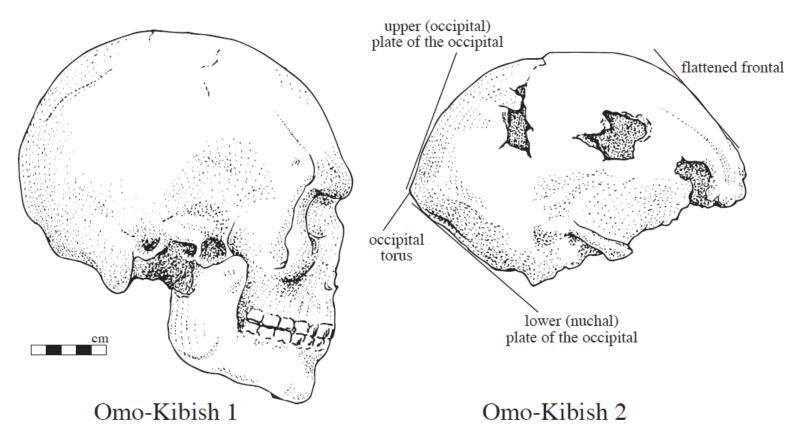








#### The fossil record of Africa and the Levant



Klein 2009





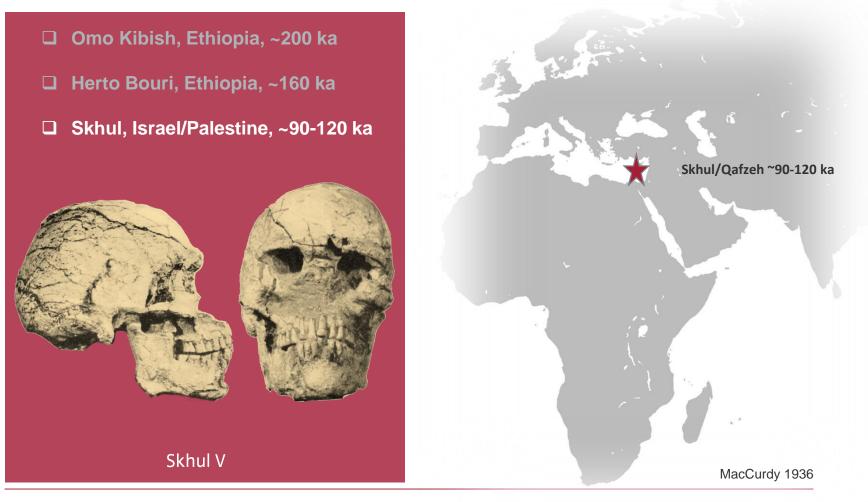








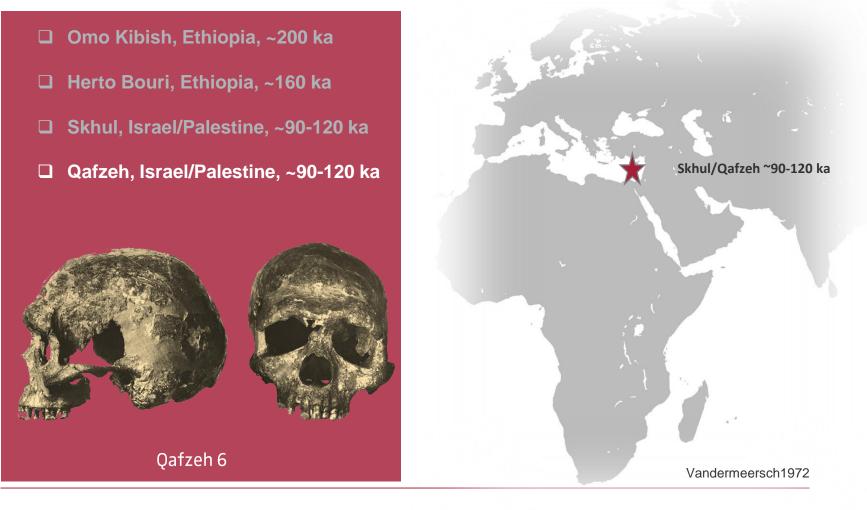










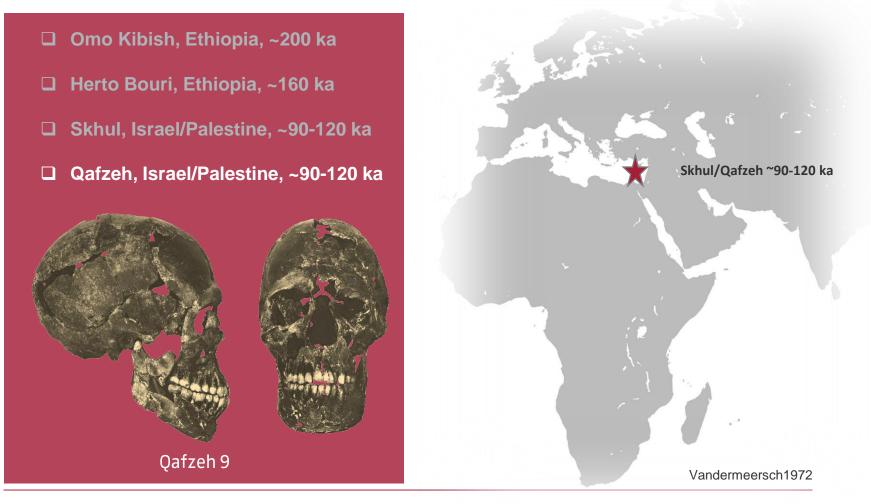




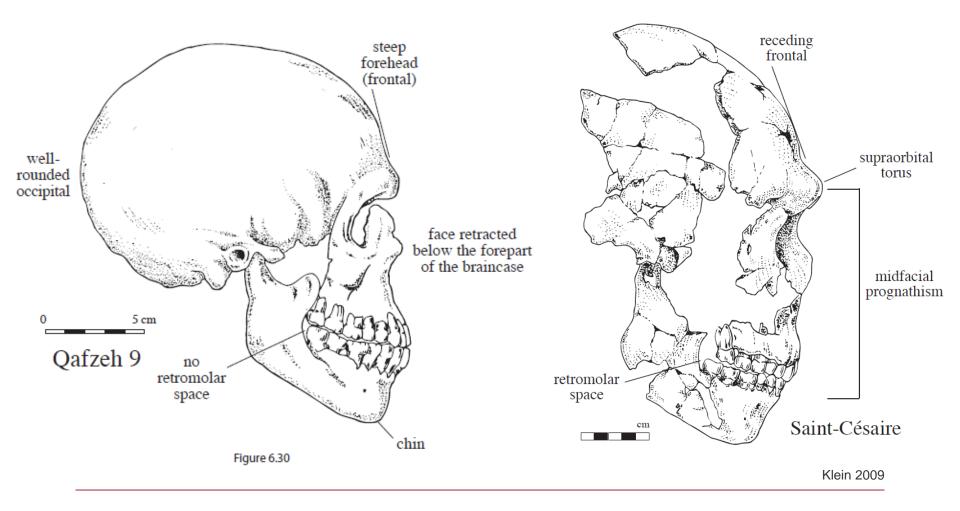




#### The fossil record of Africa and the Levant







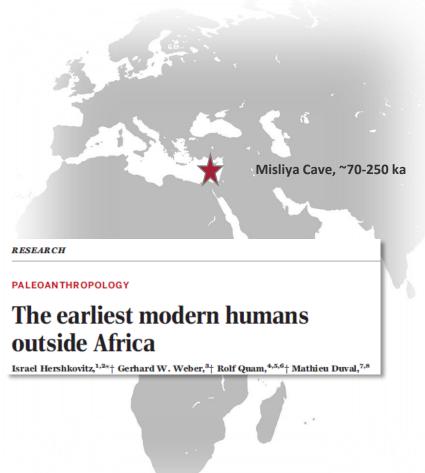




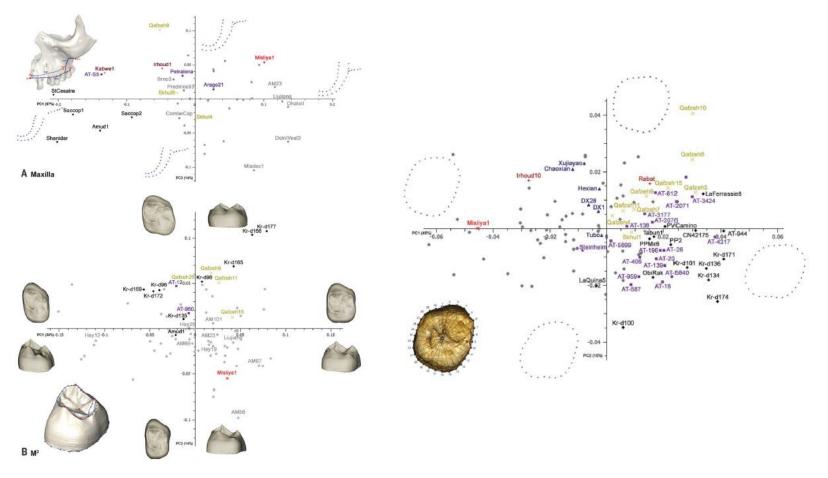


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- □ Herto Bouri, Ethiopia, ~160 ka
- □ Skhul, Israel/Palestine, ~90-120 ka
- **Qafzeh, Israel/Palestine, ~90-120 ka**
- □ Misliya-1, Israel, ~70-250 ka







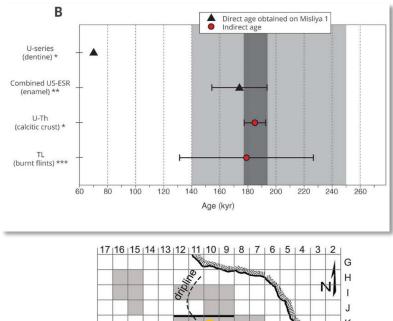


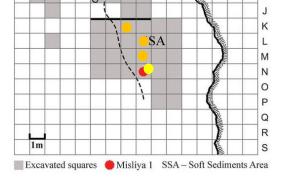
Hershkovitz et al. 2018



	[·]···//	<b>C</b> (1
No.	Location	Corrected age (3.8) [ky]
1	Maxilla 1	• 46
2	Maxilla 2	<b>3</b> 1*
3	Maxilla 3	• 19
4	Maxilla 4	• 70
5	Maxilla 5	• 24
6	Maxilla 6	<b>1</b> 85
7	Maxilla 7	<b>5</b> 8
8	Maxilla 8	61
9	Sq=K11b; Ht=145-150	• 172
10	Sq=K11b; Ht=100-105 (f)	28
11	Sq=N9b; Ht=121-127 (b)	243
12	Sq=N9b; Ht=105-108 (b)	0 21
13	Sq=N9b; Ht=82-86 (b)	<mark>)</mark> 31
14	Sq=N9b; Ht=108-113 (b)	22
15	Sq=L9b; Ht=128-133 (b)	<u> </u>
16	Sq=N9b; Ht=113-118 (b)	23
17	Sq=L9b; Ht=105-116 (b)	<u> </u>
18	Sq=M9b; Ht=108-115 (b)	<mark>e</mark> 59
19	Sq=K11b; Ht=185-190 (b)	<b>5</b> 8
20	Sq=L9 hearth: Ht=155-160	equilibrium

Supplementary Information



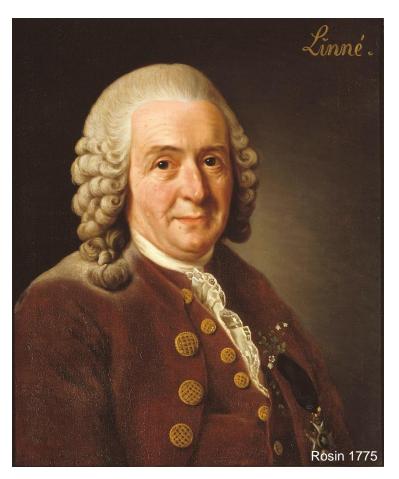


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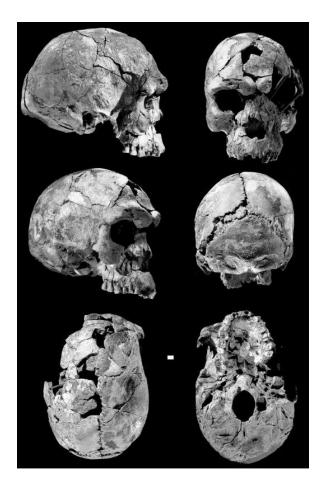












#### Methods

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.

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White et al. 2003





20

MAMMALIA PRIMATES. Homo.

#### I. PRIMATES.

Dentes Primores fuperiores IV, paralleli. Mamma Préforales 11.

**r.** HOMO nofce Te ipfum (\*)

- Sapiens. 1. H. diurnus; varians cultura, loca.
- Forus. tetrapus, mutus, hirfutus. Juvenis Urfinus lithe.nmus. 1661. Juvenis Lupinus belfenfis 1314. Juvenis Ov.nus hibernus. Talp. obf. UP. 9 Juvenis Hanoveranus. Pueri 2 Pyrenaici. 1719. Johannes Leodicenfis.

America-2. rufus, cholericus, rectus.

nus. Pilis nigris, rectis, craffis; Naribus patulis, Facie ephelitica, Mento fubimberbi. Pertinax, hilaris, liber. Pingit fe lineis dædaleis rubris. Regisur Confvetudine.

- (\*) Nosse Se Irsum gradus eft primus fapientiæ, diclumque Solonie, quondam feriptum litteris aureis fupra Diana Templum. Mul. ADOLPH, FRID. Prafat.
- Physiologice: Te contextum Nervis, intertextum Fibris, Machina tenella, fed adoleicente in perfectifilmam, facultatibus inflructam fere omnibus pluribusque, quam reliqua cunche. Nadam in nuda humo, natai die, abjecie natura ad vagitus statim & ploratum, manibus padibusque devinciendam Animal cateris imperaturum; cui scire nibil sine doftrina: non fari, non ingredi, non vojci, non alind natura sponte. Plin. Vides itaque qualem vitam nobis verum natura promisit, que primum nascentium omen sterum este Sentea.
- Diatetice: Te fanitaté & tranquilliate, fi noveris, felicem: Moderatii confervandum, Nimiii deftruendum, Variati efficiendum, Infvetii frangendum, Confvetii indurandum; polyphagum Culina inftruktifiuma, per errores gratifitma, igne vinoque horrenda. Parvo famer conflat, magno fafiidism. Seneca.
- Pathologice: Te tumidam usque dum crepueris bullam, piloque pendulam in puncho fugientis temporis, Nikil enim homine imbecillin terra alit. Homer. Nulti vita fragilior; sulli tot Morbi, tot Care, tot Pericuta. Breve miver/inn utique evi tempus: Par equa morti fimilis exigitur; net reputentar Infantia anni, qui fenfu carent; net Scieccife in penan vitacer: belocient Senfus, torpent Menubra, premorimitur Vijus, Anditus, Incefüs, Dentes, Giborum inflymmenta, Plim. Sie magna pars mortis jam preteriit, quidquid etatis vetro ef Mors tenet. Totum denique honc, quem vides popularin, quanta cogitas effe; cito natura revocavit & condet; Mors omnes eque vocat; iratis Diis propititique moriendam. Sence, II: 50.

#### MAMMALIA PRIMATES. Homo.

- Europæut. B. albus, fanguineus, torofus. Pilis flavelcentibus prolixis. Oculis cæruleis. Levis, acutifimus, inventor. Tegizur Veitimentis arctis. Regizur Ritubus.
- Afiatiens. Pilis nigricantibus Oculis fuícis, Severus, faltuofus, avarus. Tegitur Indumentis laxis. Regitur Opinionibus.

Bз

J. ni-

11

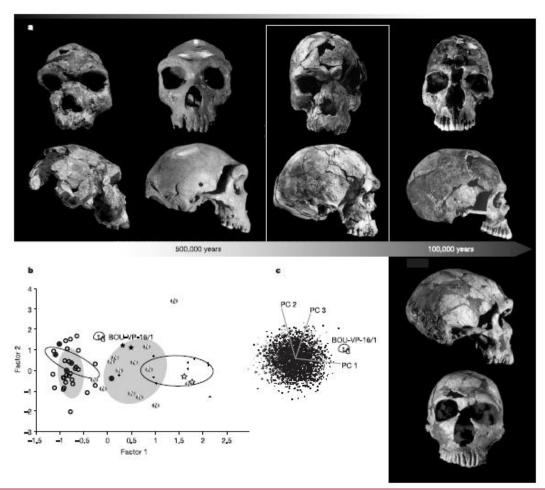
- Naturaliter : Te audacis natutæ miraculum, Animalium Principem, cujus culla cuncta genuit natura, elle animal flens, ridens, melodum, loquens, docile, judicans, admirans, fapientillimum; fed fragile, nudum, liupte natura inetme, ad omnem fortume contumeliam projectum, aliena opis indigens, anxia unentis follicitaque tuteles, precarii foiritus, pertinacus fiei, querule viae, terda fapientia. Temporis annihilati emortu contuntorum, pracfortis vividi dilayfadaorem, futurt dubii attimatorem in vita volueri, pretiofifima, irrevocabili, fie optima quæque dies miferis mortalibus ævi prima fogit; shum ad quotidianum opus laboriofa Egetiss vocat; alium Luwei incarcerat: altilemque ufficat; alium Ambitio numgram quieta follicitat: alius Drivitis, quas optaverat, mettit, & voco labotar tuo; alumi Solinto, alium femper vetitballum obfidens rurba, Hic fe habere d.let Lib ros, hic fe perdidile; Lacryme nobis deerunt antequam cauffe docienti, Sed quousque nos malos nobis deerunt entequam cauffe docienti, se feundos optare ventos, quorum felicitas eft ad bella pritere; paum vudeicet ad mottes noftra mala rapatere: Since. Catera animanta congregari contra diffimilia, aa Homini piarima ex bomine mala Plin.
- Politice : Te redit loco tenere errorem publicum factum, qui te vix enixum confvetudinis larva induit, nutrit, educat. alut, regit, fecundum quam honeflux, fortis, fapiens, moratus, pius exittimaris; Cum gubernatus Opinione vivas ad Confverudinem, nec ad Rationem. Te, inter perituros conflicturum, cum nulli contigit impune nolci, benefici loco petere, ut ultimus cervicem prabeas, dum interim, dulci fortuna ebrius, colligendo in craftinum Lapillos fortunar cerus, verbis in furorem ageris, alicer theoretise pios odio perfequeris, quantosque tumultus excitas, non ut fervias, fed cui; nugis irrevocabile tempus confumis; immorralia exernaque animo volutas, de feris nepotibus proneptibusque diffonis, novas fpes oblitus conditionis Tuz ponis, cum interta lorga conantem mors opprimit, at in agone oculos aperiens ( $\alpha \times J \in M \times 6$ ) fonnium primo obfervas; Sic visinus ut immertales U morimar at mortalet. Senec.
- Moraliter : Te fub rudi larva Ineptum, Lafeivum, Imitetorem, Ambitiofum, Prodigum, Solicitum, Aftbrum, Aufterum, Invidum, Avarum, transformari in Attentum, Cafthum, Confideratum, Modeflum, Sobrium, Tranquillum, Sincerum, Mitern, Beneficum, fuis Contentum. Uni animanism

B al-







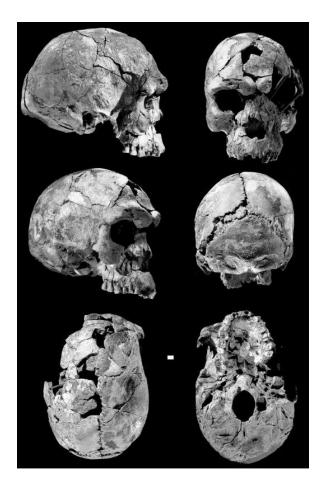


White et al. 2003









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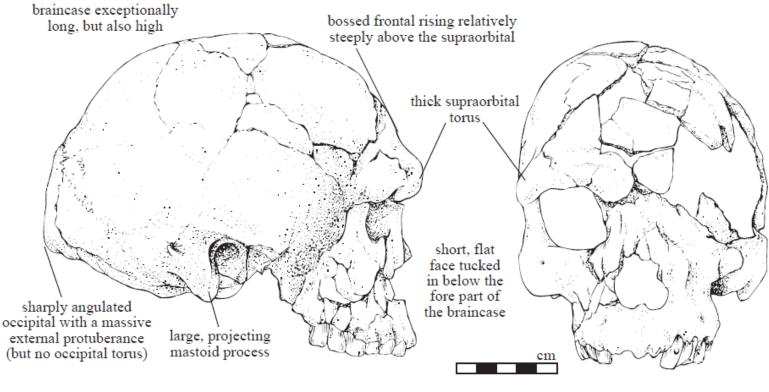
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Herto BOU-VP-16/1

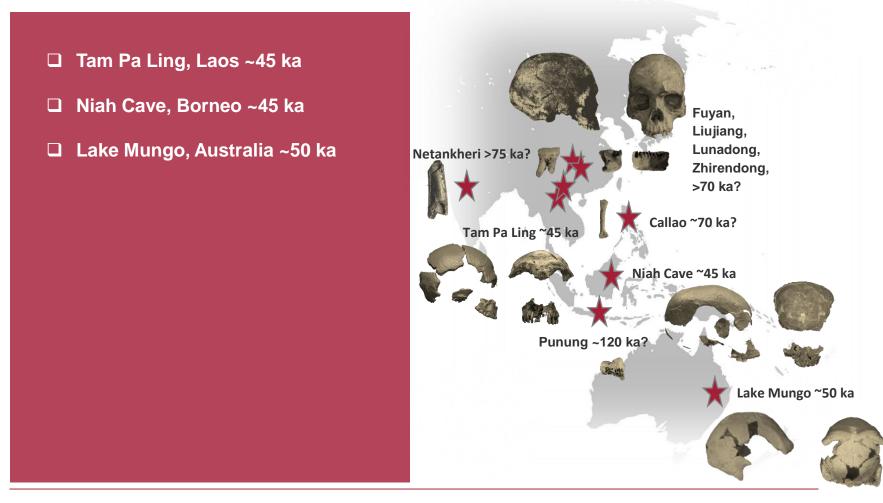
Klein 2009







## The fossil record of Eurasia and Australia









# **Classification and taxonomy**

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

Are modern humans:Homo sapiensHomo sapiens idaltu

□ Homo sapiens sapiens ?

What about the Neanderthals?

What about the ergasterines / erectus?











# Should we think about populations rather than species?

65 | Modern Human Origins, Lecture 5







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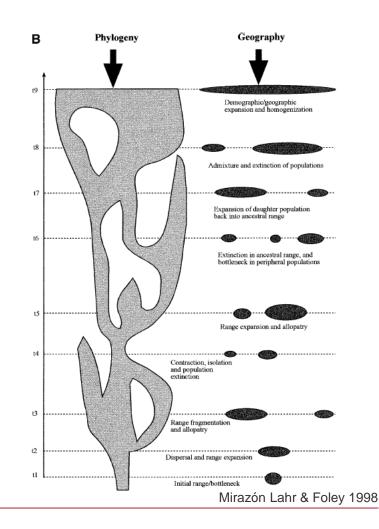
The betwee A & B. chings but of whiten. C+ B. The finat gradation, B + D rather greater bitadem The genere Unto be from . - being ulitin







- 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

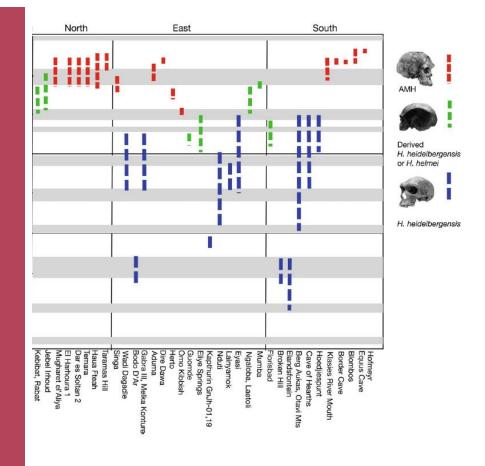








- Paleo-demes refer to chronologically and spatially constrianed groups of fossils
- Accurate dating is crucial for formulating paleo-demes

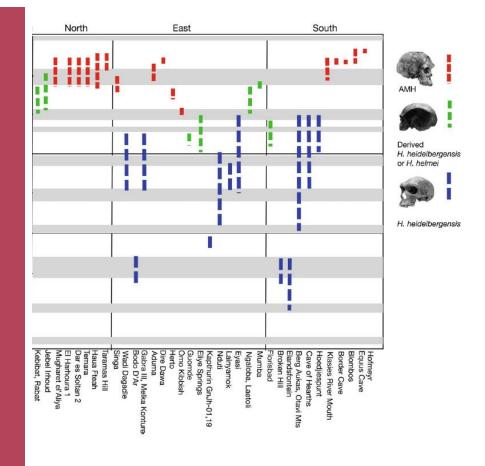








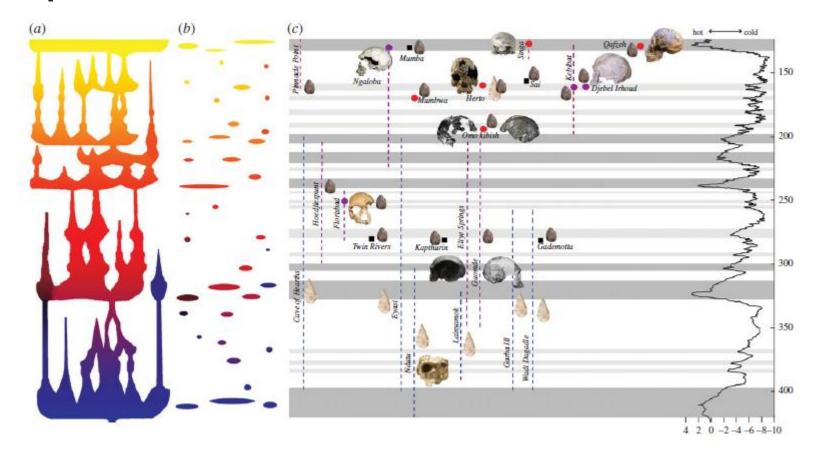
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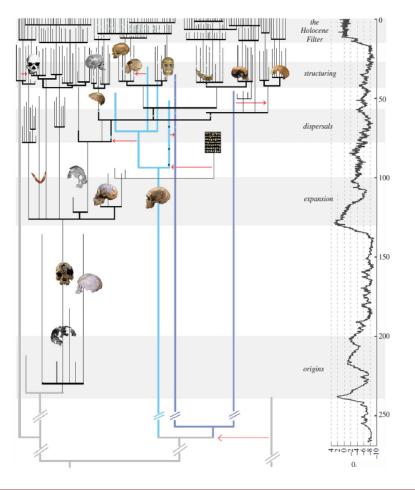


Mirazón Lahr 2016









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







#### **DFG Center Colloquium TOMORROW**

12:30-13:30 INA, Room 602

#### Dr. Andrea Benazzo & Prof. Silvia Ghirotto University of Ferrara

A new Approximate Bayesian Computation framework to distinguish among complex evolutionary models using complete genomes data

