Section 4

Natural selection and Evidence for evolution

Evolution

Evolution means that living things slowly change over many generations

Charles Darwin explain evolution using his idea called natural selection

Natural selection means survival of the fittest

- **In every population individuals are different because they have different genes. New alleles appear by mutation**
- **Things like predators, lack of food, lack of water or competition for mates are called selection pressures, these affect how well an organism can survive**
- **Individuals that have useful characteristics like better adapted to the environment they survive more easily and are more likely to breed**
- **Overtime the helpful alleles become more common in the population**

A species that cannot compete well may become extent

Bacteria provide evidence for the evolution

- Bacteria sometimes get random DNA mutations
- These create the new alleles
- These new alleles can change the characteristics
- For example a bacterium can become resistance to an antibiotic
- Antibiotic resistance is the big advantage
- When someone takes antibiotic, a resistance bacterium survives longer than a non resistant one
- It can reproduce many more time
- This is a natural selection. over time there resistant alleles becomes common

Process

- There is variation in the bacteria population
- Some bacteria have resistant Allele
- Antibiotics kill the non resistant bacteria
- Resistant bacteria survive and reproduce
- The resistant allele becomes more common

- Antibiotic resistance is evidence for evolution because bacteria become better adapted to an environment where antibiotics exist

- Other organisms like rats that became resistant to poison also give evidence for evolution

Fossil evidence for human evolution

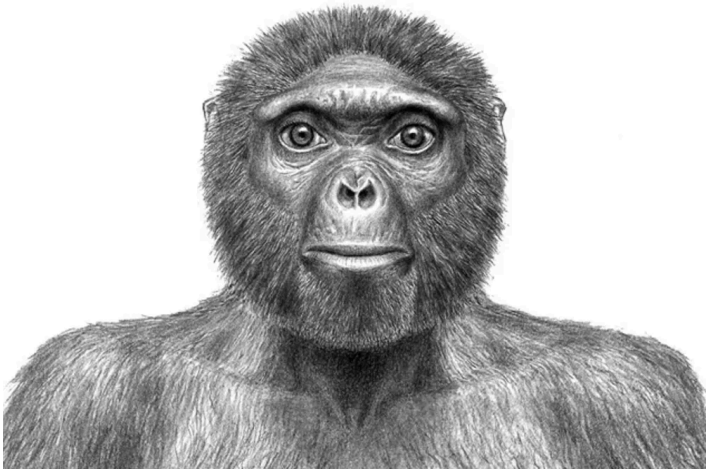
There is a lot of fossil evidence that humans evolved from common ancestor shared with other apes

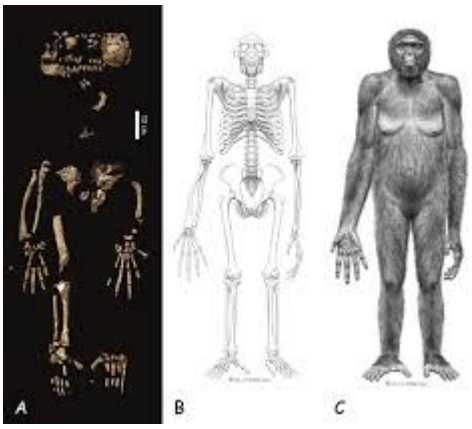
What fossil tells us

- Evidence shows humans and chimpanzees had a common ancestor around 6 million years ago
- Humans and their ancestors are called hominids
- Many different hominids fossils have been found
- These fossils show features between Apes and human
- by studying hominid fossils we can see how human changed over the time

Ardi - 4.4 million years old

- Ardi is a Fossil of Ardipithecus ramidus, Found in Ethiopia
- Ardi Has both Ape like and human like features





- Her feet shows she climb the trees
- She had an ape like big toe to hold the branches
- She had long arms and short legs like an ape
- Her brain size was similar to chimpanzees
- Her leg bone show she walked up right like a human
- Her hand bones show she did not walk on our hands like the ape do

Lucy - 3.2 million years old

Lucy is a Fossil of Australopithecus afarensis is also found in Ethiopia

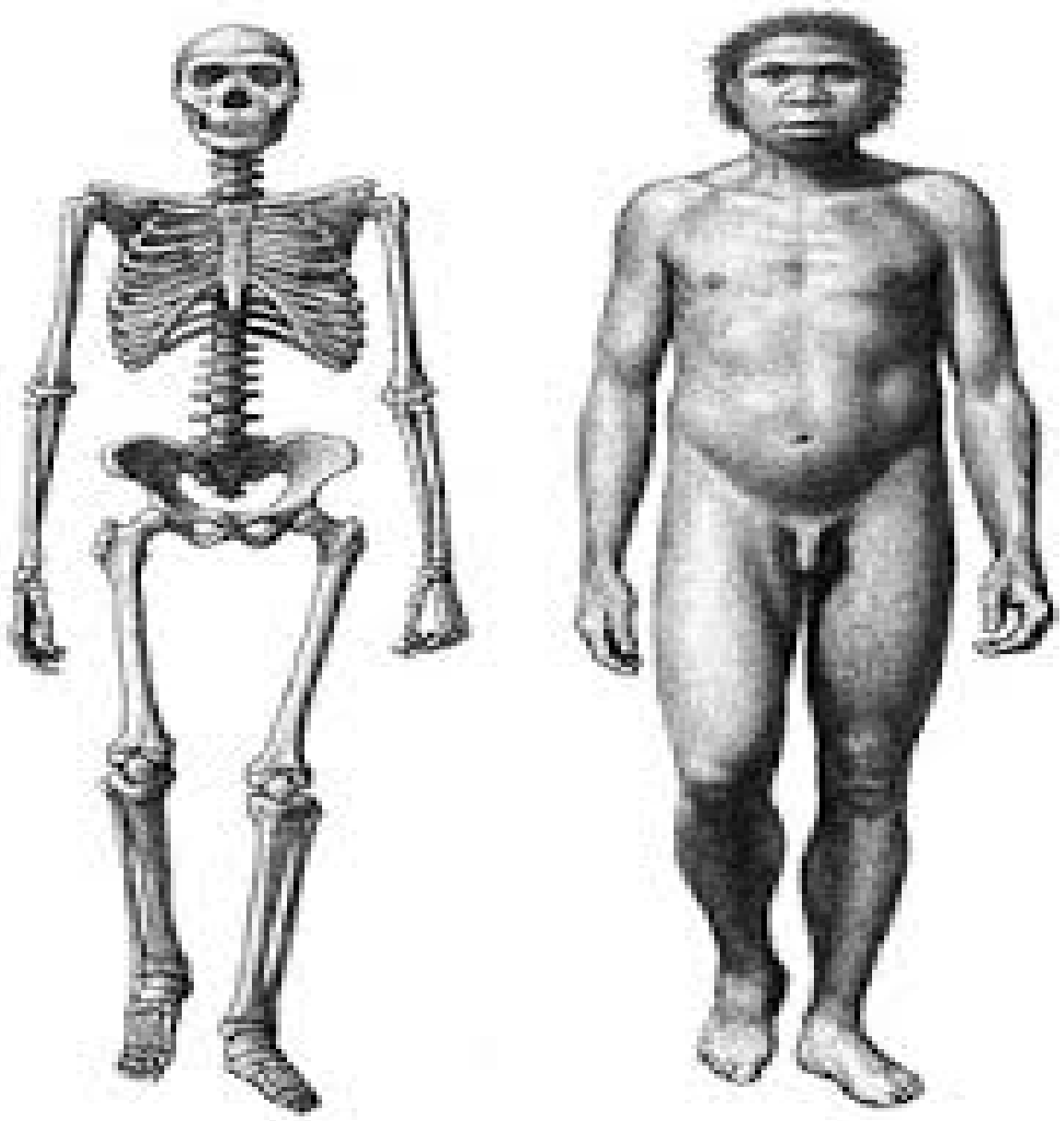
Lucy was more like human then Ardi



- She had arched feet for walking and no ape like big toe
- Her arms and legs were between Ape and human size
- Her brain was slightly bigger than Ardis but close to chimp
- Her leg and foot bones show she walked upright better than Ardi

Turkana boy - 1.6 million years old

- In 1984 Richard Leakey and his team found many fossils in Kenya
- One Fossil was turkana boy, a homo erectus skeleton



Turkana boy had

- **short arms and long legs like a human**
- **a much smaller brain than Lucy close to human size**
- **leg and foot bones that show he walked upright very well**

Timeline of human evolution

1. Ardipithecus (Ardi)
2. Australopithecus (Lucy)
3. Homospecies (Turkana boy)
4. Modern Humans

This shows humans become more human like through the time

Stone tools give more evidence

As homeo species evolved they made stone tools
These tools became more Complex showing brain size increased

How scientist find the age of tools and fossils

- Structure of the tool or fossil: simple tools are older and complex tools are newer
- stratigraphy, study of Rock layers. deeper layers are older
- carbon 14 dating, if a tool has carbon material like wood, carbon 14 can show its age

Dating is not always perfect because Rock layers can move

Classification of living things

Classification means putting living things into groups

Old system ; five kingdoms

- **Animals**
- **Plants**
- **Fungi**
- **Prokaryotes**
- **protists**

These they are divided into

- **Kingdom**
- **Phylum**
- **class**
- **order**
- **Family**
- **genus**
- **species**

Classification changed over the time

Woese Found that old Kingdom had two different groups he divided them

- **Archea**
- **bacteria**

He said all life should first be split into three domains

Archaea, Look like bacteria but are genetically very different like in extreme condition

Bacteria , True bacteria life E.coli

Eukariya, fungi , plants animals and protists These domains are then divided into smaller groups like before