

# **Modern Human Origins**

# Lecture 1: Anatomical and Behavioral Modernity

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# Organization

Lecture Wednesdays, 16-18:00 c.t. Institut für Naturwissenschafliche Archäologie, Rümelinstraße 23, Room 602

#### Instructors

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#### Course website

http://www.christianbentz.de/teaching.html

#### Written exam

mix of multiple-choice, short-answer, and essay (90 minutes) Students in linguistics (Faculty of Philosophy) can use this for one of the following modules: (1) BA Linguistics: Variation, Evolution & Change; (2) MA Linguistics: Language, Variation & Change; (3) MA Linguistics: Research Trends 1.

If you want to get course credits, please sign up at Campus Portal









If you would like to listen in on the talks please send an e-mail with your full name to chris@christianbentz.de

Details at: http://www.wordsandbones.unituebingen.de/symposium2017/







# Out of Africa and Into the Rest of the World ca. 50 000 and 100 000 years ago



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Please, follow this link to watch the video: https://www.youtube.com/watch?v=PUwmA3Q0\_OE

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# Out of Africa Archaeological Evidence







# **Background: 7 million years of evolution**

#### **7 MYA**

First putative hominid; discovered in chad



Map showing the distribution of all major early hominids



Sahelanthropus tchadensis



Hominid status assigned based on position of the foramen magnum, which is claimed to have suggested bipedal gait

Brunet et al. (2002)

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# 6 to 5.2 MYA

More convincing—but still fragmentary—fossils of earliest hominids derive from Kenya (left) and Ethiopia (right)





**Orrorin tugenensis** 



Ardipithecus kadabba

Hominid status assigned based on angle of proximal femur (tigh bone), dentition, etc.

Brunet et al. (2002); Senut et al. (2001); Haile-Selassie (2001)

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4.5 to 3 MYA



Ardipithecus ramidus

Australopithecus anamensis

Australopithecus afarensis



*-ramidus retains a mosic of features, opposable big toes* 

-anamensis is considered tansitional

- afarensis considered fully bipedal

White et al. (2009); Leakey et al. (1995); Johanson et al. (1978);







#### 4 to 3 MYA



and the second s

Australopithecus bahrelghazali Chad Lake Turkana Taung Chad Hadar Middle Awash Olduvai Gorge Sterkfontein Swartkrans Kromdraai

*(left) africanus represents a robust Australopithicine limited to southern Africa* 

(right) partial lower jaw from Chad assigned to a controversial distinct species of Australopithicine.

These fossils are australopithecines discovered outside of the east African rift

Australopithecus africanus

Brunet et al. (1995);







#### 2.8 to 1.8 MYA



Australopithecus garhi

early Homo



The origin of our genus (Homo) is believed to have taken place in easetrn Africa during this period

The late Australopithcus species garhi may have overlapped with early Homo

All fossil from eastern Africa

Asfaw et al. (1999); Villmore et al. (2015), Lieberman et al. (1988); Tobias (1991)



#### 2.0 to 1.8 MYA



Australopithecus sediba

Great Rift Valley Hadar Lake Turkana Taung Taung Great Rift Valley Hadar Awash Olduvai Gorge Laetoli Sterkfontein Swartkrans Kromdraai

Outside the east African rift valley, cave sites in South Africa have yielded numerous later Australopithecine fossil. Sediba has been suggested as a candidate anscestor that evolved into Homo. However, many believe it was more a side branch than a major contributor to the evolving lineage

Berger et al. 2010







2.6 MYA



Semaw et al. (1997, 2000)



Au. garhi



Ното



Earliest unequivocal evidence for technology appears at Gona in Ethiopia ~2.6 MYA. It represents simple coreflake technology

It is not clear whether garhi or early Homo (or both) made the first tools







Atapueroa









*Homo erectus/ergaster* 

Turkana Bouri Olduvai Swartkrans

-With a much larger brain size and more sophesticated stone tool tradition, erectus was the first hominid ever to spread out of Africa

Map shows the geographical distribution of H. erectus in green, and major sites with erectus fossils (in red points)

Duboise (1891); Gilbert et al (1999); Brown et al. (1985); Lordkipanidze et al (2013)









-The Maur mandible (near Heidelberg) represents typespecimen.

Jinniusha

species has anatomy and technology transition between erectus and sapiens

Duboise (1891); Gilbert et al (1999); Brown et al. (1985); Sahle et al. (2013)



presen

0.5

1.0

1.5

2.0

millions of years ago



Homo sapiens





Oldest known sapiens fossils derive from Omo and Herto in Ethiopia (see above map)

Prominent forehead and chin, and a more globular braincase etc charachterize our species

Clark et al (2003): McDougall et al. (2005); Shea 2008; Sahle et al 2013, 2014





fracture from



H. sapiens idaltu







# Out of Africa: what do we know?

# **1. Fossil evidence**

- 0 Skhūl, Qafzeh (90 to 120 kya)
- 0 SE Asia/Australia (~50 kya)

### 2. Genetic evidence

0 L3 disperses 55-70 KYA

### 3. Archaeological evidence

The following slides and classes

Groucutt et al. (2015); Nielsen 2017









# **Behaviors at the Dawn**

- What separates our species from others before it?
- Is modern as modern looks OR does?
- Evolution OR revolution?
- What behaviors are we talking about?
- Why are these important anyway?

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

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# Early mortuary?





A gir wearing her siste's skull (Andaman Islands—India)

Did the earliest H. sapiens practice some kind of ritulalized burial?

Skulls of Homo sapiens idaltu show modification consistent with dismemberment of the head.

Ethnographically, some societies curate heads of their dead for quite sometime before final burial



White et al. (2003); Clark et al (2003)







### Symbolism/group identity?

**Projectiles?** 



Henshilwood et al (2009, 2011); Texier et al. 2010); Lombard & Phillipson (2010)

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**Does similar tool forms = migration?** 













# Into Europe

- Meeting and mating?
- Us and them
- Demise and replacement





Hohlenstein-Stadel, Geißenklösterle, Hohle Fels, Vogelherd



Cueva de los Aviones



#### Conard (2010); Zilhão et al. (2010)



# DFG

#### Consensus and/or conundrum

Dispersal routes: 'northern' vs. 'southern' vs. ...?

Role of culture/behavior in the dispersal

How many dispersals

Complex technologies/behavior: evolution or revolution?

Middle-to-Upper Paleolithic as a model?

Neanderthals vs modern humans

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







# Out of Africa Genetic, Morphological and Cultural Evidence



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# **Human Genetic Diversity**





Fig. 1 Summary tree of world populations. Phylogenetic tree based on polymorphisms of 120 protein genes in 1,915 populations grouped by continental sub-areas and  $F_{rr}$  genetic distances<sup>14</sup>. Root placed assuming a constant rate of evolution. BOB CRIMI

Fig. 2 Relationship between genetic and geographic distance. Genetic distance of population pairs measured by  $F_{st}$  as a function of geographic distance between members of the pairs<sup>14</sup>. Only samples from indigenous people were included. Continents where primitive economies predominate (hunting-gathering or tropical gardening) show highest asymptotes. Asia and the world do not asymptote within the range shown.

#### Cavalli-Sforza & Feldman (2003)







# **Out of Africa and Into Asia**



Cavalli-Sforza & Feldman (2003)







# **Serial Founder Effect in Genetics**



#### Prugnolle et al. (2005)

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# **Recent Genomic Studies**



**Figure 1** | **Timeline of important milestones in human evolutionary genomics.** A large number of studies have contributed important insights into human history using genomic data; those of particular influence in terms of the data or data analyses that they present are shown.

#### Nielsen et al. (2017)







# Out of Africa and Into Asia (updated)



**Figure 3** | Major human migrations across the world inferred through analyses of genomic data. Some migration routes remain under debate. For example, there is still some uncertainty regarding the migration routes used to populate the Americas. Genomic data are limited in their resolution to determine paths of migration because further population movements, subsequent to the initial migrations, may obscure the geographic patterns that can be discerned from the genomic data. Proposed routes of migration that remain controversial are indicated by dashed lines. CA, Central Anatolia; FC, Fertile Crescent; IP, Iberian Peninsula; PCS, Pontic–Caspian steppe.

### Nielsen et al. (2017)







# **Routes of Dispersal**



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# **Routes of Dispersal**









# Genetics and Culture Co-evolution



Creanza & Feldman (2016)

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# Genetics and Culture Co-evolution

Торіс	Assumed gene function	Refs
The evolution of learning, social transmission and culture; the evolution of social learning strategies (unbiased transmission, direct bias, indirect bias, frequency dependent bias, and so on); the analysis of reliance on social learning; the evolution of teaching	Genes that affect learning; genes predisposing individuals to learn from others and to do so in particular ways or under particular circumstances, or to learn from particular individuals	19–21,23,33, 35,36,119–124
The co-evolution of genes for lactase persistence and milk use	Gene for adult human lactase persistence (LCT)	13,31,40
The evolution of language; the co-evolution of sign language and hereditary deafness	Language-facilitating genes (for example, forkhead box P2 (FOXP2)); genes for hereditary deafness	125–128
The inheritance of intelligence, behavioural and personality traits	Genes that affect personality and intelligence	38,39,54,129,130
The evolution of handedness and lateralized structures	Genes for lateralization of hand preference	37
The evolution of cooperation; the evolution of ethnic markers and conformity	Genes predisposing individuals to cooperate with in-group members, to not cooperate with or be hostile to out- group members, to punish non-cooperators, to express pro-social emotions, to internalize norms and to conform	21,131–138
The evolution of incest taboos and avoidance of sibling mating	Genes predisposing individuals to an aversion to mating with individuals with whom they are reared	139,140
Sexual behaviour; sexual selection with culturally transmitted mating preferences and genetically transmitted traits; culturally transmitted paternity beliefs and the evolution of human mating systems	Genes for skin, hair and eye colour, body and face shape, and facial and body hair; genes that affect degree of character symmetry, degree of neoteny, level of aggressiveness, emotionality, personality traits, promiscuity, jealousy and faithfulness	42,94,141
The effects of sex-biased infanticide and parental investment; the effects of sex-selective abortion on sex-ratio evolution	Sex-ratio distorter genes	43,142,143
The evolutionary consequences of cultural niche construction	Genes related to metabolism, immunity and pathogen defence and the nervous system	45,46

#### Laland et al. (2010)







# Evolutionary Linguistics (Biolinguistics)

# EVOLANG IX

# KYOTO, JAPAN 13 - 16 March, 2012









# Saltation vs. Graduation









# Language as shaped by the brain



#### Christiansen & Chater (2008)

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# **Preadaptations for language**









# **The Vocal Tract**



Lowering of the larynx (Kehlkopf) Fitch (2010)







# **Genetic and Linguistic Diversity**



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# **Anatomy and Language**





#### (d) Inverse Targets (Left)



#### (e) Inverse Targets (Top)



Moisik & Dediu (2017)

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# **Stone Tool Production and Language**



Morgan et al. (2015)







# Thank you... and see you next week.









