

CHANGES IN POPULATIONS

WHAT'S A POPULATION?

- Group of individuals which are
 - Same species
 - In same area
 - Using same resources
 - Reproducing

GENETIC VARIATION

- different alleles within the population → many different phenotypes
- Sources
 - Mutations = new alleles
 - Sexual reproduction = new allele combinations

WHY IS VARIATION SO IMPORTANT?

- What would happen if there was a disease and the population showed NO VARIATION?



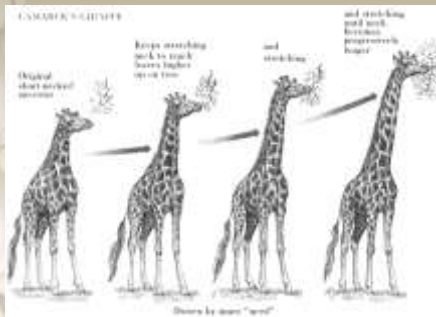
WHAT IS EVOLUTION?

- Change in population over time
- Essentially, new species arise from earlier species by accumulated changes

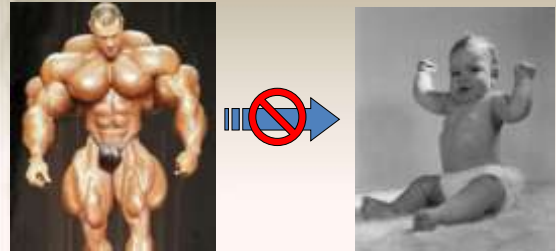
ACQUIRED TRAITS??

- Jean Baptiste de LaMarck
- Organisms change due to acquired characteristics
 - The more an organism uses a part of its body, the more the part develops
 - These characteristics can be passed on to offspring

LAMARCK'S HYPOTHESIS



WHY IS LAMARCK'S HYPOTHESIS FLAWED?

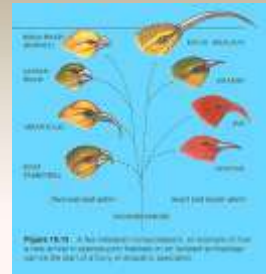


WHY WAS LAMARCK WRONG?

- Acquired Traits = not coded in DNA; gained during lifetime
- Acquired traits CANNOT be passed to offspring

DARWIN'S HYPOTHESES

- Explains how species change over time
- Explains how different species are related to each other



DARWIN'S HYPOTHESES

- Natural Selection
 - Only those best suited to the environment will survive and reproduce



REQUIREMENTS FOR NATURAL SELECTION

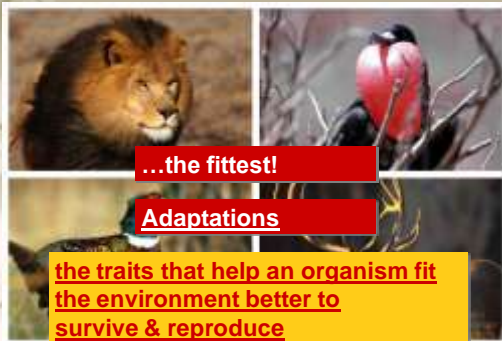
1. Variation within the population.
2. Certain traits will be favorable given the environment → increased reproductive success.
3. Traits must be inherited and show up in PHENOTYPE.

REQUIREMENTS FOR NATURAL SELECTION

4. Better reproductive success → passing on the genes for favorable traits.
5. Favorable traits accumulate in the population ⇒ the population adapts.



SURVIVAL & REPRODUCTION OF THE FITTEST



ROLE OF ENVIRONMENT

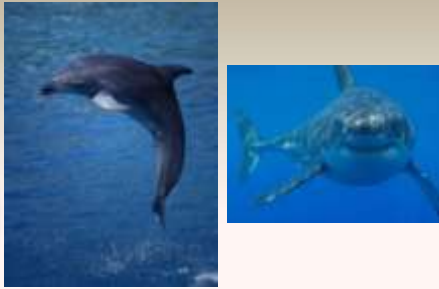
- different selective pressures in different environment
- environment dictates which traits are FAVORABLE
- natural selection



PATTERNS OF EVOLUTION

- **Convergent Evolution**
 - distantly related species become more alike due to living in the same environment

CONVERGENT EVOLUTION

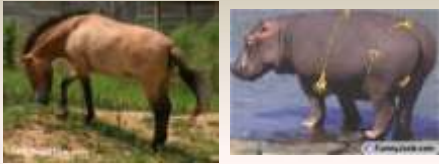


DIVERGENT EVOLUTION

▪ Divergent Evolution

- Groups become more DIFFERENT due to DIFFERENT environments
- leads to speciation (formation of new species)

DIVERGENT EVOLUTION



DIVERGENT EVOLUTION?



COEVOLUTION

- Coevolution- when the presence of another species influences the evolution of another species

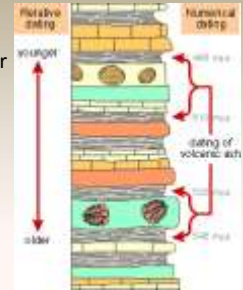
COEVOLUTION



EVIDENCE OF EVOLUTION

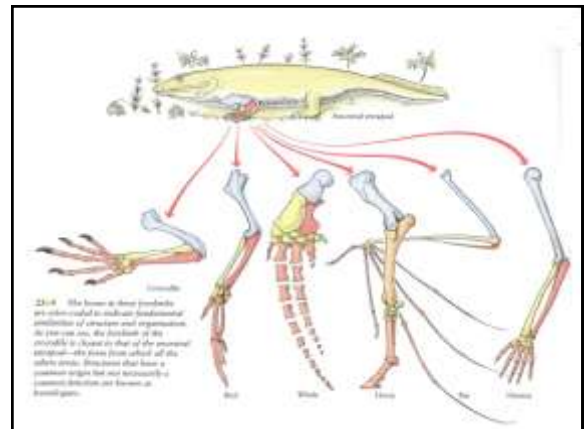
FOSSILS

- Relative dating:
lower layers = older fossil
- Absolute dating:
use radioactive isotopes to get an actual age.



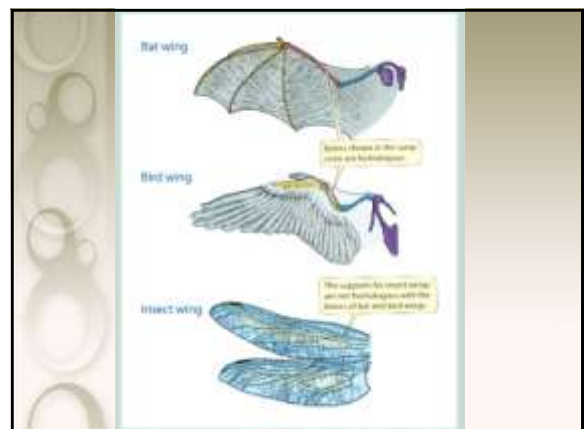
ANATOMY

- Homologous structures
 - Formed in similar ways during embryonic development
 - May take on different forms and perform different functions.
 - animals share a relatively recent common ancestor



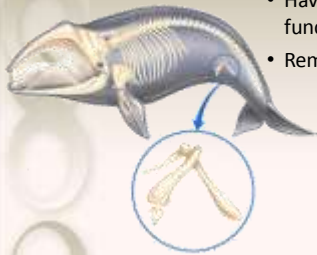
ANATOMY

- Analogous structures
 - similar in function and form
 - But have very different internal structures and embryonic development.
 - animals **do not** share a recent common ancestor



ANATOMY

- Vestigial Structures
 - Have lost most or all function
 - Remnants from ancestor



BIOCHEMICAL ANALYSIS

- Using similarities between
 - DNA sequences
 - RNA sequences
 - Amino acid sequences
 - Protein structure

Amino acids reveal evolution

Cytochrome c Evolution

Organism	Number of amino acid differences from humans
Chimpanzee	0
Rhesus monkey	1
Rabbit	9
Cow	10
Pigeon	12
Bullfrog	20
Fruit fly	24
Wheat germ	37
Yeast	42

SPECIES

- A population of organisms having common characteristics and capable of mating with one another and producing fertile offspring.
 - Horse & donkey?
 - Dog & gray wolf?

PHYLOGENETIC TREE

- Shows how species are related
- Uses morphological differences
 - phenotype
- Uses biochemical differences
 - Genotype
 - DNA Changes
 - Amino acid differences

