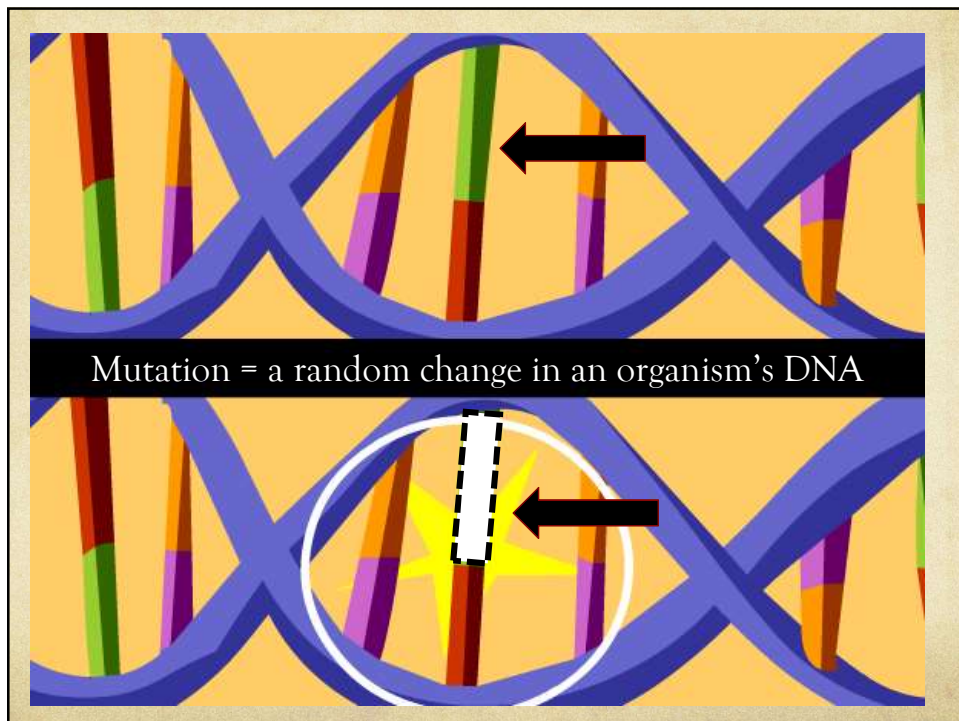
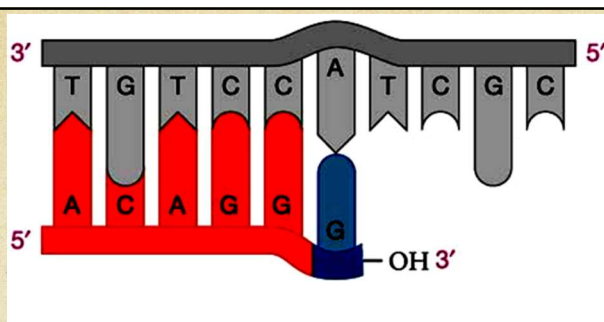


Mutations

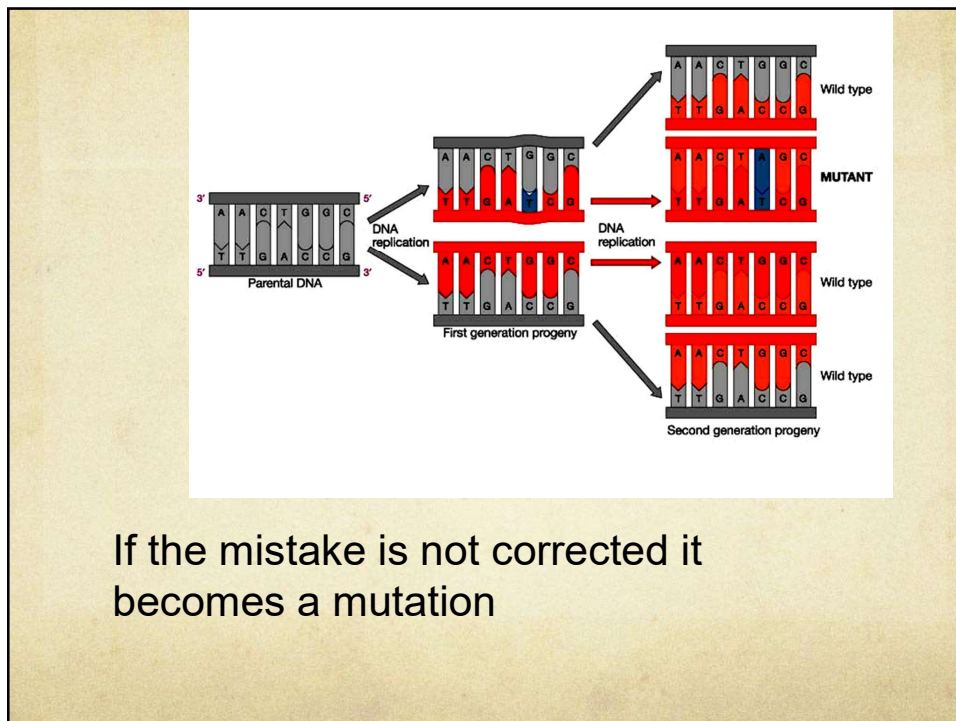
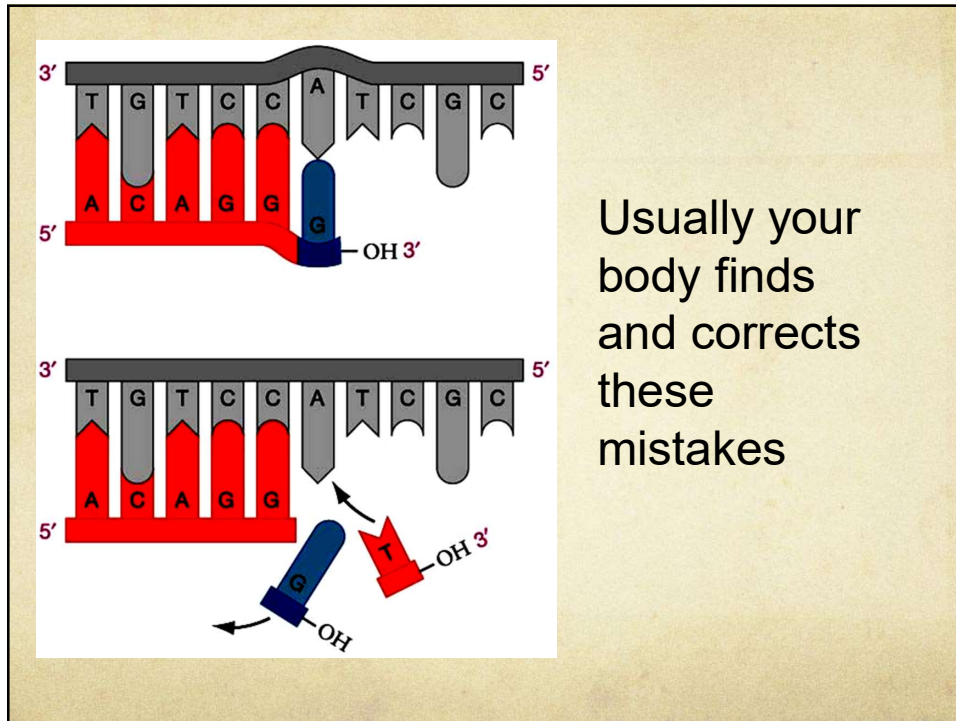


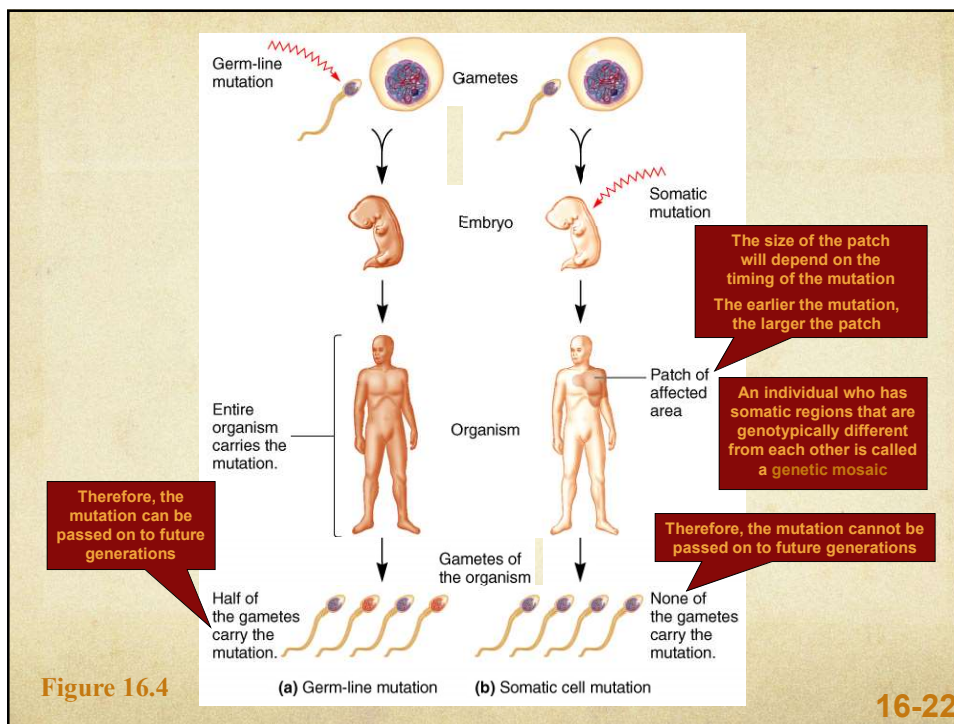
Definition of Mutation

1. A random change in an organism's DNA
2. Can be inherited - passed down from a parent to their offspring



Sometimes mistakes occur when DNA is copied





Circle one!

#4. Mutations that occur in [**sex cells** / body cells / any cell] can be passed down to offspring.

HINT 1

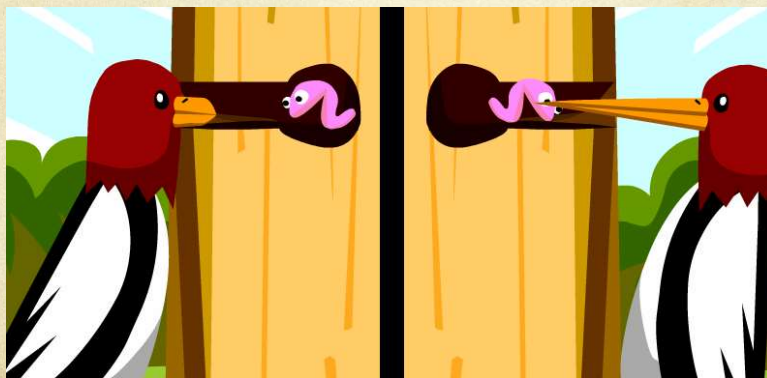
HINT 2

HINT 3

What Can Mutations Do?

Mutations can be **POSITIVE** (helpful)

- Some mutations can provide an *advantage* which helps the organism survive



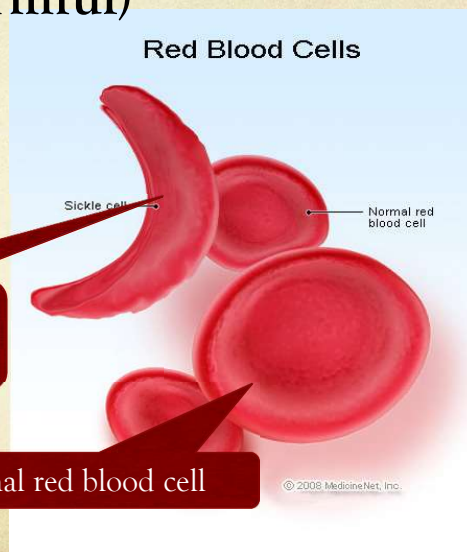
Mutations can be NEUTRAL (not harmful, not helpful)

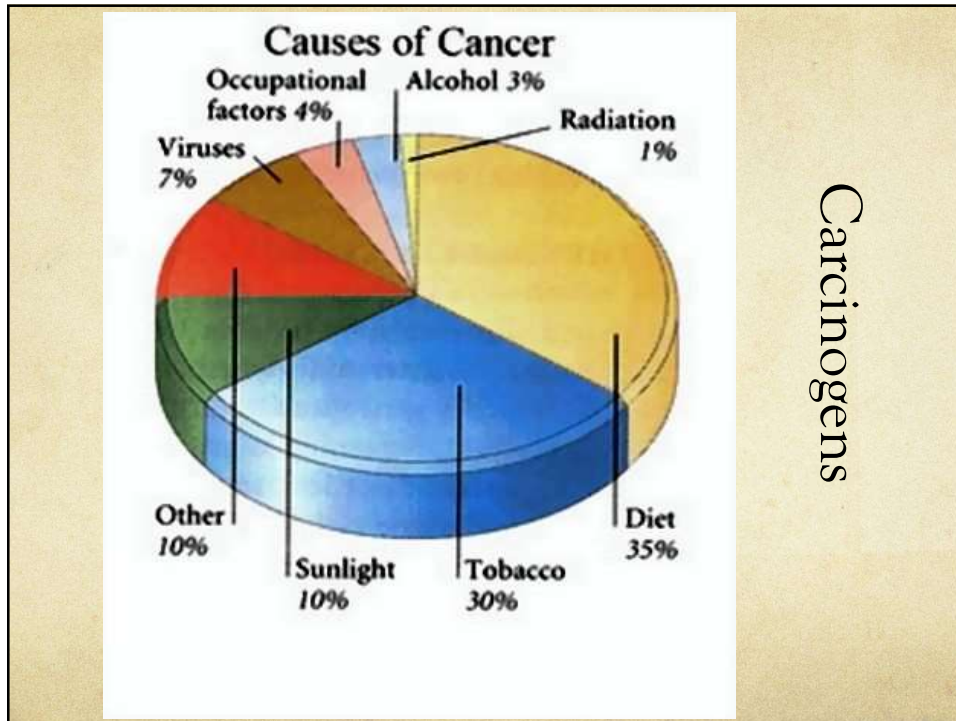
- Some mutations do not effect the organism's survival (the mutation does not help or hurt the organism)



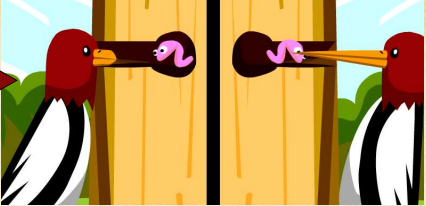
Mutations can be NEGATIVE (harmful)

- Some mutations are harmful, and hurt the organism's chances for survival





Some mutations can be helpful



Some mutations can have no effect (NEUTRAL)



Some mutations can be harmful





A mutation may be **POSITIVE**, or **NEUTRAL**, or **NEGATIVE** depending on the environment

Which bird would have the best chances of survival in a forest where all the leaves were BLUE?

What impact do DNA mutations have?

Mutation →

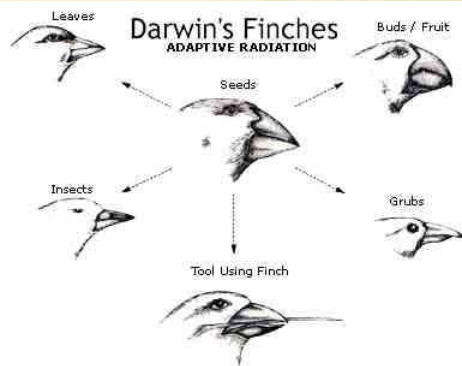
Genetic Diversity →

Natural Selection →

Evolution!

Natural Selection → Evolution

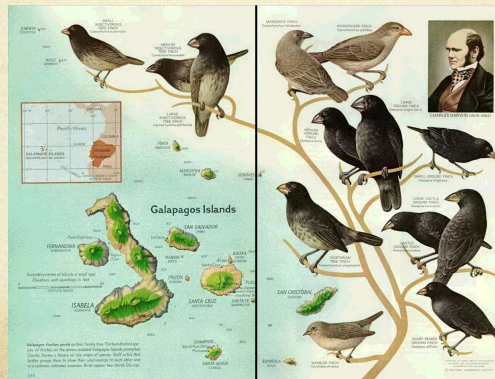
- Favorable traits are passed on through the generations
- Well-adapted individuals survive and reproduce



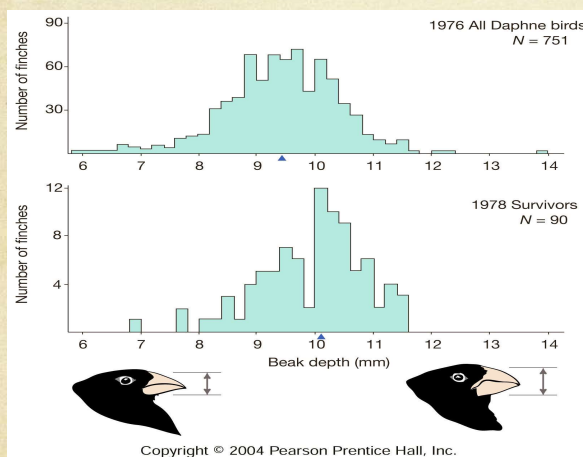
An example -- All arose from a single species

How did so many species evolve?

- Different environments
- And
- Changing environments

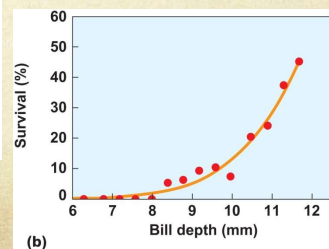


An example of change

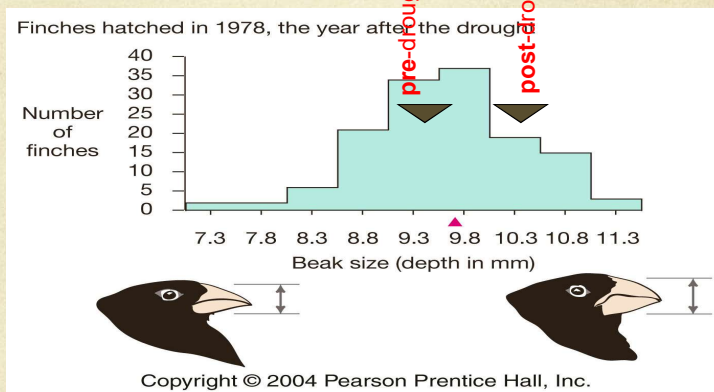


In 1978, there was a severe drought, small seeds declined more than large seeds.

Small beak birds have difficulty to find seeds, and suffered heavy mortality, especially females.



Average beak size before and after drought Beak size evolves



Conclusion: Nature selection indeed caused evolution in beak size

Other changes in response to the environment



Peppered Moths in Great Britain

Before pollution – most of the moths were black and white speckled –bottom picture

After pollution darkened tree trunks – the most common colour of the moths changed to a dark colour – upper picture



(a)



Evolution-Cave fish are most commonly albino and blind (gene inactivation)



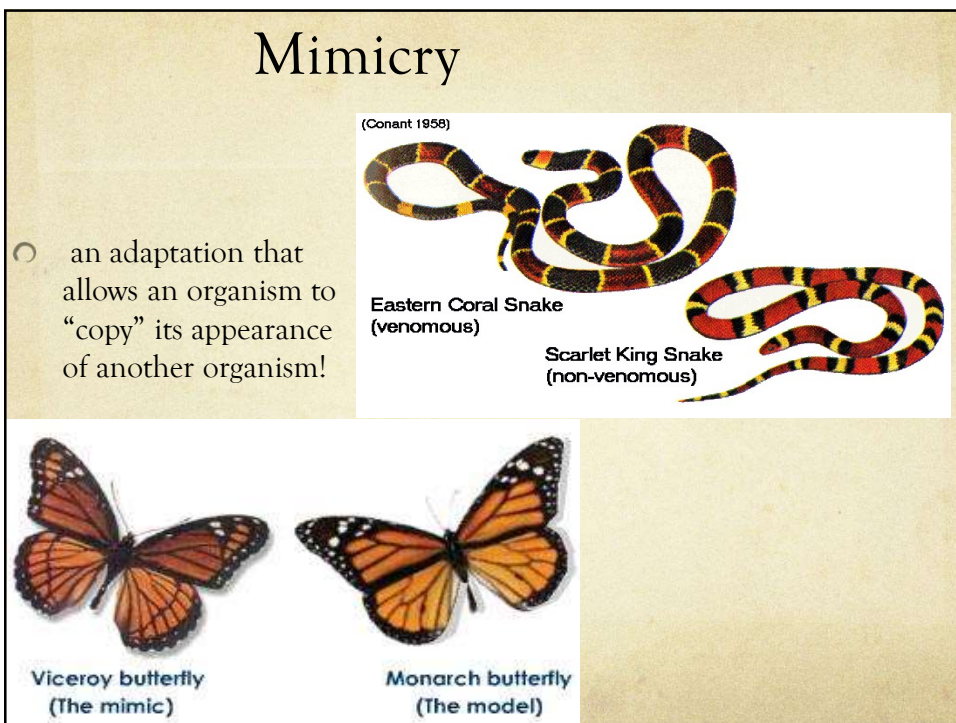
Molino cave



Pachón cave



Surface



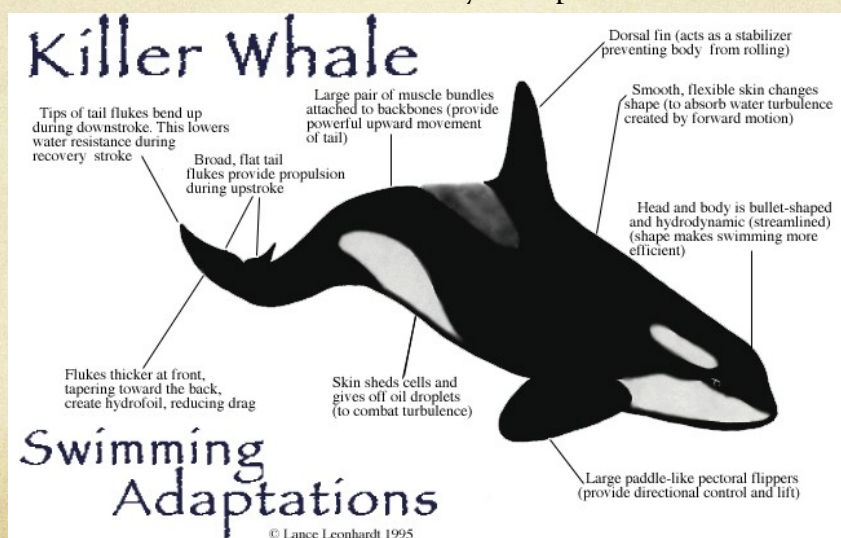
Remember!

- **ORGANISMS** cannot **CHOOSE** to genetically change to adapt to their environment.
- Genetic mutations occur in response to mutagens e.g. Radiation, Sunlight, some chemicals
- IF the mutation is **ALREADY** present then the organism can change.



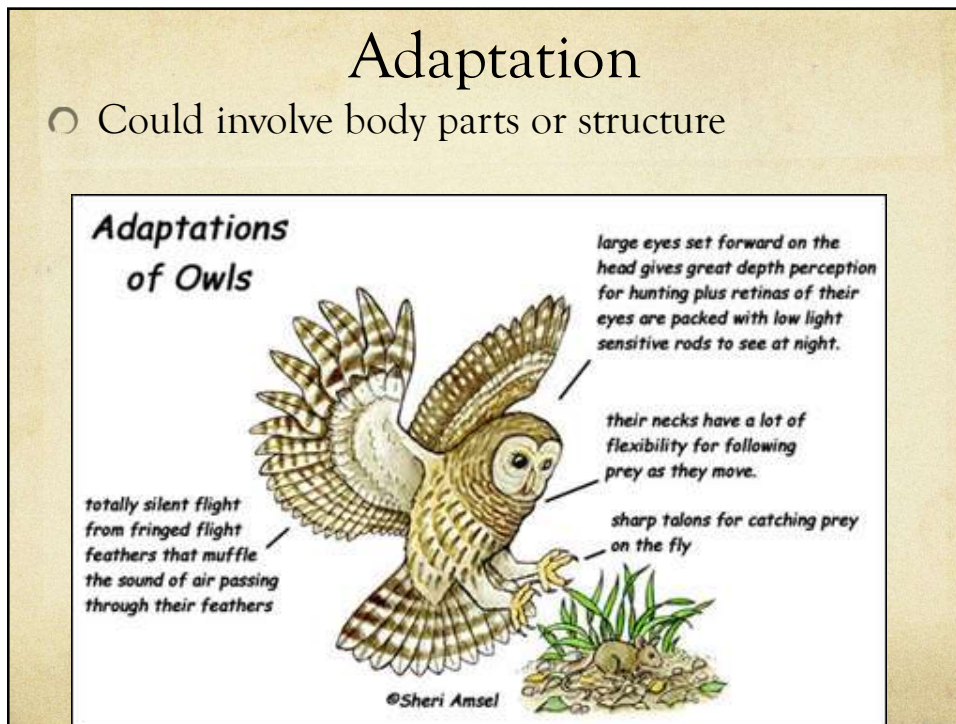
Adaptation

- Heritable variations that **INCREASE** an individual's chance of survival and ability to reproduce



Adaptation

- Could involve body parts or structure



Adaptation

- Could involve color (camouflage or mimicry)



Adaptation

- Eagles see clearly in the daytime and can hold enough air in their lungs to fly in high altitudes



If the mutation increases the probability of survival and reproduction it increases in the gene pool.



Review

How does DNA relate to evolution?

Mutation →

Genetic Diversity →

Natural Selection →

Adaptation →

Evolution!

How do Mutations Affect Populations?

1. **Mutation** - a _____ in the DNA sequence
2. **Genetic Variety** - different types of _____
3. **Natural Selection** - when a _____ trait helps an organism _____ AND _____ it will get passed on to future generations and possibly enable the _____ to _____ (& maybe even _____ over a _____ period of time)
4. **Evolution** - when a _____ adapts over a _____ period of time

1) Random changes in the DNA of an organism is known a _____

1. Variation
2. Mutation
3. Gene Flow
4. Sexual reproduction

2) Which of the following can a mutation cause?

1. Change in physical characteristic
2. Change in an organisms behavior
3. A change in the physiology of the animal
4. All of the above

3) Mutations can cause really noticeable changes in organisms

1. True
2. False

4) Mutations can be

1. Beneficial
2. Harmful
3. Have No affect
4. All of the above

5) What are some external causes of mutations?

1. Chemicals
2. Radiation
3. Both 1 and 2
4. None of the above

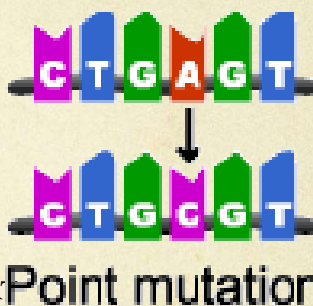
6) Variation in a species is caused by what two things

1. Sexual Reproduction
2. Asexual Reproduction
3. Mutations
4. Adaptations

Gene Mutations

○ Point Mutations – changes in one or a few nucleotides

- Substitution
 - THE FAT CAT ATE THE RAT
 - THE FAT HAT ATE THE RAT
- Insertion
 - THE FAT CAT ATE THE RAT
 - THE FAT CAT XLW ATE THE RA
- Deletion
 - THE FAT CAT ATE THE RAT
 - THE FAT ATE THE RAT



Gene Mutations

○ Frameshift Mutations – shifts the reading frame of the genetic message so that the protein may not be able to perform its function.

- Insertion
 - THE FAT CAT ATE THE RAT
 - THE FAT HCA TAT ETH ERA T
- ↑
H
- Deletion
 - THE FAT CAT ATE THE RAT
 - TEF ATC ATA TET GER AT
- ↓
H

