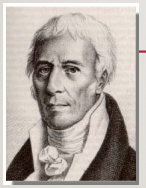
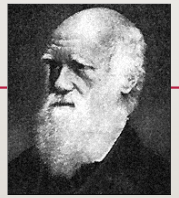
THE THEORY OF EVOLUTION

CHANGE OVER TIME



Lamarck



Darwin.

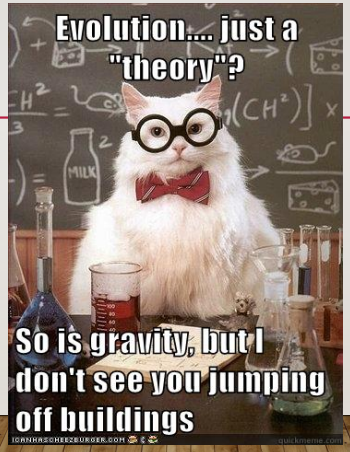
Malthus

I. WHAT IS EVOLUTION?

Why is Evolution So Controversial, anyway?
clip #7

A. Microevolution- change of allele frequency within a population over time (not disputed)
B. Population- same species living together - same place, same time
C. Macroevolution- origin of new species (clashes with some religious beliefs)
D. Species- a group of organisms that are closely related and can mate to produce fertile offspring
E. Gene pool- ALL alleles in the population

- Clip #1 isn't evolution just a theory?

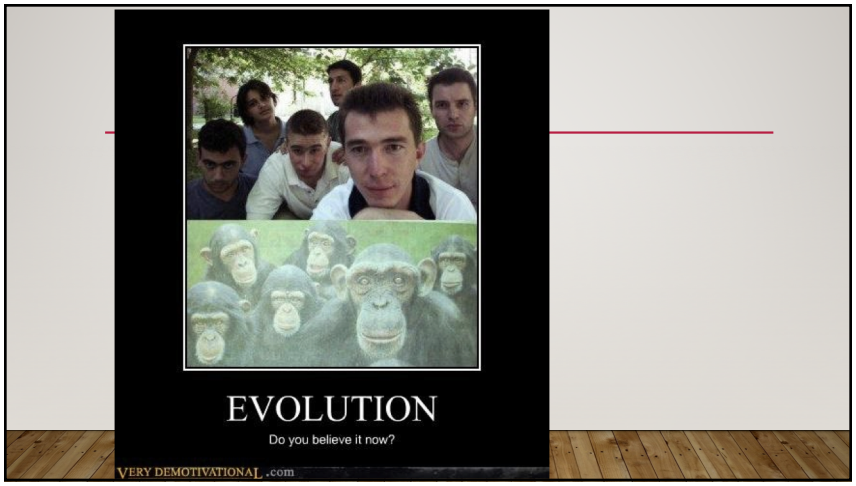


2. INFLUENCES ON DARWIN

A. Lamarck- spontaneous generation* AND use/disuse theory

Clip2 who was Charles Darwin?

* Oops, we now know flies come from fly eggs, remember Virchow?



LAMARCK'S USE/DISUSE THEORY

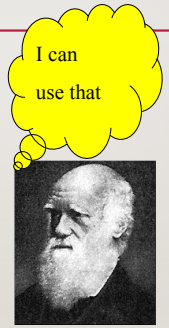
FALSE

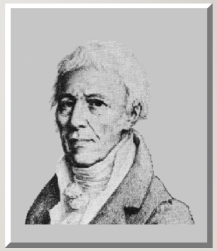
Giraffes who stretch their necks to reach tall branches will pass on the long neck characteristics to their offspring.

Example: Mice whose tails are cut off do not have mice with no tails

WAS LAMARCK RIGHT ABOUT ANYTHING?

- ☑ Coined the term invertebrates
- ☑ Living things cannot be living if they don't have cells
- ☑ **Offspring get traits from parents**
- ☑ Earth was immensely old
- ☑ (Implied environmental) Children and grandchildren of smokers have increase risk of asthma
- ❑ Not right about women, married 4 times



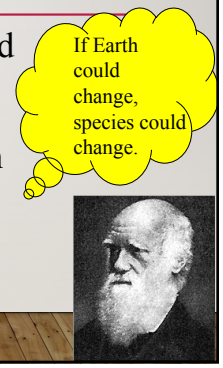


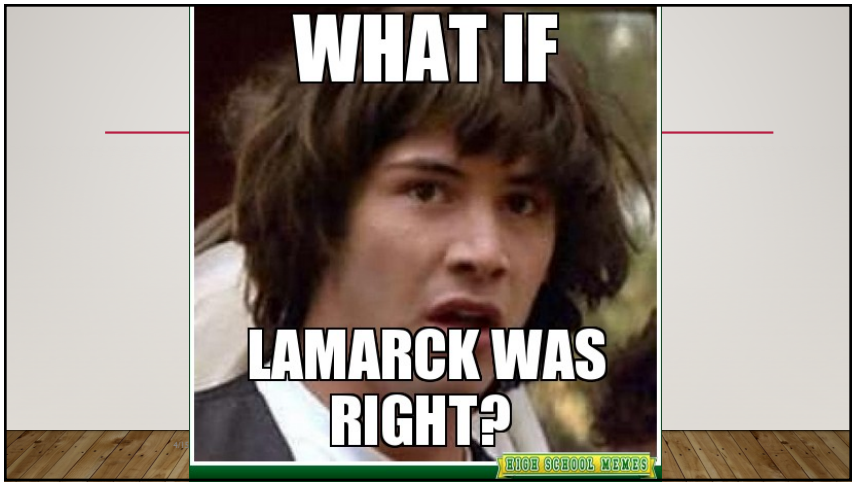
2. INFLUENCES ON DARWIN (CONTINUED)

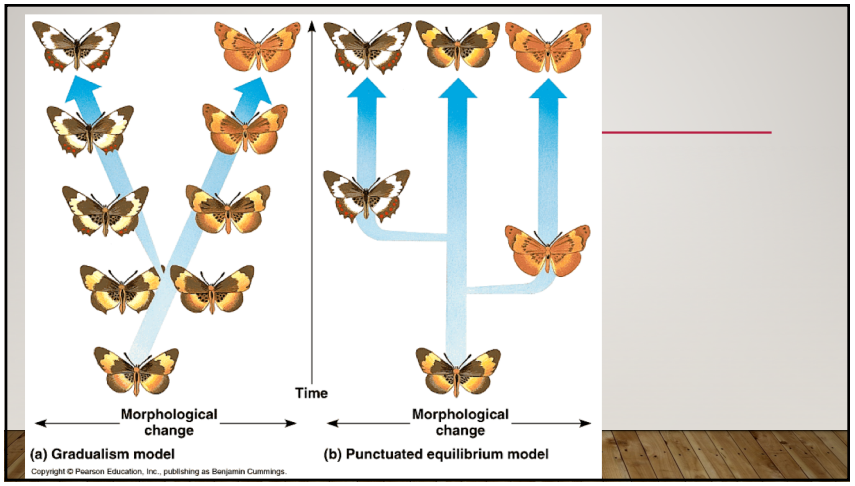
B. Geologist (Charles) Lyell Earth changed over time

C. Geologist- (James) Hutton- gradualism

D. Punctuated equilibrium (1972) due to catastrophic changes




WHAT IF
LAMARCK WAS RIGHT?
HIGH SCHOOL MEMES


Time
Morphological change
Morphological change
(a) Gradualism model
(b) Punctuated equilibrium model
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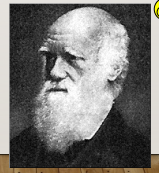
2. INFLUENCES ON DARWIN (CONTINUED)

E. (Thomas) Malthus described how food and other resources limit human population growth

(Certain individuals die due to lack of food)



If population size in humans is limited, how about animals?

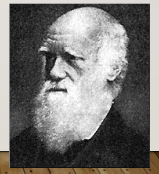
3. DARWIN'S DATA

A. Collected <u>fossils</u>

B. Finches on the mainland differed from island species- food changed, beaks changed

C. Descent With Modification

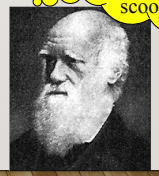
D. Biogeography- study of past and present geographic distribution of organisms

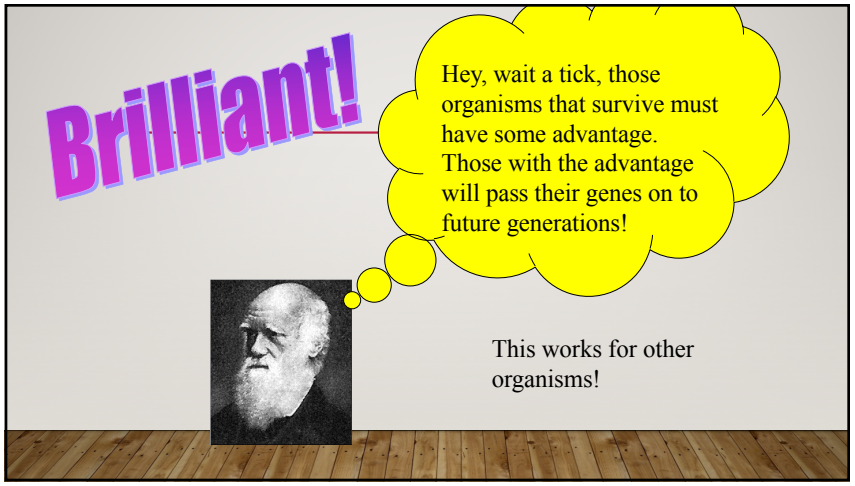


Finches get their beak shape from their parents (Lamarck)

4. THE BOOK

a) 1858 – Wallace – Evolution article
b) 1859 Darwin's book, The Origin of Species





5. CAUSES OF EVOLUTION

A. Natural selection- better suited organisms survive to reproduce- frequency of phenotypes shift (see last sentence page 483 *)

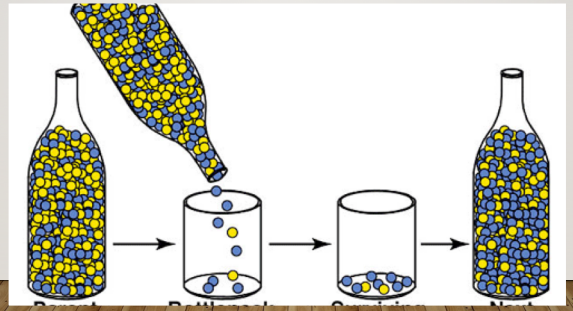
* *"Natural selection operates on individual organisms, but the changes it causes in allele frequency show up in the population as a whole"*

Clip #6 Why does evolution matter now?

5. CAUSES OF EVOLUTION

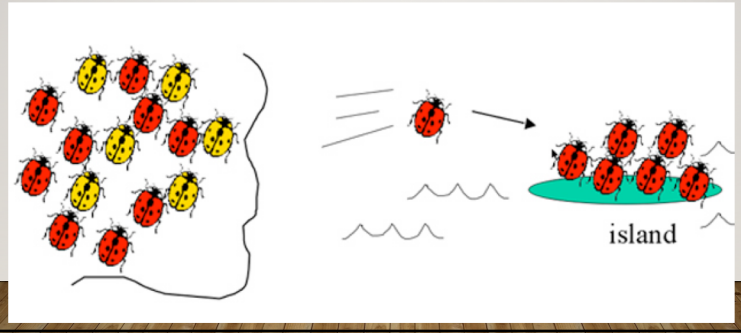
B. Genetic drift- random change NOT due to natural selection- 2 examples (Bottleneck & Founders)

BOTTLENECK EFFECT: A FEW SURVIVE A NATURAL DISASTER- LESS GENETIC DIVERSITY IN NEW GENERATION



OOPSIE! GREEN WENT AWAY- HAD NOTHING TO DO WITH FITNESS

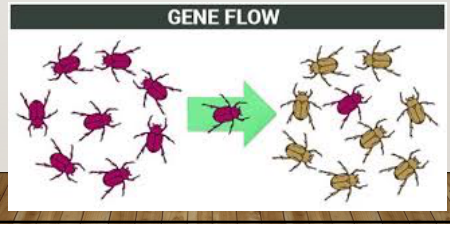
FOUNDER EFFECT- A FEW INDIVIDUALS FROM A POPULATION START A NEW POPULATION WITH A DIFFERENT ALLELE FREQUENCY THAN THE ORIGINAL POPULATION



5. CAUSES OF EVOLUTION (CONTINUED)

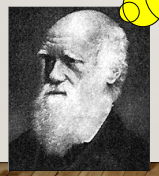
C. Gene flow- immigration, emigration, birth, death

D. Mutation – random change of DNA (can be helpful, harmful or have no effect)



6. NATURE…

…changes species by selecting traits. Nature "selects" the parents for each new generation



You should write this, it's how "natural selection" gets its name

Clip 6- why does evolution matter now?

7. NATURAL SELECTION- WHY?

clip #4

How does Evolution really work?

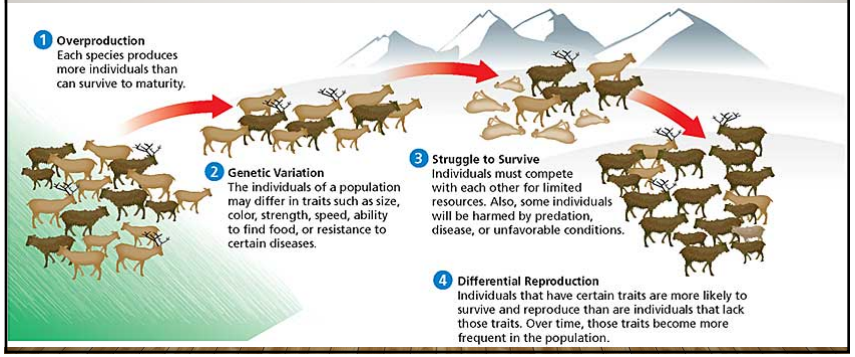
A. Genetic Variation

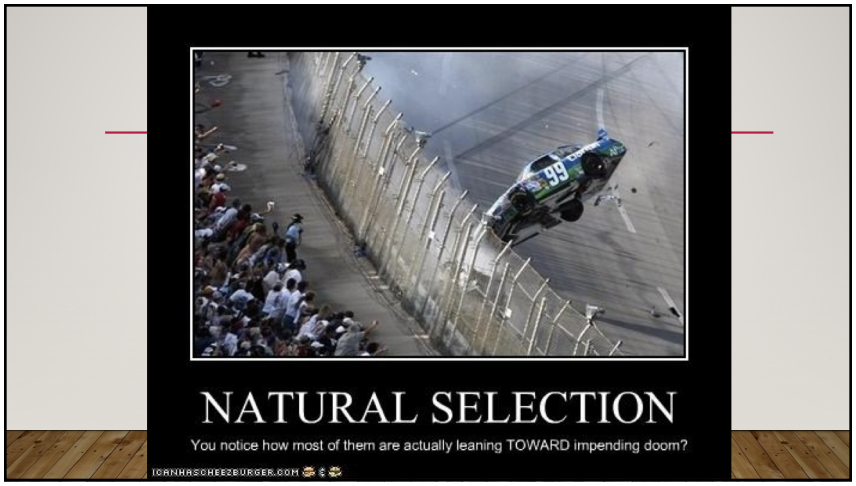
B. Overproduction of offspring

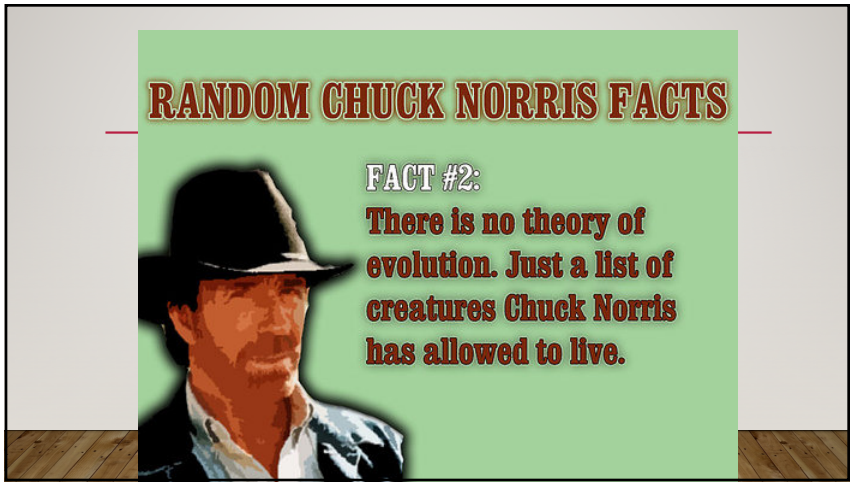
C. Struggle to survive- competition
   - A trait that makes an organism more suited is called an adaptation

D. Differential reproductive success

NATURAL SELECTION




NATURAL SELECTION
You notice how most of them are actually leaning TOWARD impending doom?
ICANHASCHEEZBURGER.COM


RANDOM CHUCK NORRIS FACTS
FACT #2:
There is no theory of evolution. Just a list of creatures Chuck Norris has allowed to live.

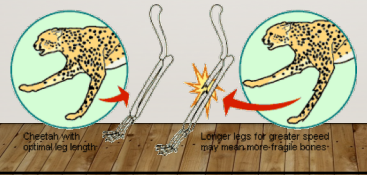
8. FITNESS- A MEASURE OF AN INDIVIDUAL'S HERITABLE CONTRIBUTION TO FUTURE GENERATIONS

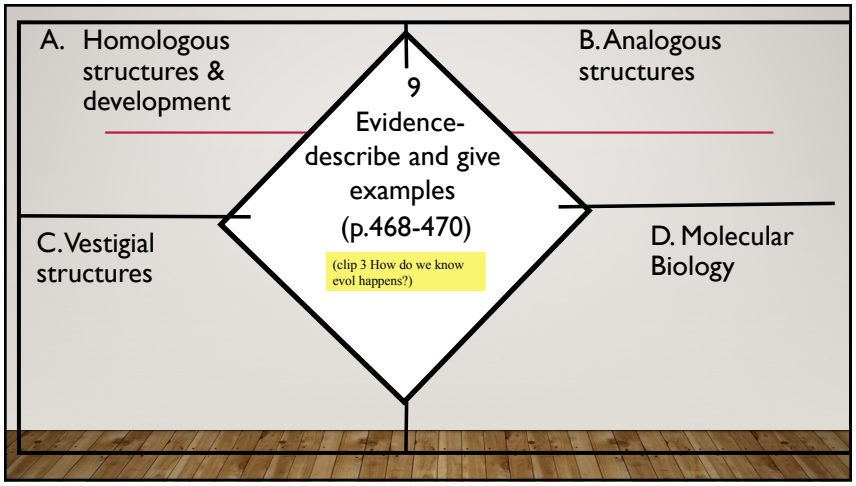
A. It's NOT…. being the biggest (smartest, fastest, most/least colorful)
B. It IS… leaving the most descendants
C. Sexual selection- select mate based on heritable traits
D. Mating successfully*= winning *(*producing live offspring that can reproduce)*
E. Adaptations- increase fitness

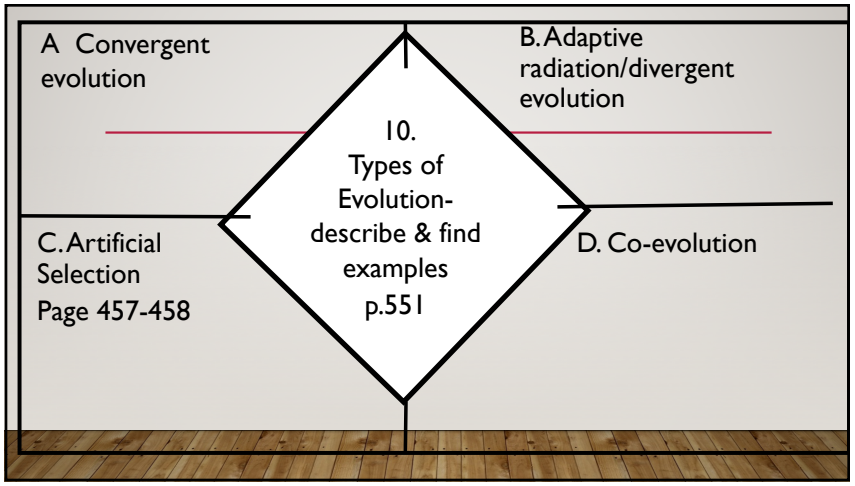
MORE ON FITNESS: CAMOUFLAGE- IMPORTANT TO SOME, NOT OTHERS

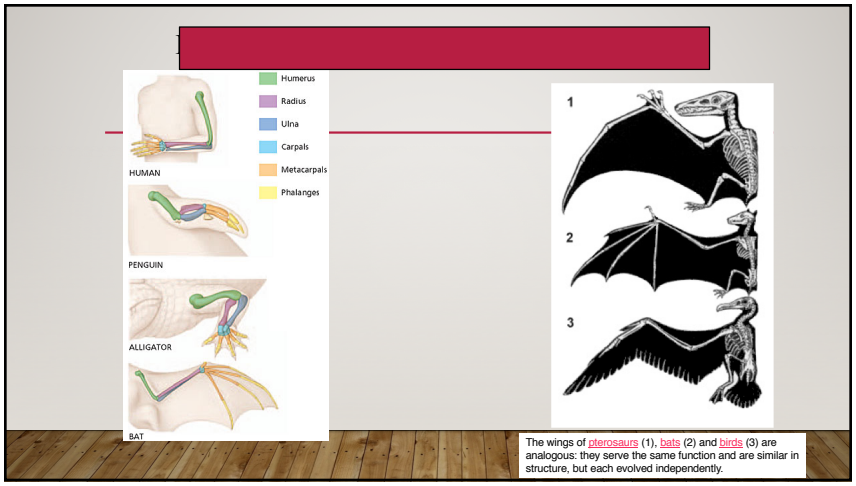
- https://www.youtube.com/watch?v=KLESZStQqZY
- Evolution of camouflage

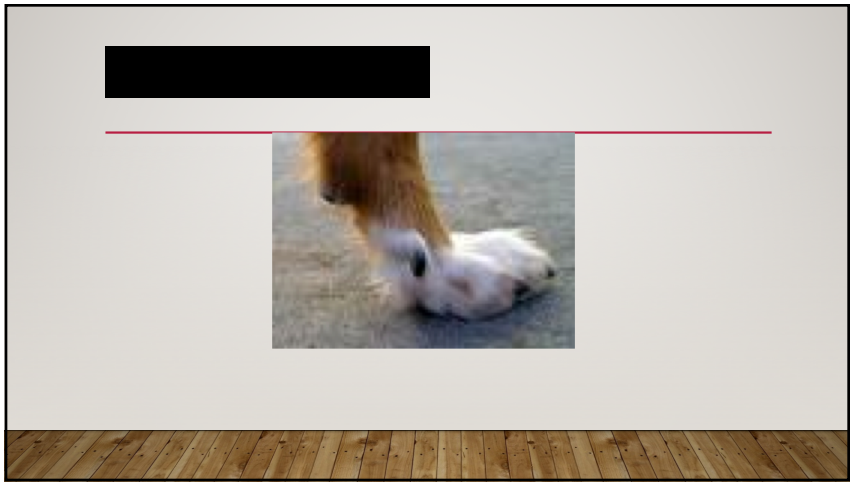
Survival of the fit enough- you don't have to be "faster than the bear"




A. Homologous structures & development
B. Analogous structures
9
Evidence- describe and give examples (p.468-470)
(clip 3 How do we know evol happens?)
C. Vestigial structures
D. Molecular Biology


A Convergent evolution
B. Adaptive radiation/divergent evolution
10.
Types of Evolution- describe & find examples p.551
C. Artificial Selection
Page 457-458
D. Co-evolution

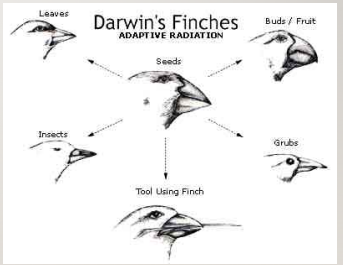

Humerus
Radius
Ulna
Carpals
Metacarpals
Phalanges
HUMAN
PENGUIN
ALLIGATOR
BAT
1
2
3
The wings of pterosaurs (1), bats (2) and birds (3) are analogous: they serve the same function and are similar in structure, but each evolved independently.

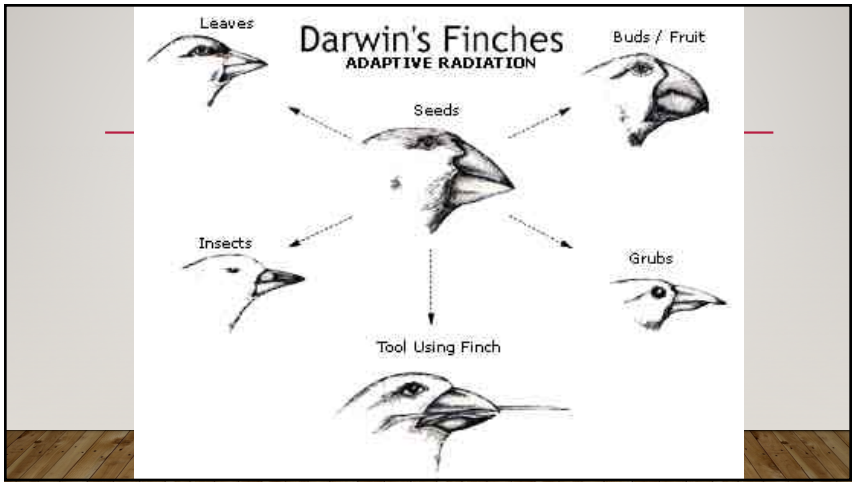


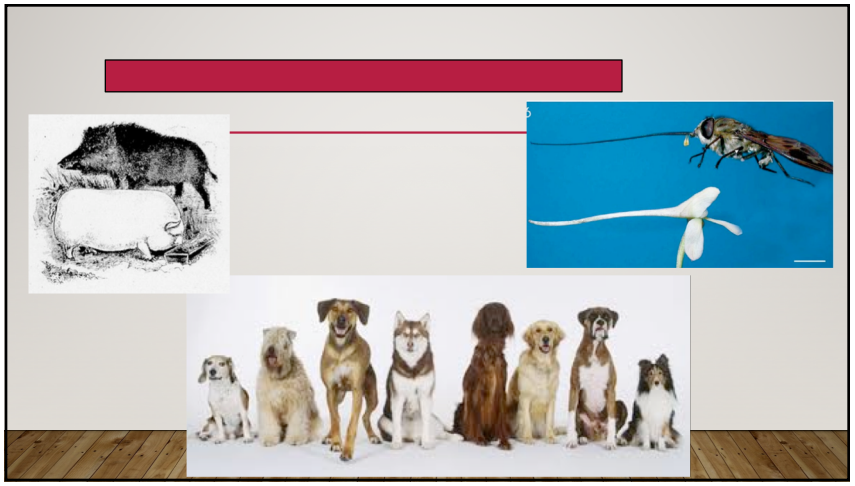
Hemoglobin Comparison

Clip 5
Did humans evolve?
Relative vs ancestor.

Species	Amino Acid Differences from Human Hemoglobin Protein
Gorilla	1
Rhesus monkey	8
Mouse	27
Chicken	45
Frog	67
Lamprey	125

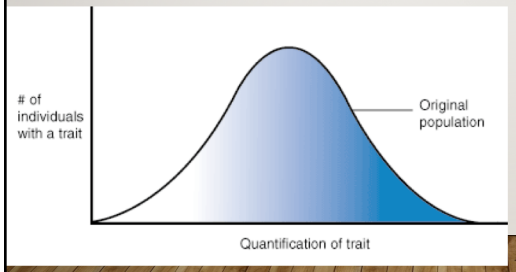



Darwin's Finches
ADAPTIVE RADIATION
Leaves
Buds / Fruit
Seeds
Insects
Grubs
Tool Using Finch



11. NATURAL SELECTION PATTERNS- DRIVEN BY FITNESS

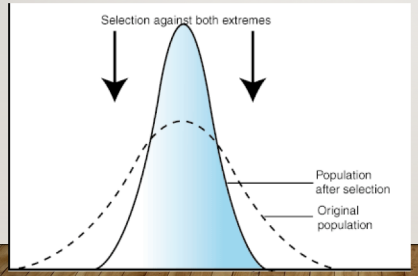
A. Normal "bell curve" distribution



…. Then something happens to change this

11. NATURAL SELECTION PATTERNS- DRIVEN BY FITNESS

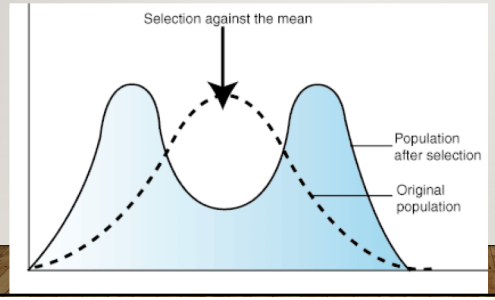
B. stabilizing selection- Against both extremes



Ex: Plant height- too tall wind damage, too small sunlight, animal birth weight

11. NATURAL SELECTION PATTERNS- DRIVEN BY FITNESS

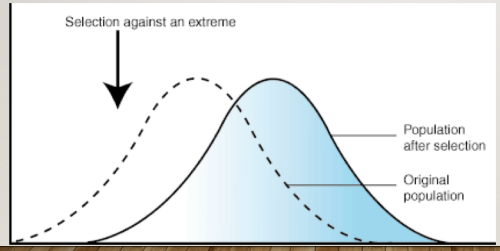
C. Disruptive selection- outer ends have higher fitness



Imagine plants that are pollinated by 3 different pollinators- short, medium and tall. Something happens to the medium pollinators, only the short and tall get pollinated and leave seeds.

11. NATURAL SELECTION PATTERNS- DRIVEN BY FITNESS

D. directional- phenotypes shift in one direction



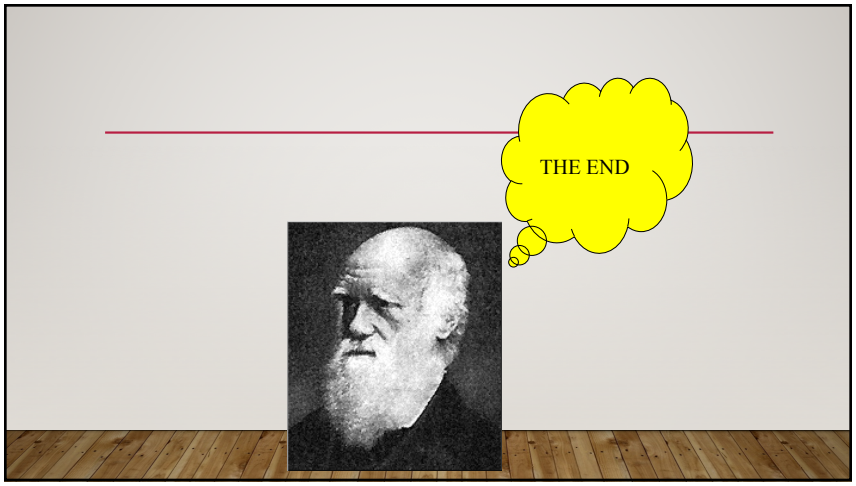
Consider giraffe neck length- too short they get out competed
Or hummingbird bill length

12. REPRODUCTIVE ISOLATION MECHANISM THAT LEAD TO SPECIATION (C, D, & E ARE PRE-ZYGOTIC)

A. organisms can't or won't reproduce
B. over time, the "isolation" leads to speciation & breeding between the 2 groups (interbreeding) stops
C. Behavioral isolation- rituals differ
D. Geographic isolation- physical barrier

12. REPRODUCTIVE ISOLATION MECHANISM THAT LEAD TO SPECIATION (C, D, & E ARE PRE-ZYGOTIC)

E. Temporal Isolation- timing is wrong
F. Post- zygotic- can mate, but offspring are not born alive or not fertile (or their offspring are nonviable or infertile)



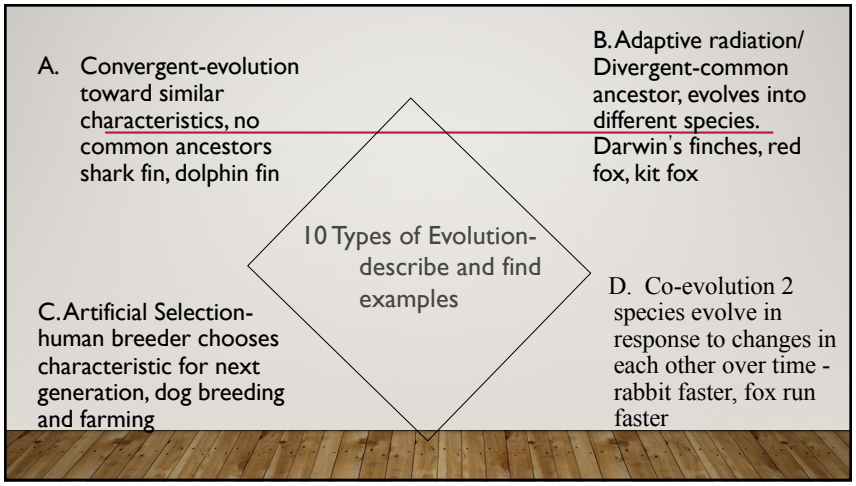
A. Homologous structures- similar structure, different function, arm human/ wing bat, common ancestor embryology

B. Analogous structures- perform a similar function, no common ancestor, wing bat/wing fly dolphin/shark

9. Evidence- describe and give examples

C. Vestigial structures- remnant from a once useful organ, appendix human, pelvic bone in whale

D. Molecular Biology comparing nucleotide sequences how closely related 2 organisms are: insulin, hemoglobin


A. Convergent-evolution toward similar characteristics, no common ancestors shark fin, dolphin fin
B. Adaptive radiation/ Divergent-common ancestor, evolves into different species. Darwin's finches, red fox, kit fox
10 Types of Evolution- describe and find examples
C. Artificial Selection- human breeder chooses characteristic for next generation, dog breeding and farming
D. Co-evolution 2 species evolve in response to changes in each other over time - rabbit faster, fox run faster