

Evolution

Time for something new!

- Our new unit is on Evolution
- For today's slides, please look at section 22.2 in your book.
- Read it and learn more about the life of Charles Darwin

What is evolution?

- Evolution is the change in the genetic makeup of a population over time
 - Change in allele frequency over time

What does that mean?

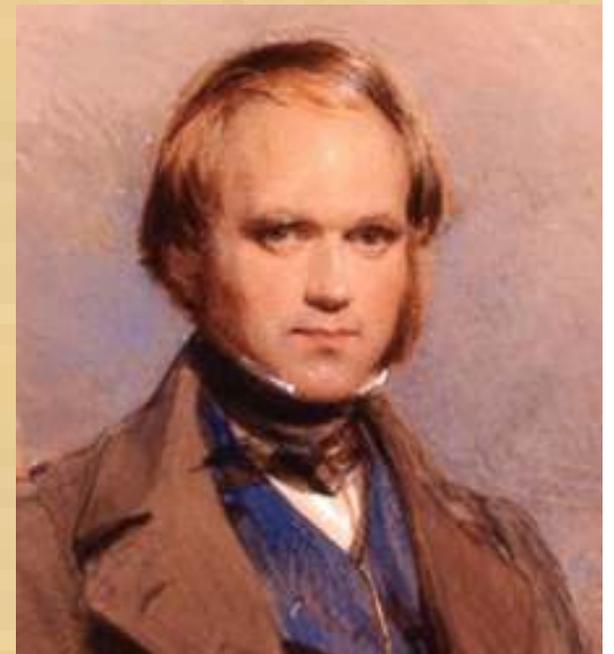
- It means that over time, the genes found in groups of living organisms have changed
 - Alleles – the DNA sequences that are directly responsible for traits
 - Frequency – the amount of times they appear in a population

Why have living things changed and how have they done it?

- Those are really good questions.
- Charles Darwin asked the same questions and he came up with an explanation
 - He observed how living things have changed or appeared to become modified to their surroundings.

Darwin came up with...

- Natural Selection!
- Natural Selection is his best explanation of how evolution works
 - His theory is based on his observations of how living things have adapted to their environment.



What is natural selection?

- Its hard to describe in a simple definition but the next 2 slides should help
- Check out pg. 444 for a summary too!

How does natural selection work?

- 1. Living populations increase exponentially and resources are naturally limited.
 - Food, space, etc.
- 2. More individuals are born than can possibly survive, which creates a struggle for existence.
 - Competition for resources

How does natural selection work?

- 3. Populations of living organism have natural, heritable variation of characteristics
 - Traits allow you to have different abilities
- 4. Survival is dependent on traits; some traits are more likely to help an organism survive and reproduce
- 5. Those traits that help an organism survive and reproduce will be passed on, gradually changing the population over time to have the favorable characteristics

Summary

- Take a minute and summarize what natural selection means in your own words in your notebook.

Some important ideas about Natural Selection

- The environment drives evolution
 - Environments change over time and that determines which traits are most beneficial
 - Selects for additional adaptation
- Evolution leads to new species
 - As living things change, eventually they become so different they are no longer the same species
- Individuals do not evolve – populations do
 - Nothing you do can change your genetics!

Some important ideas about Natural Selection

- Evolution is not a theory- it is a fact
 - We can clearly see that living things have changed over the history of our planet
- Natural selection as the mechanism that causes evolution to occur is the theory part of this

Evolution and Natural Selection

Ok, quick review from last night

- What is evolution?
- What is natural selection?
- Why and how have living things changed?

Key ideas that help explain natural selection

- Natural heritable variation exists
 - Even though all maple trees look the same, they are all genetically different and have different traits as a result.
- Traits that are not heritable are not part of evolution
- This variation allows some individuals to be better at securing resources for themselves
- Those individuals with favorable variations are more likely to survive and produce more offspring, which passes on their traits to future generations

Natural Selection

- Some key ideas that help make sense of natural selection
 - Genetic Variation
 - Gene Pool
 - Heritable variation and adaptation
 - Fitness
 - Environment

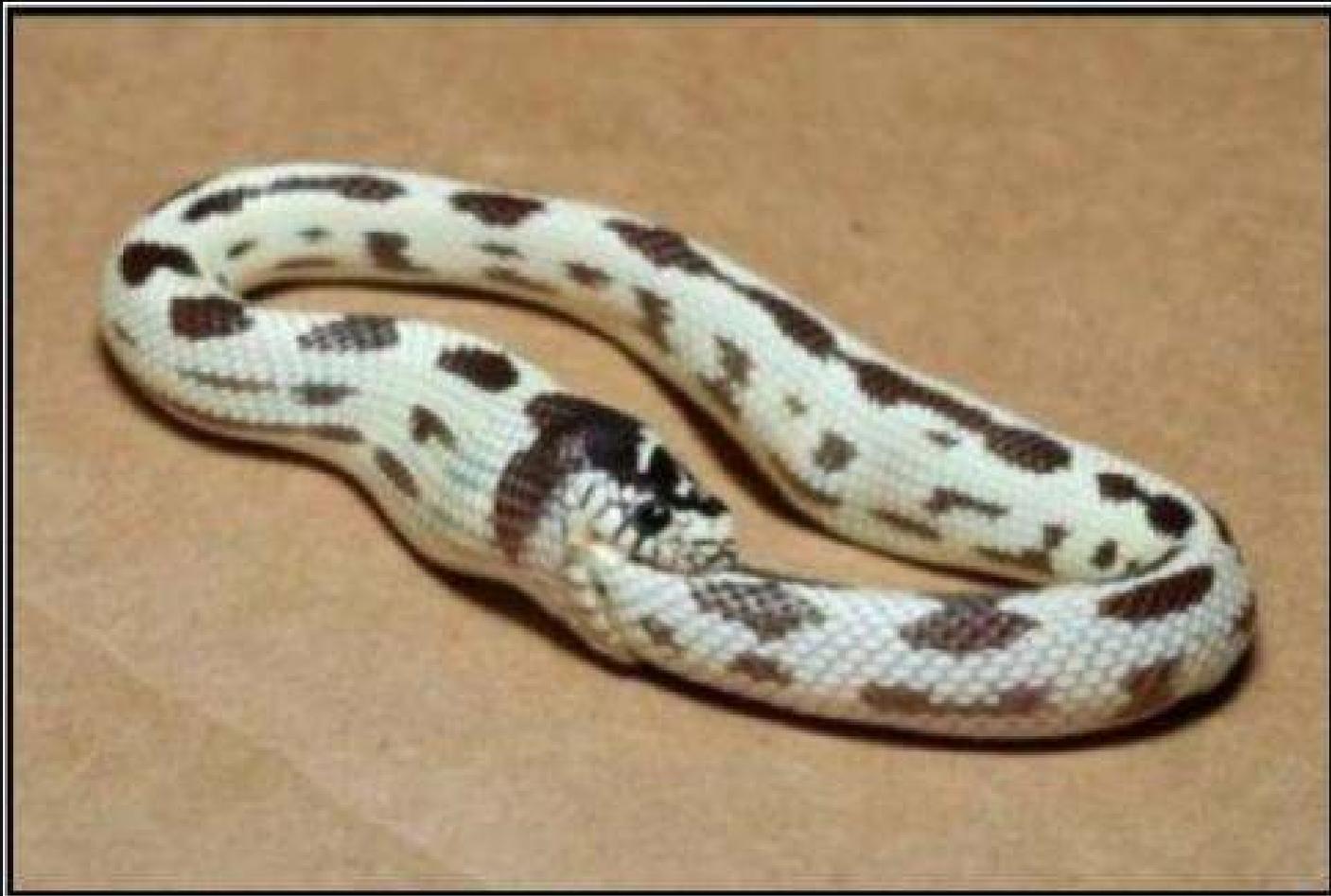
Genetic variation

- Where does new variation come from?
 - Mutation
 - The only way to get new alleles
 - Sexual reproduction
 - Crossing over
 - Independent assortment
 - Random fertilization
- Important because variation allows selection to occur
 - Some traits are more helpful than others = better survival

Gene Pool

- All of the available genes in a population
- Why is the gene pool so important in Natural Selection?
- Genes that are not there can not be selected
 - Genes are not created on demand





OKAY, THAT'S IT

Everyone out of the gene-pool

Heritable variation and adaptation

- Some traits are not heritable
 - Skills and traits gained in life are not genetic, even if they affect phenotype
 - Working out
 - Practicing piano

Heritable variation and adaptation

- Adaptations are characteristics that arise from genetics which aid survival
 - Some rabbits produce a white coat in winter. They do not choose to do this. It just happens.
- Adaptations are different from adapting to a situation
 - Adapting to a situation: a human puts on a coat to stay warm when it is cold. Not genetic.

Fitness

- In the evolutionary sense, what does it mean to be fit?
- Fitness is measured by reproductive success
- More fit= more likely to survive and produce offspring

Environment

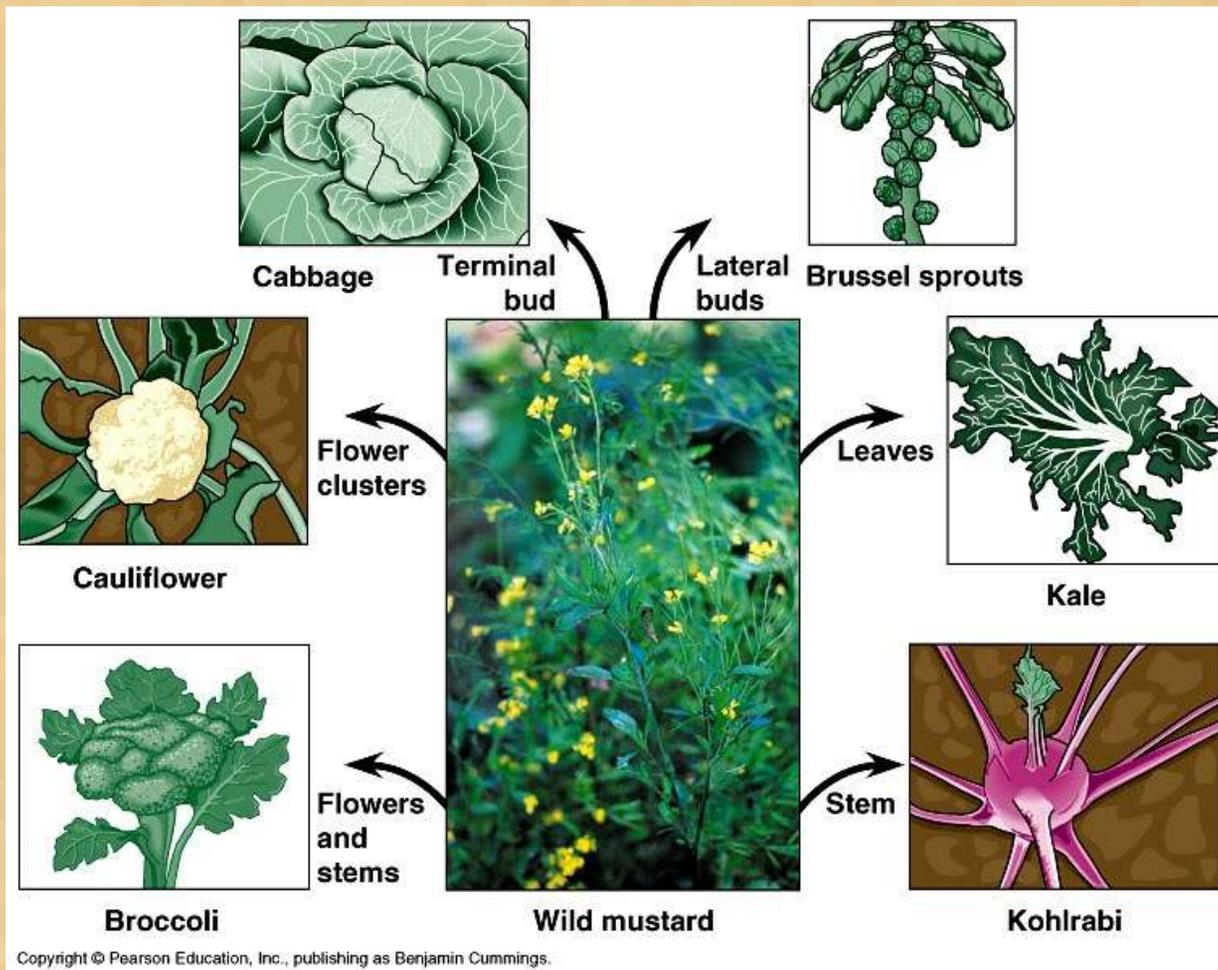
- Environments are always changing and there is no perfect genome
 - Quick change
 - Slow change
- The environment is the gene filter- some phenotypes stay and others disappear based on conditions
 - A diverse gene pool is the key to a species survival
- The environment does not create new variation. It only filters what already exists

Is there other stuff (besides Natural Selection) that can affect evolution?

- Yes
- Remember, what is evolution? Change in allele frequency in a population over time

Artificial Selection

- Humans can change allele frequency by selecting desired traits in animals and plants







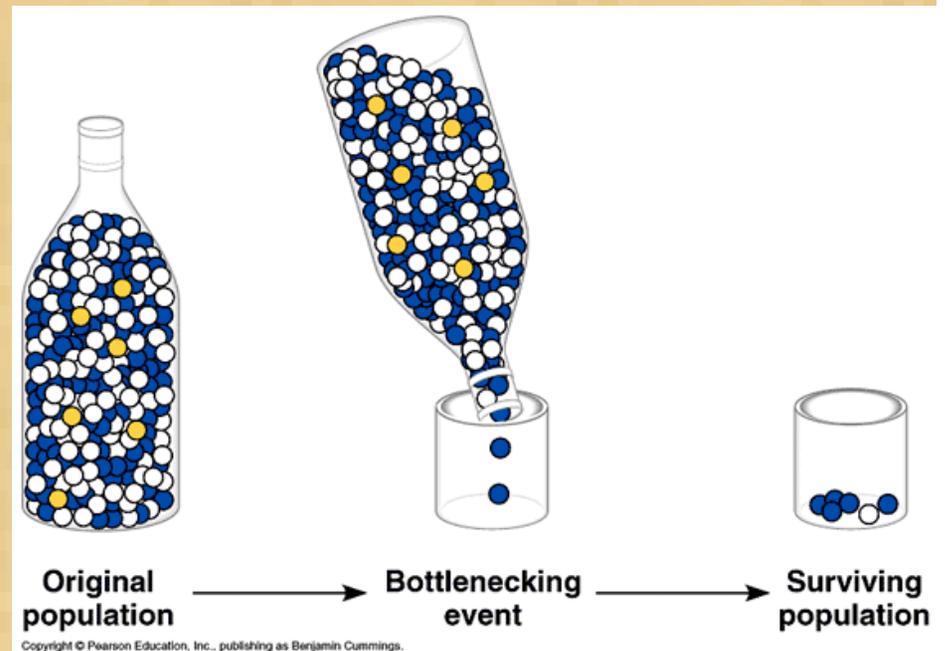
Human genetic engineering

- Results in new genes and new gene combinations which produce new phenotypes

Some process that drive evolution are
random

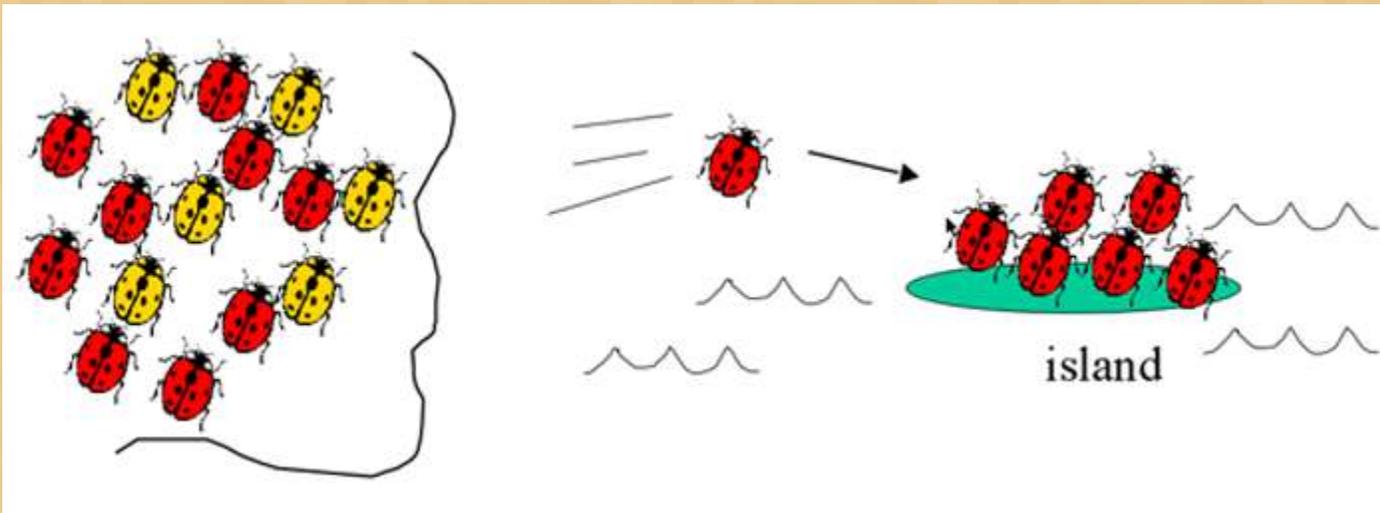
Genetic Drift

- Genetic drift- elimination of alleles from a population due to chance
 - Typically found in small populations
 - 1. Bottleneck effect – major event eliminates most of the individuals
 - Allele variation is lost
 - Major event? Like a flash flood or a disease or human hunting



Other things that change allele frequency in the gene pool

- 2. Founder effect – individuals break off from original population and start a new population
 - Not representative of original population
 - Stranded on an island



Other things that change allele frequency in the gene pool

- Gene flow – introduction or removal of alleles due to individual movement
 - Sometimes animals from one population mix with individuals of another population
 - They have different traits in different populations- changes allele frequency if new traits are introduced

