

Evolution Unit

Evolution of Macromolecules (Overview):

Early Earth had little free oxygen (for “breathing”)

Macromolecules appeared 1st then macromolecules:

Nucleic acids – made of _____ acids (RNA)

Proteins – made of _____ acids

Carbohydrates – made of _____

(saccharides)

Lipids – made of _____ and fatty acids



Evolution of Cells (Overview):

_____karyotes came first - _____ nucleus or membrane – bound organelles

Photosynthetic bacteria – created oxygen by process of _____

_____ karyotes came 2nd - _____ nucleus and membrane – bound organelles



Darwin's Theory of Natural Selection--occurs over many generations

A. Natural selection – organisms that are **better** adapted for their environment

Survive, Mate, and Pass on **survival traits**

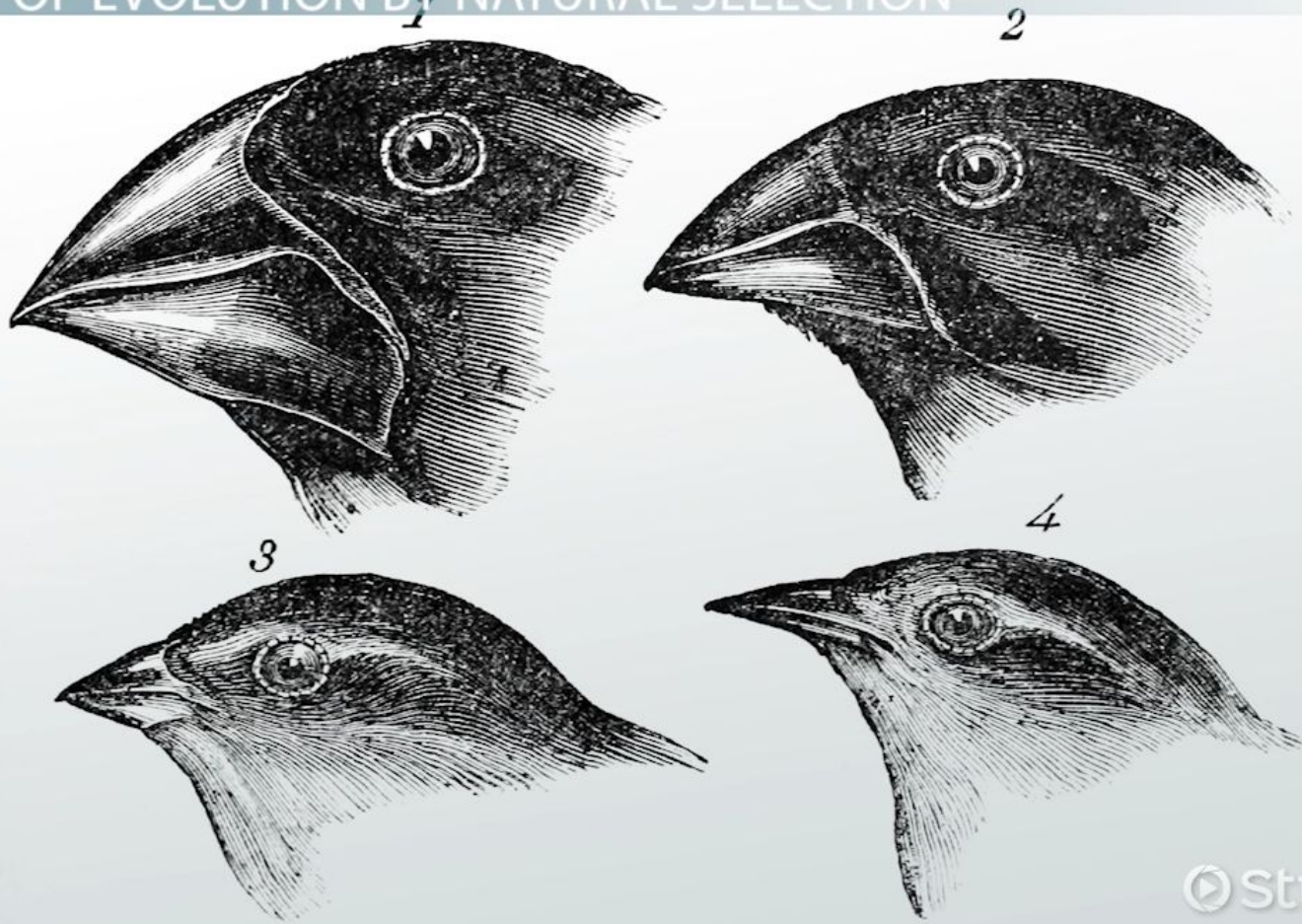
Movies have coined Darwin's theory to state: “survival of the fittest”

The term “FIT” actually means

more likely to survive & reproduce



THEORY OF EVOLUTION BY NATURAL SELECTION



Darwin's Theory of Natural Selection--occurs over many generations

B. Adaptation - any inherited change that helps an organism to survive

(genes given in gametes: eggs and sperm)

Ex. Falcon adaptations –

- Excellent vision, long toes, sharp talons, and a hooked beak

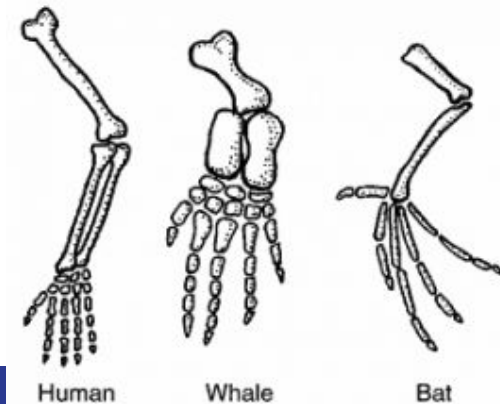


Evidence for Darwin's theory:

Fossil record – compare **fossilized** organisms to those alive today; can see how some organisms have adapted/evolved over time ex. lobster

Homologous structures – body parts in different organisms that have **the same** origin but not necessarily the same function

Ex. limbs in humans, whales, and bats



Evidence for Darwin's theory:

Embryonic development (development before birth)

-Insects & animals that have VERY similar development are **closely** related

-All vertebrates have VERY similar development = **common** ancestor

Vestigial structures – organ that is **not** used AND doesn't function

-**Appendix** in humans

- **Hind legs** in snakes

-Legs in whales

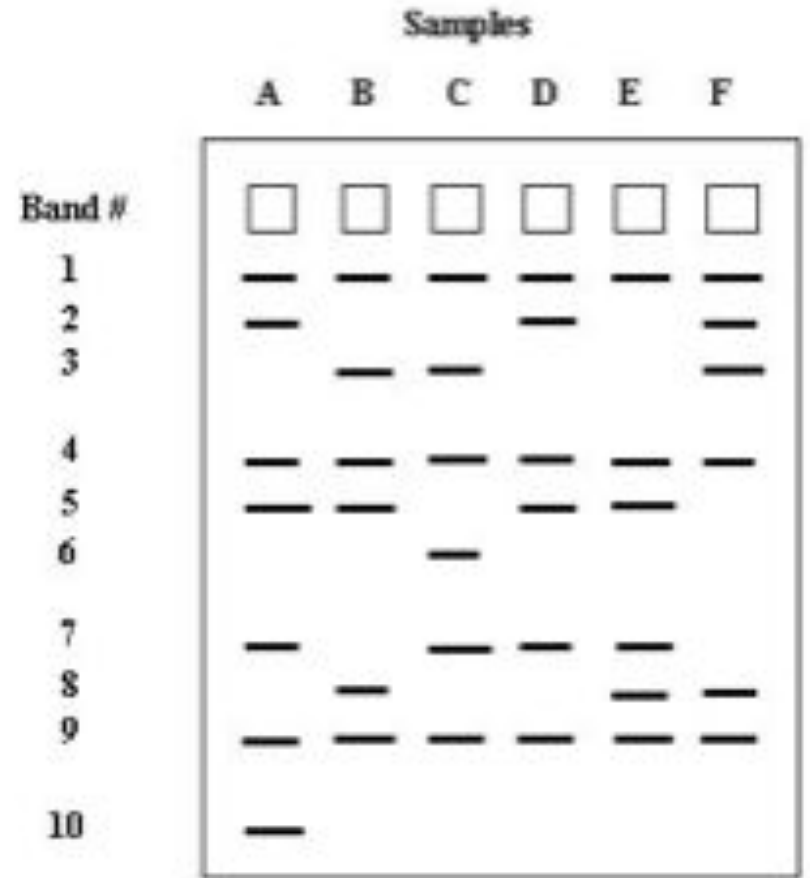


Evidence for Darwin's theory:

Biochemical evidence: 1980's Gel electrophoresis – can compare the DNA sequences of genes between organisms

-The more exact codons two genes have, the more genetically related the organisms are

Ex. diabetics use to inject insulin from cows!



Which two letters are most closely related?

KEEP IN MIND

Species – a group of the same kind of organism; can survive and produce **viable** offspring (babies can have babies of their own) ex. all humans!

Population – a group of the same kind of organism that lives in the same area.

Population – the fittest group of organisms that can evolve



How Evolution Occurs:

A population lives in a **suitable** environment.

Those organisms that are **better** adapted to the environment survive, reproduce and pass on their genes.

What causes one organism to be “best” adapted?

a particular variation of a gene (brown eyes are best adapted in bright light)

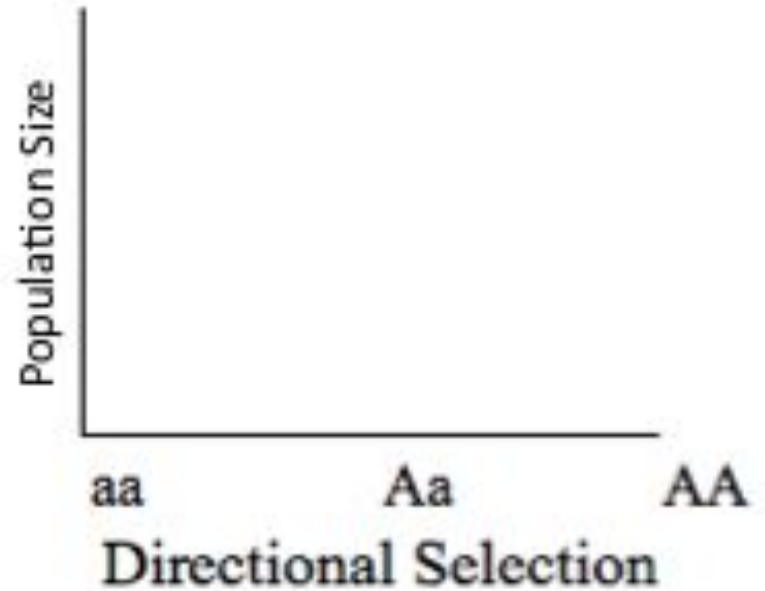
A random **mutation** within a gene (carriers for sickle-cell are immune to malaria)



Types of Natural Selection

Directional selection – when **EITHER** the dominant **OR** recessive form of a gene is **best adapted**

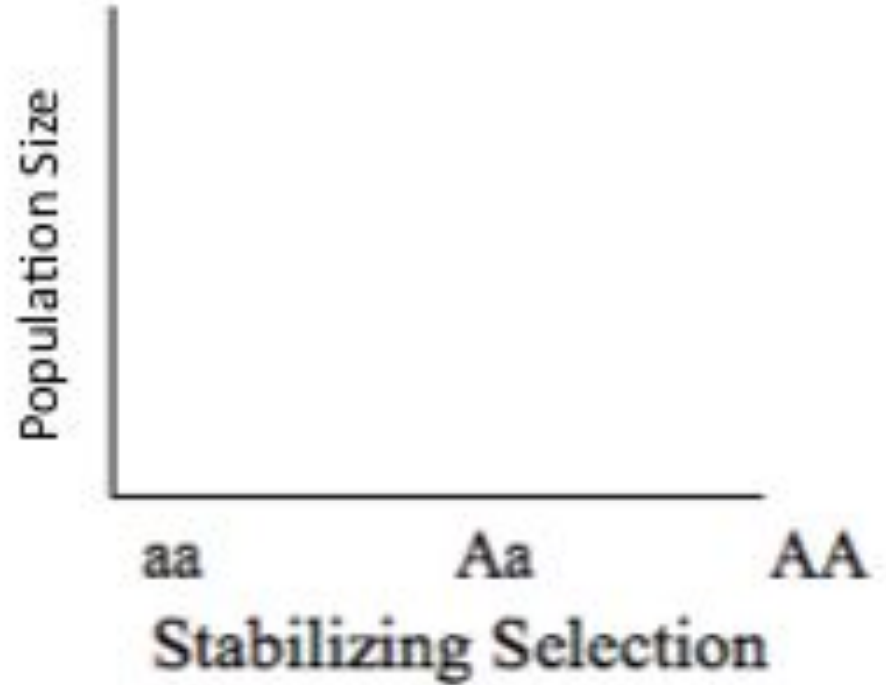
Woodpecker beaks are mostly large in size (small beaks can't build homes)



Types of Natural Selection

Stabilizing selection –
when the **heterozygous or
medium** form of a gene is
best adapted

Human baby weights have
been similar for over 30
years



Types of Natural Selection

Disruptive selection – when **BOTH homozygous** forms of a gene are best adapted

Both light and dark barnacles live attached to docks at Myrtle Beach



Geographic Isolation (can cause new species to appear)

- Mountains - adapt to their specific environment, often becoming a **speciation** species.

Ex. Panda bears, many species of hummingbirds

- Islands - adapting to their environment, they become a **speciation** species from those found on the mainland.

Ex. species of **poison** arrow frogs differ from island to island and mainland

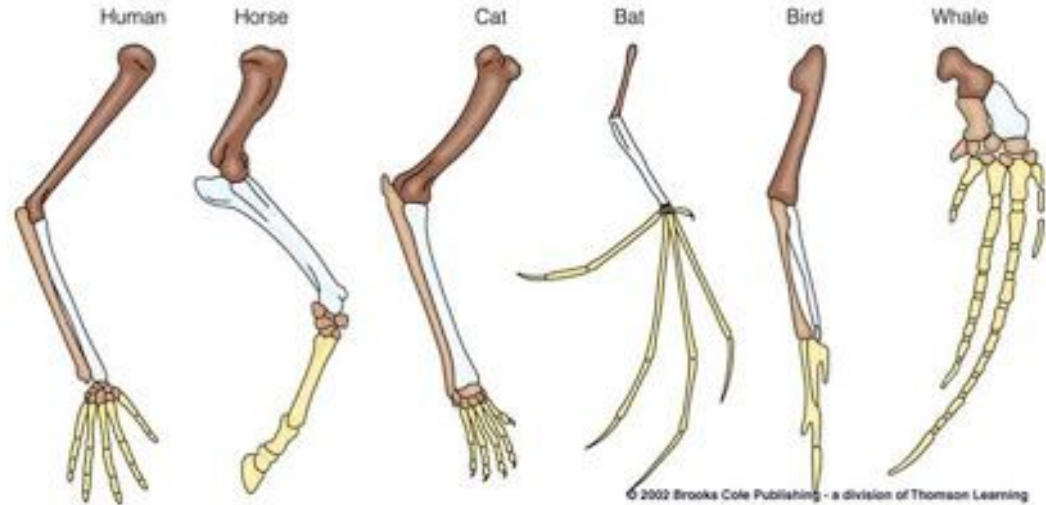
Ex. Galapagos tortoise – **largest** turtles in the world

Divergent Evolution (Adaptive Radiation)

When one species evolves into two new species over time.

Ex. Birds on the Galapagos and Hawaiian islands

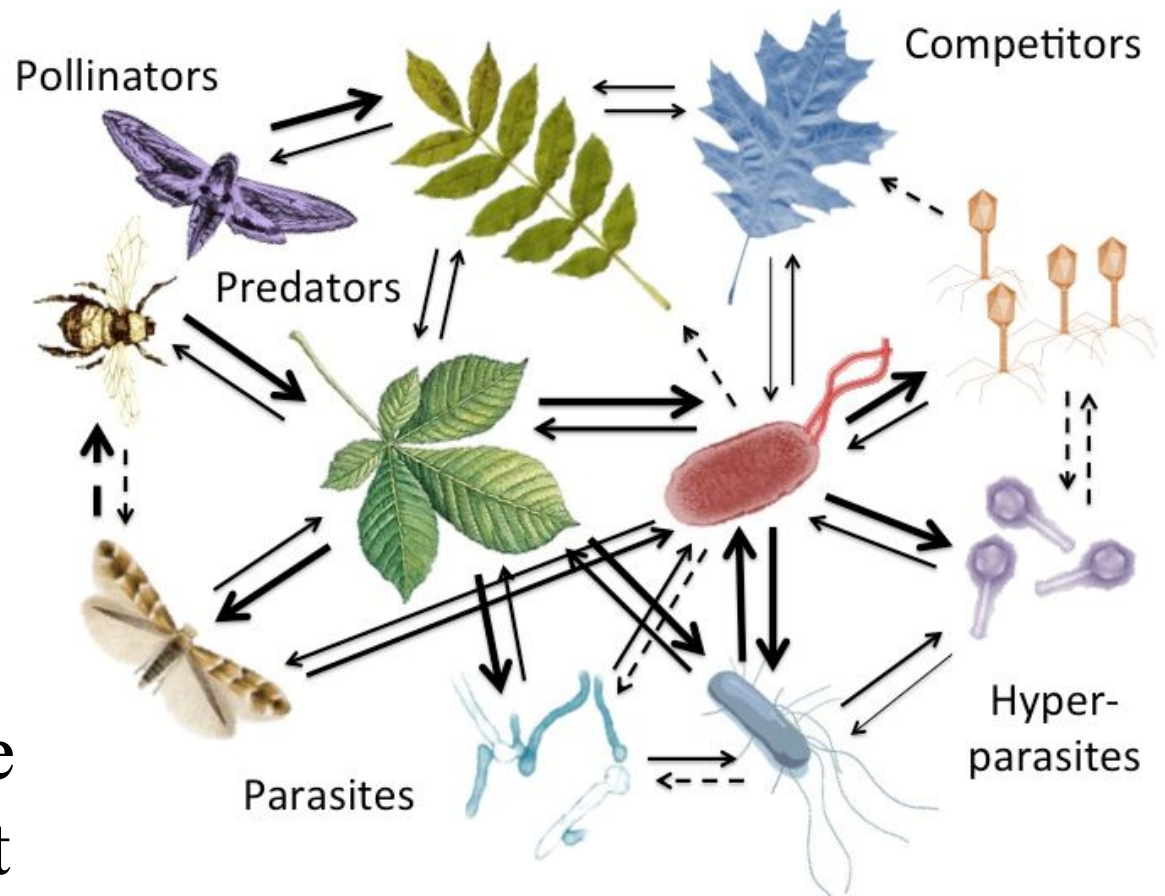
Divergent evolution



Coevolution

When **one** species evolves to the presence of **another** species

Ex. flowers and insects – flowers have shapes that are easiest for their pollinators



Diseases cause Evolution

Drug resistant bacteria (when penicillin and antibiotics no longer work)

ex: pneumonia, why over-the-counter drugs are less effective than prescriptions

AIDS virus has **evolved** many times, creating different strains (immune to drugs)




Immune System & Pathogens

Passive immunity – passage of immunity from mother to unborn baby AND nursing newborn:

Acquired immunity – occurs when a person gets infected, then gets better later (actively sick)

Vaccines – cause an immune response by injecting either; damaged virus or bacteria or proteins from their cell walls or protein coats



The History of Classification

Man has tried to **classify** all living things on Earth

1st system: Plants and animals

2nd system: “**Kingdom System**:” bacteria, fungi, plant, and animal (better microscopes)

3rd system: split bacteria into **TWO** kingdoms (by **DNA** analysis)

Current system: Added “**Domains**” above the kingdoms (DNA genome sequencing)



The History of Classification

In time, more will be learned about organisms, thus **more** kingdoms will be added!


Taxons - the Latin name for **arrangement**

Scientific name: - uses the Genus species name of an organism;

ex. *Canis lupus* is the scientific name for the grey wolf,

Homo sapiens – scientific name for **humans**





Taxon	Spider Monkey	Chimpanzee	Whale shark	Grey wolf
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Chondirchthyes	Mammalia
Order	Primates	Primates	Squaliformes	Carnivora
Family	Atelidae	Hominidae	Rhincodontidae	Canidae
Genus	Ateles	Panini	Rhincodon	Canis
Species	<i>paniscus</i>	<i>Pan</i>	<i>typus</i>	<i>lupus</i>

The more the **same** word appears in a ROW = similar traits

The more **different** the words are in a ROW = more differences between the species

Phylogenetic Tree

Key:

Branching = differences

Closeness = relatedness

Common ancestors =

Trace each line backwards

