The beginnings

Miocene (~ 23-5 mya) environmental changes leading to much less rainfall and much more seasonal in African tropics - end of Green Sahara.

Distinction between early hominins and modern humans through bipedal locomotion, brain size, slowed development, dental morphology and cultural adaptations.

Sahelanthropus tchadensis

Earliest known hominin.	*6.8-7.2 mya*

Fossil record consists of partial cranium, partial mandibles, some teeth, part of a femur and lower arm bones.

Mixture of ancestral + derived features -> transitional biped?	**Foramen magnum** in skull - aligned under skull, would allow bipedalism. Morphology of the femur = also under discussion regarding terrestrial bipedalism. Lower arms morphology = spent time in trees. Brain size = much smaller than modern human, closer to ape size. Face also = very flat with large brow ridge.

S. tchadensis

Ardipithecus

Ar. kadabba and *Ar. ramidus* from Ethiopia	*5.8-5.2 mya*

Mixture of primitive and derived dental traits e.g. canine sharpens itself on the first premolar like in chimps.

Ardi	Nearly complete skeleton of a female *Ar. ramidus* individual. Limb proportions were similar to Miocene quadrupedal monkeys. Plant and animal fossils around Ardi paint picture of habitat: woodland areas with dense patches of trees and open grasslands. Skull: ape-sized brain, flat head but prognathic. Foramen magnum suggests head = upright on spine.

Ardipithecus (cont)

Bipedalism	Postcranial skeletal evidence for locomotion suggests bipedalism in *Ardipithecus* e.g. pelvis, feet and hands. - **Feet** show mixture of modern ape and human morphology: opposable toe like apes, but other 4 toes adapted to bipedalism. - **Pelvis** shows shorter + broader ilium than in chimps. Lower part of pelvis = more ape-like. So in conclusion, most likely bipedal but perhaps also transitional? Gait would have been different to that of modern humans.

Ardi

Partial skeleton of Ardi (*Ar. ramidus*)

Bipedalism

Key hominin feature. Deduced from associated morphological traits.

Pelvis	Chimp pelvis (quadrupedal) = much taller and slimmer. Modern human and australopithecine pelvis = wider and shorter.

Bipedalism (cont)

Torque and abductors	Stepping involves rotation of torso, facilitated by torque (twisting force). Torso is kept from tipping by abductor muscles attached to the ilium.
Cortical bone in the femur	Add leverage for the abductors. Femur neck also lengthens.
Knee joint	Bipedalism requires knees to be close to centre of the body (i.e. curve inwards), so femur slants downwards and inwards.

Why was bipedalism selected for?

Savannah mosaic hypothesis	Arboreal hominins faced with environmental changes and retreat of forests. More grasslands with some trees and shrubs. Bipedalism as a means of escaping fast-r-unning predators.
	(*Note: Bipedalism would have evolved slowly and transitio-nally. This would therefore have been a bad time to evolve a new type of locomotion which would have at first been inefficient as well as being less energetically efficient for running than quadrupedalism. Bipedalism is also rare in nature, so if this had been an adaptation for fast running, we would expect for it to be more common.*)

Bipedalism (cont)

Adaptation to arboreal life	Bipedalism could have altern-atively evolved in an arboreal setting before being used terrestrially. Morphology of teeth in early hominins show arboreal diet to support this. This also expands the *savannah mosaic hypothesis* as it suggests the possibility for a semi-arboreal lifestyle - this matches evidence of transitional bipedalism.
Feeding adaptation	Developed in an arboreal setting to facilitate feeding? Not mutually exclusive with above theory but is contested. Bipedalism would have allowed for effective harvest of fruit in small fruit trees.
Keeping cool ***(Wheeler)***	Heat stress becomes more important as tree cover retreats and environment becomes more exposed. Standing upright reduces this stress. *Doesn't fit evidence regarding bipedalism evolving in semi-arboreal hominins, but could have been a factor in mosaic environments?*

African H. erectus

Kenya (*e.g. Lake Turkana*), Ethiopia, Tanzania (Olduvai Gorge) and South Africa.	*~2 mya*
Turkana Boy excavated by Leakey.	

African H. erectus (cont)

Morphology	Receding forehead, no chin, less prognathic face and shelf-like brows. Brain becomes larger and more modern over time.

Homo erectus out of Africa

First hominin out of Africa.	In Georgia by *~1.8 mya*.
Morpho-logical evidence for *H. erectus'* ability to run for long distances and throw objects with high accuracy.	Longer neck and torque to counteract the twisting of the torso generated when running. Other morpho-logical features present also = consistent with modern human adaptations to long-distance running.
Dmanisi individual *Georgia*	Most complete skull of any *H. erectus* individual -> very small brain (~546 cc), large and prognathic lower face. Vertical upper face, characteristic of *Homo*.
	Overall = mixture of primitive and derived traits.
Tool use	*Trinil* site in Java with engraved shells showing evidence of tool use. Contested as marks could be naturally formed, but some consider it as the earliest example of tool use.

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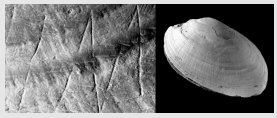
Multiple H. erectus in Asia

Sinanthropus pekinensis ~780-400 kya	Original classification of *Peking Man*, now reclaimed by *H. erectus*.
Java *Pithecanthropus erectus* ~1.3 mya	The first human ancestors excavated outside of Europe. Then classified as *Pithecanthropus erectus* ("erect monkey-man"), these remains were ultimately attributed to *H. erectus*. Initially however the *S. pekinensis* remains were classified under the *Pithecanthropus* genus as associations were made between the two.
Homo erectus	Both *Pithecanthropus* and *Sinanthropus* were joined under the common name of *H. erectus*.
Recent v. archaic *H. erectus*	*Pithecanthropus* = much older than *Sinanthropus*. Multiple species evolving simultaneously in different climactic conditions? Divergent evolution between the two, possibly caused by meteor in sea of China.

So *Sinanthropus* and *Pithecanthropus* = different forms of the *Homo erectus*, separated geographically and therefore evolving apart and diverging. Could potentially be considered different species?

H. erectus tool use



Engraved shell from Trinil, Java. If considered consistent with cut marks from a stone tool, would have been engraved by *H. erectus*.

Homo neandertalensis

Africa, Europe and Asia. *300-40 kya*

Temperatures begin to cool down c. 75kya

Homo heidelbergensis thought to have been found in Europe for the first time in Sima de lof Huesos, Spain. Skull shared characteristics of *H. heidelbergensis* and derived characteristics of early *H. erectus* and modern humans.

Neanderthals - morphology

Large brains	Average of ~1,520 cc, larger than average modern humans
Rounded crania	Long + low skull with rounded bulge at back.
Big faces	Large + rounded brow ridges, very large nose.
Robust + heavily muscled body	Very thick leg bones, scapulae had more muscles attachments, wider rib cage... Overall very sturdy and strong, slightly shorter than modern humans on average.

Neanderthals - complex behaviours

Stone tools	Mousterian industry + compound tools.
Cooperative hunting	Animal remains often dominated by one or two species - *e.g. Mauran in France with remains of bison and aurochs*. This non-random sample suggests cooperative and organised hunting strategies.

Neanderthals - complex behaviours (cont)

Burials + altruism	*Shanidar* - Flower burial disproven, but still evidence of burying dead in designated location repeatedly. Shanidar also shows evidence of altruism - looking after wounded and elderly.
Ocre + manganese	Pigment is collected, crushed and made into crayons which have been shown to be usable on skin (so could have been used for body markings?). Markings could have been symbolic, ritualistic or even medicinal. Evidence of ocre use in *Los Aviones*, Spain, in shells used as receptacles.
Feathers	Small markings on bird bones have led to the inference of the use of feathers *e.g. Krapina, Croatia*.