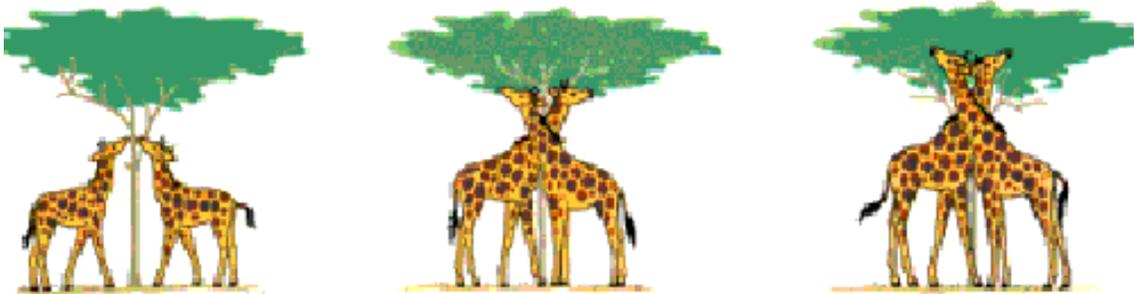


3. The Theory of Evolution

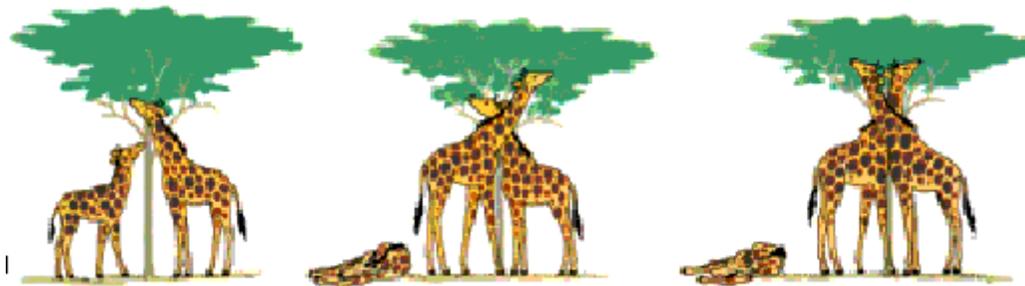
- The **Theory of Evolution** remains one of the most useful theories in biology
- attempts to explain why living organisms so similar in **molecular structure** are so different in **form and function**
 - all organisms are similar in
 - : basic cell structure
 - : requirements for energy
 - : basic life processes
 - : ability to adapt
- Why Do Organisms Evolve?
 - one population of organisms cannot survive in the **niche** of another
 - differences between organisms are necessary = makes them special
 - **adaptations** = **inherit trait(s) that improve the chance of survival & reproduction of an organism**
 - ie) Ferns / mosses are adapted for wetlands; cacti for drylands
- organisms are **diverse** due to their adaptations
- There are 2 main theories of evolution:
 - A. Lamarck's Theory Of Acquired Characteristics (1809)**
 - Changes in the environment caused organisms to **need** or **not need** certain structures.
 - If an organism does not need a certain part, it will **disappear**
 - ie) Appendix of man
 - When an organism needs a certain adaptation, that adaptation arises. If the change is beneficial, then parents will pass this change to their offspring by **heredity**.
 - = Organisms **ADAPT TO** an environment to survive
 - ie) Droughts in Africa, caused giraffes to need long necks so they developed this adaptation and passed it to their offspring by heredity



- Today, Lamarck's theory is regarded as invalid!

B. Darwin's Theory of Natural Selection

- Charles Darwin was a naturalist who observed many species. He is famous for his trips to the Galapagos Islands, his observations of the finches (and other animals) and the book he wrote: "The Origin of Species".
- Darwin's Theory of Evolution by Natural Selection states that evolution is caused by 5 factors:
 1. Over Production (Over Population)
 - All organisms produce more offspring than can **survive** to reproduce
le) perch lay millions of eggs
 2. Competition (Struggle for Existence)
 - Over population causes organisms of the same species and organisms of different species to **compete** for limited resources
le) food, shelter, space, etc.
 3. Variation
 - No 2 organisms are exactly alike, even among the same species. These **variations** are passed on through heredity
 4. Natural Selection (Survival of the Fittest)
 - Those organisms who are better able to **adapt** (compete and survive) will reproduce while all others die off without leaving offspring
 - Adaptations are inherit traits (**variations**) that improve the chances of survival
 - = nature '**selects**' the organisms that survive
 5. Speciation (Origin of a New Species)
 - Over time and numerous generations, new can species arise through the accumulation of inherited variations
 - = **natural selection is the cause of evolution**



= Organisms **ALREADY ADAPTED TO** an environment to survive

Other Evolutionary Scientists

Darwin was inspired Thomas **Malthus**, an English biologist, who suggested that nature allows organisms to **overproduce** which creates **a natural struggle to survive**.

Alfred **Wallace**, a British biologist working in the East Indies, also suggested a theory of evolution very similar to Darwin's although it was developed completely independently. Wallace allowed Darwin to receive **total credit** for the same theory of evolution.

4. Sources of Variations

= where do the adaptations come from?

a) Mutations

- all genetic variation in a population originates as a **heritable mutation** & is passed on and preserved from one generation to the next
- whether a mutation is good, neutral, or harmful depends on how it affects **survival & reproductive success** of a species
- variations are the raw materials for natural selection
 - = are the **adaptations** that enhance survival
- these changes do not enter the evolution process rapidly because they tend to be **masked** (hidden) by stronger forms of a gene (**allele**)
- if environmental changes occur, this trait may be selected
 - = the mutation becomes an **adaptation** (ie. Peppered moths)

b) Recombination

- during meiosis when gametes are made **crossing over** occurs causing chromosomes to exchange pieces resulting in different **genetic combinations** of traits (ie. brown hair & blue eyes)
- types of adaptations:

1) Structural Adaptations

- : **physical traits** that allow an organism to survive & reproduce
- ie. bird's bill, coloring (camouflage)



pursuit fishing

aerial fishing

dip netting



filter feeding

gripping

surface skimming



2) Physiological Adaptations

- : allow an organism to perform special **functions** to survive to reproduce
- ie. making venom, secreting slime, pitcher plant



3) Behavioural Adaptations

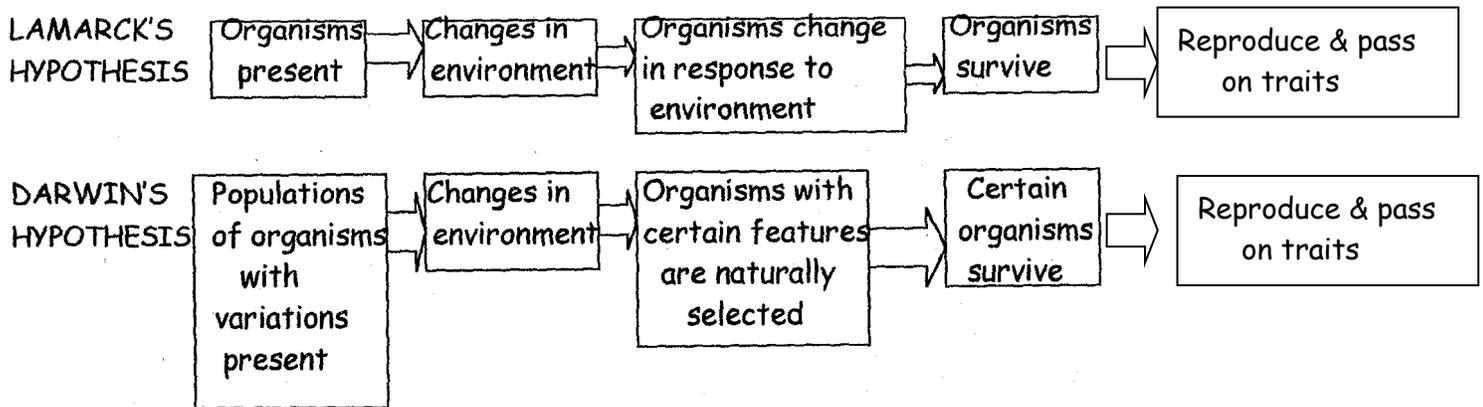
- : perform **actions** that allow an organism to succeed in its environment
- ie. mimicry, stalking prey, hunting in packs



- Characteristics of Evolution

1. Evolutionary change involves a change in **population** and not in **individuals** during their lifetime. It is the frequency of different **kinds** of individuals in the population.
2. A single evolutionary event involves **few** characteristics.
3. There must be a **valid reason** for an evolutionary change to occur

LAMARCK VS DARWIN



Similarities:

- 1) Evolution (changes) does occur
- 2) Environments do change
- 3) Traits are passed on via reproduction
- 4) Speciation = result of evolution

Differences:

Lamarck	Darwin
1) All organisms within a population are the SAME	1) Organisms within a population DIFFER from each other (variations)
2) When the environment changes, organisms change in RESPONSE TO the environment so all organisms survive	2) When the environment changes organisms WITH the best variations (adaptations) survive
3) Change (speciation) occurs over ONE GENERATION	3) Change (speciation) occurs over MANY GENERATIONS

3. The Theory of Evolution

- The **Theory of Evolution** remains one of the most useful theories in biology
- attempts to explain why living organisms so similar in _____ are so different in _____

- all organisms are similar in: basic cell structure
: requirements for energy
: basic life processes
: ability to adapt

- Why Do Organisms Evolve?

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- differences between organisms are necessary = makes them special
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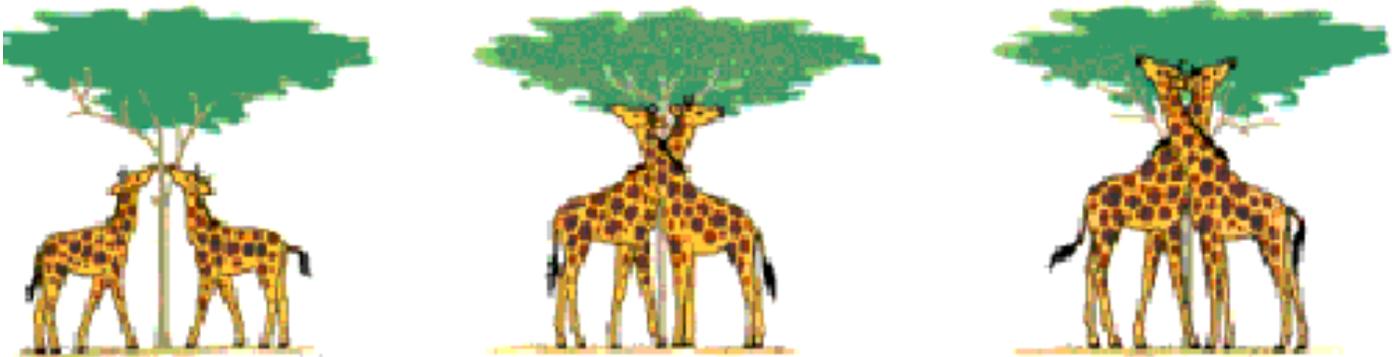
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= Organisms _____ an environment to survive

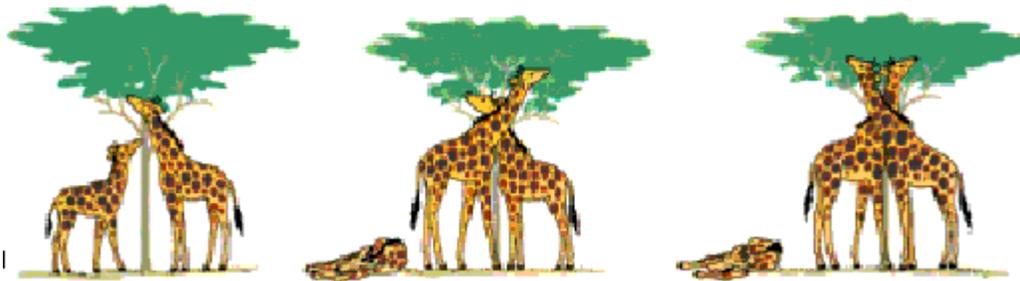


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 5. Speciation (Origin of a New Species)
 - Over time and numerous generations, new species can arise through the accumulation of inherited variations
 - = is _____



= Organisms _____ an environment to survive

Other Evolutionary Scientists

Darwin was inspired Thomas **Malthus**, an English biologist, who suggested that nature allows organisms to **overproduce** which creates _____

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- if environmental changes occur, this trait may be selected
 - = the mutation becomes an _____

b) Recombination

- during meiosis when gametes are made _____ occurs causing chromosomes to exchange pieces resulting in different _____ of traits (ie. brown hair & blue eyes)

- types of adaptations:

1) Structural Adaptations

: _____ that allow an organism to survive & reproduce

- ie. _____

2) Physiological Adaptations

: allow an organism to perform _____ to survive to reproduce

- ie. _____

3) Behavioural Adaptations

: perform _____ that allow an organism to succeed in its environment

- ie. _____

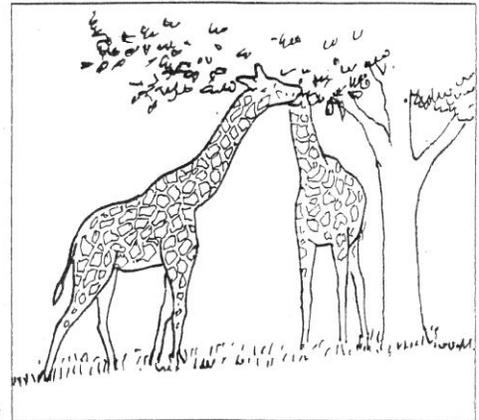
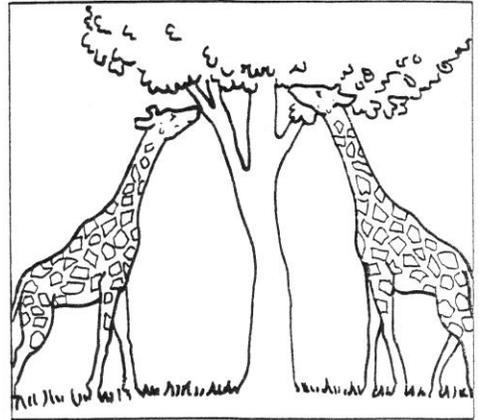
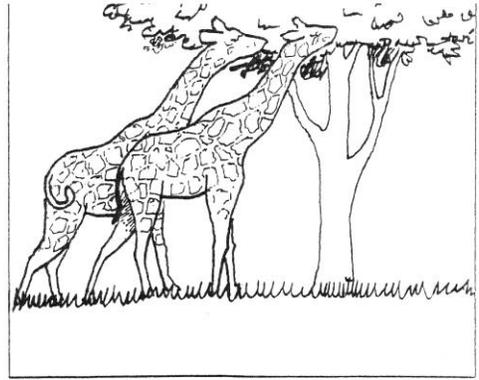
- Characteristics of Evolution

1. Evolutionary change involves a change in _____ and not in _____ during their lifetime. It is the frequency of different _____ of individuals in the population.
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Biology 20 Worksheet

Theories of Evolution

1. Name 3 biologists who proposed a theory in regards to evolution?
2. Which person influence Darwin's thinking about overpopulation of organisms?
3. Using the diagrams on the right, answer the following questions:
 - a) According to Lamarck, all ancient giraffes were short necked with short legs. T or F
 - b) According to Darwin, all ancient giraffes had a varied of neck and leg shapes. T or F
 - c) A change in environment caused the giraffes to experience a change in their general appearance. T or F
 - d) According to Lamarck, the short necked giraffes began to stretch their necks and legs because they had a specific need. T or F
 - e) According to Darwin, the long necked and legged giraffes were able to compete for the limit supply of leaves. T or F
 - f) According to Darwin, which giraffes would have survived and reproduce?
 - g) According to Darwin, what acquired trait did the giraffes pass to their future offspring?
 - h) According to Darwin, the giraffes with the long necks and legs were naturally selected. T or F
 - i) The giraffes which survive in a changing environment are: a) the oldest b) the youngest c) the best adapted



Complete each statement using a term or terms from the list below.

changing
Darwin
variations
extinct

favourable
adapted
different
reproduce

disused
competition
limited number
Lamarck

need
heredity

acquired traits
Wallace

organisms
survival

1. An organism that is suited to its environment is said to be _____ to its surrounding.
2. A given environment is always _____.
3. As the environment changes, the _____ that live on it also changes.
4. A species that does not change as its environment changes may become _____.
5. _____ was the scientist who stated organisms evolve as the result of change in the environment where as _____ and _____ believed the organisms that was best adapted to the change was selected.

According to Lamarck:

6. A change in the environment such as draught causes organisms to have an inner _____ to adjust.
7. The _____ are the result of changes that occurred within the parent organisms.
8. Any organ or structure that is not required by the parent organism would become _____.
9. Both acquired and disused traits are passed on to the next generation through _____.

According to Darwin:

10. A favourable environment can support only a _____ of organisms.
11. Overproduction leads to _____.
12. Organisms belonging to the same species can have _____ traits.
13. Differences among traits are called _____.
14. Organisms that are adapted to their environment _____ and pass their _____ traits on to their offsprings.
15. Greater variation within a species increases the chance for _____.