

Biology Level 3

Human Evolution

Introduction to Human Evolution

Environment



Forest

Arboreal environment



Climate becomes warmer and dryer



Grassland

Savannah environment

Biological



Inheritance genetically
Occurs parent → child only
Slow change over time
E.g. anatomy



Cultural




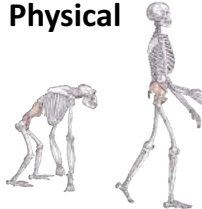
Inheritance by learning
Occurs in any direction
Rate increasing over time
E.g. fire, tools, technology



Video Summaries

Bipedalism – Part 1

What you need to know:

	Quadruped	Biped
Environment 	<ol style="list-style-type: none"> 1. Look smaller to predators 2. Can't see as far 3. Back exposed to sun (overheats) 4. Can't carry food, infant, tools, or defend 5. Less efficient for locomotion 	<ol style="list-style-type: none"> 1. Look larger to predators 2. Can see further 3. Top of head in sun (thermoregulation) 4. Can carry food, infant, tools, or defend 5. More efficient for locomotion
Physical 	<ol style="list-style-type: none"> 1. C shaped spine 2. Weight supported by long arms 3. Flat feet, inefficient for bipedalism 4. Opposable 1st toe to grip branches 5. Curved fingers for power grip 	<ol style="list-style-type: none"> 1. S shaped spine 2. Weight not supported by short arms 3. Arched feet, efficient for locomotion 4. Short, straight toes to push forward 5. Straight fingers for fine motor skills

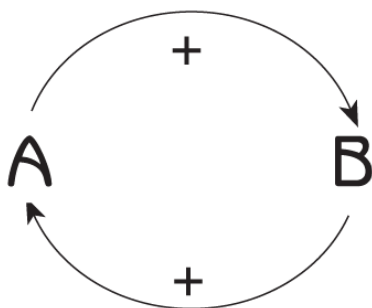
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Bipedalism – Part 1

What you need to know:

Changes happen because of
Positive feedback loops



Bigger brain → better motor skills →
better food → bigger brain



Less hair → carry infants → infants
don't hold onto hair → Less hair



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Video Summaries

Bipedalism – Part 2

What you need to know

	Quadruped	Biped
Skull 	<ol style="list-style-type: none"> 1. Bigger jaw 2. Big sagittal crest 3. Big zygomatic arches 4. Big brow ridge 5. Small cranium (400cc) 	<ol style="list-style-type: none"> 1. Smaller jaw 2. No sagittal crest 3. Small zygomatic arches 4. Small brow ridge 5. Large cranium (1400cc)
Other 	<ol style="list-style-type: none"> 1. Hairy 2. Sexually reproductive for whole life 3. Offspring are born more advanced and develop more quickly 	<ol style="list-style-type: none"> 1. Hairless 2. Stop sexual reproduction later in life 3. Offspring are born less advanced and develop more slowly

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Tool Culture

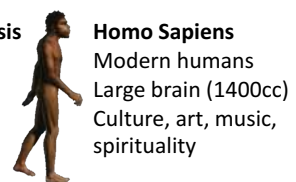
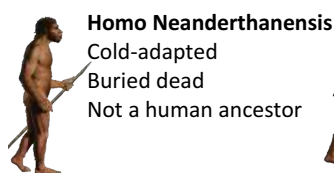
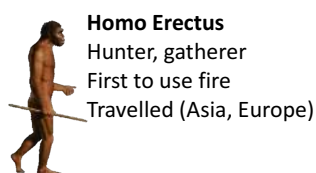
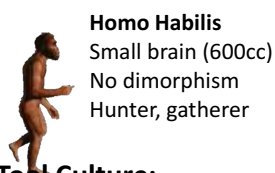
Time:

2.4M – 1.6M yrs

1M – 300k yrs

240k – 30k yrs

160k yrs – present



Tool Culture:

Oldowan

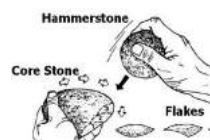
Acheulean

Mousterian

Paleolithic

6 blows:

To make food accessible



E.g. Bone marrow



50 blows:

Bi-faced for hunting, food processing, protection

E.g. hand axe for trees, animal hides etc.



150 blows:

Improved hunting
Could punch holes (for clothing)

May have used rope



250 blows:

Hammer and punch
Range of tools
(including composites)

E.g. Fish hooks for coastal environments



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Video Summaries

Human Dispersal

Theory 1: Multiregional hypothesis

- Continual movement of genes between populations.
- Thus, homo sapiens evolved at the same time in these areas.

The evidence

- Fossils that half way between homo erectus and homo sapiens have been found in Asia
- DNA evidence has shown interbreeding
- There are other ways to explain why a population died out

Theory 2: Replacement hypothesis

- No movement of genes between populations.
- Homo sapiens developed in Africa (around 200 k years ago) and took over the world (replacing other populations)

The evidence

- H. sapien fossils found in Africa at the same time as H. Erectus and H. Neanderthalensis
- Common male ancestor (120-200 thousand years ago) - Y-DNA
- Common female ancestor (140-200 thousand years ago) – mtDNA
- Greater genetic variation in African people

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Human Dispersal

Two ways to compare DNA:

- 1. DNA sequencing**
If species are similar they will have areas of similar sequence
- 2. DNA hybridisation (melting point of DNA)**
If DNA is similar the melting point will be similar

Males have a Y chromosome:

- 1. Does not undergo recombination**
No mixing up with other Y chromosomes
- 2. Is inherited down the paternal line**
Fathers will pass Y-chromosomes to their son's (and so on)

Females have mt-DNA:

- 1. Mutates at a constant rate**
So gives a change over time
- 2. Does not undergo recombination**
No mixing up with other mt-DNA
- 3. Is inherited down the maternal line**
Mothers will pass mt-DNA to their daughters (and so on)

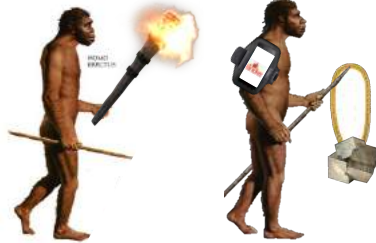
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Video Summaries

Fire

What you need to know:



The five uses of fire:

1. Food preparation and cooking
2. Hunting
3. Safety from predators and insects
4. Warmth & light – could move to new (colder climates)
5. More time with light so more socialisation & tool making

Biological



Cultural



Evolution

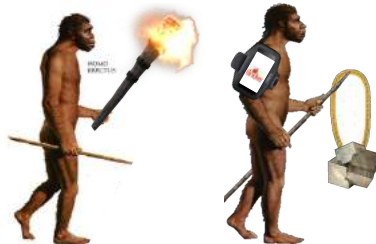


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Fire

What you need to know:



Benefits of cooking food:

1. Food became more digestible
2. Greater range of food
3. Increased hygiene
4. Food was brought back home to eat and cook

Biological



Cultural



Evolution



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