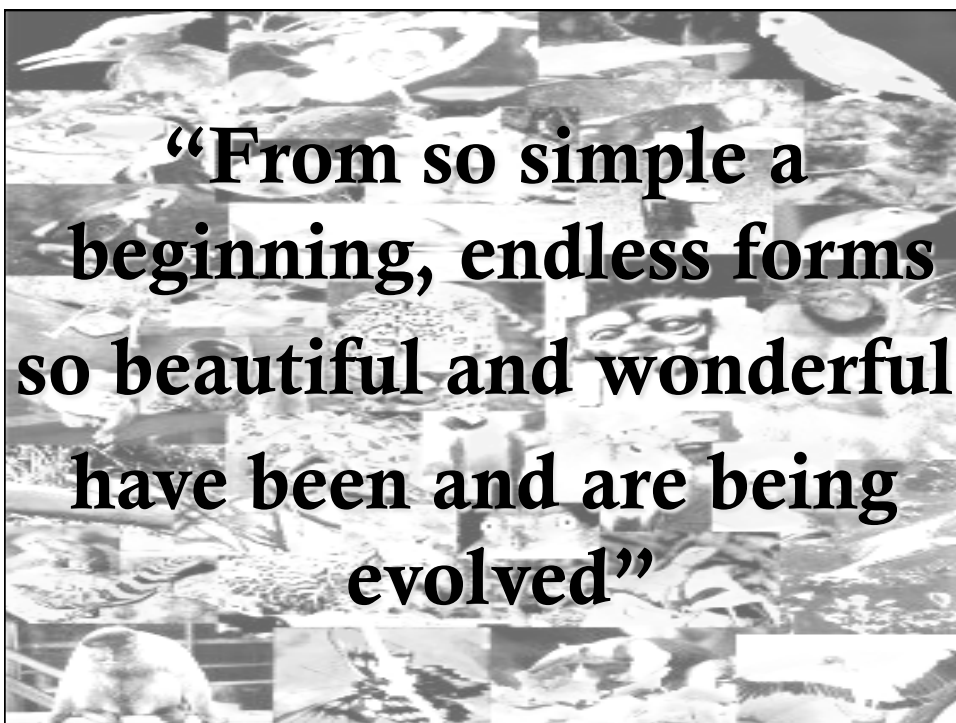
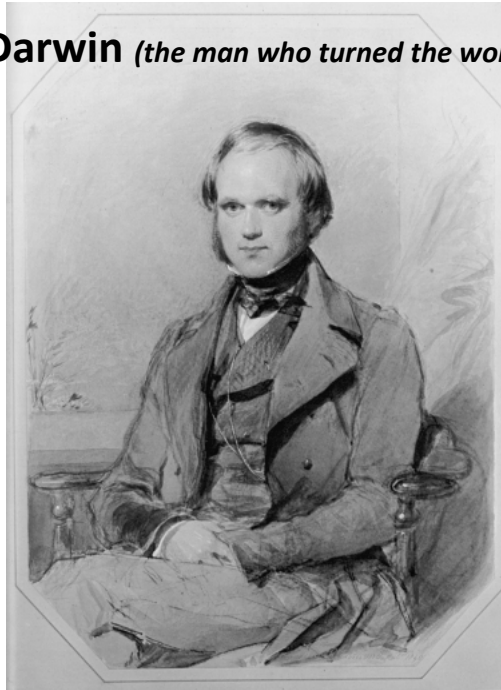


# Variation: The KEY to Evolution

SWBAT describe how  
natural selection acts on  
genes.



**Charles Darwin** (*the man who turned the world upside down*)

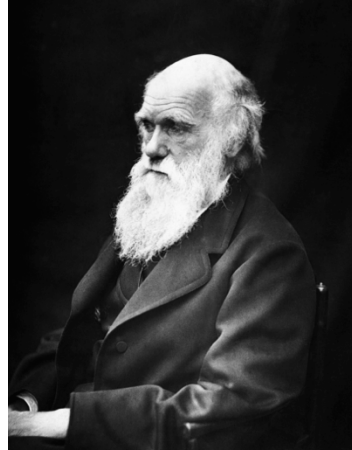


## Charles Darwin

- Darwin explored the Galapago islands from April through October 1835.
  - Entire voyage of *The Beagle*: Dec 1831 - Oct 1836
- When and where he started thinking about what was to become his theory of evolution by natural selection.
- He did not publish his thoughts until the publication of *The Origin of Species* in 1859.

## Charles Darwin's Ideas

- Biological evolution is change in species over time.
  - This was not a new idea at the time
  - But there were no good mechanisms to explain how these changes occurred
- Natural selection is just such a mechanism, and this is what Darwin contributed.



5

## The THEORY of EVOLUTION

- **EVOLUTION** means change over time.
- Explains how current organisms have descended from organisms of the past.

**VARIATION** within species is the KEY to Darwin's theory of evolution.

**variation**

**Differences; Changes within a species**

**Variation naturally exists in all species**



Example 1: Frogs



Example 2: Roosters



Example 3: Giraffes

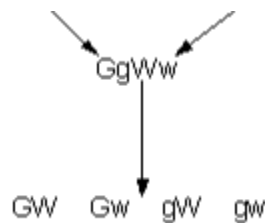


## What are the CAUSES of variation in living things?

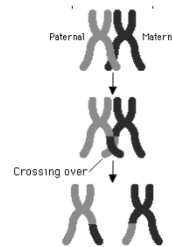
### • 1. Meiosis

- Creates billions of unique gametes with unique combinations of alleles

#### a) Independent assortment



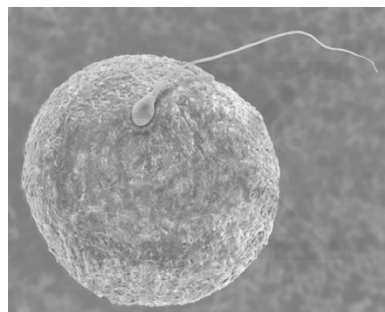
#### b) Crossing over



## What are the CAUSES of variation in living things?

### • 2. Sexual Reproduction

- COMBINES the DNA of two different individuals, forming brand new combinations of alleles



## What are the CAUSES of variation in living things?

- **3. Mutations**

- Random changes in the bases of DNA can create brand new alleles

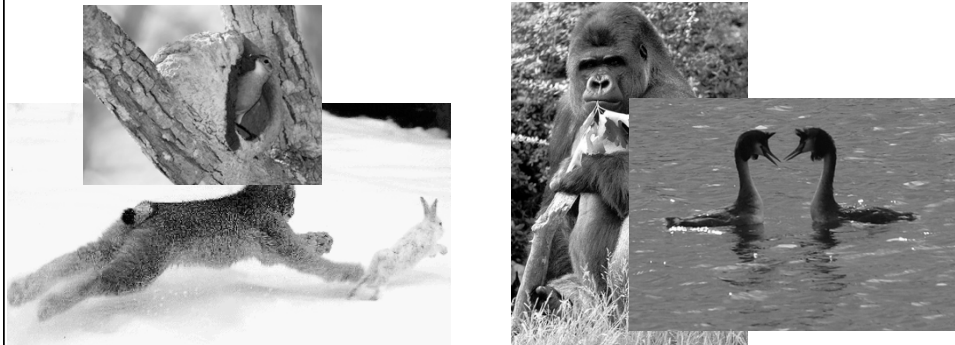
ATG	GAA	GCA	CGT
Met	Glu	Ala	Gly
↓			
ATG	GA C	GCA	CGT
Met	Asp	Ala	Gly

DNA → RNA → Proteins → Traits (phenotype)

## How can variation help certain members of a species?

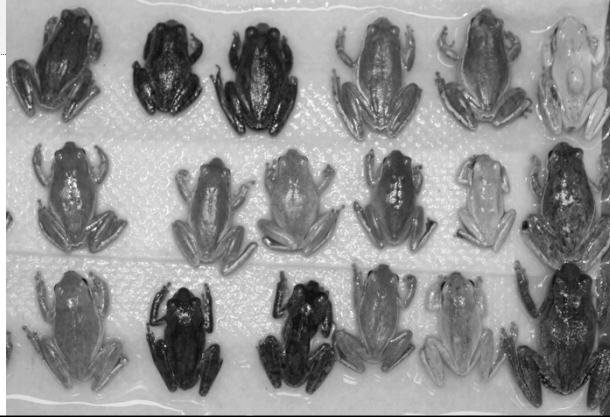
A living thing's goal:  
survive and reproduce

This is a species' fitness!



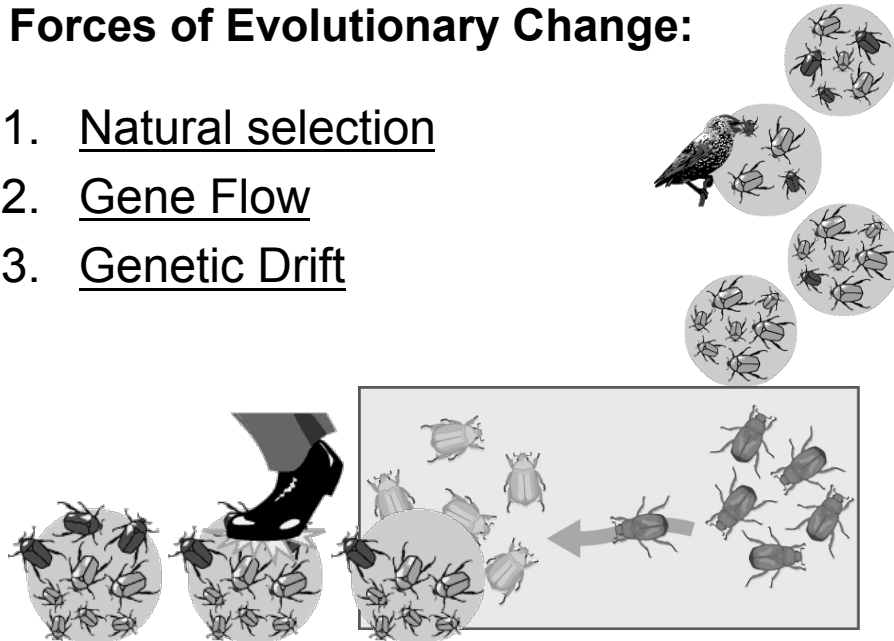
*Ex: Frogs with dark green skin are hard to see in the swampy environment. Over time, more and more frogs are born with dark green skin instead of bright green skin because dark green are able to camouflage.*

*Eventually, all frogs have dark green skin.*



## **Forces of Evolutionary Change:**

1. Natural selection
2. Gene Flow
3. Genetic Drift



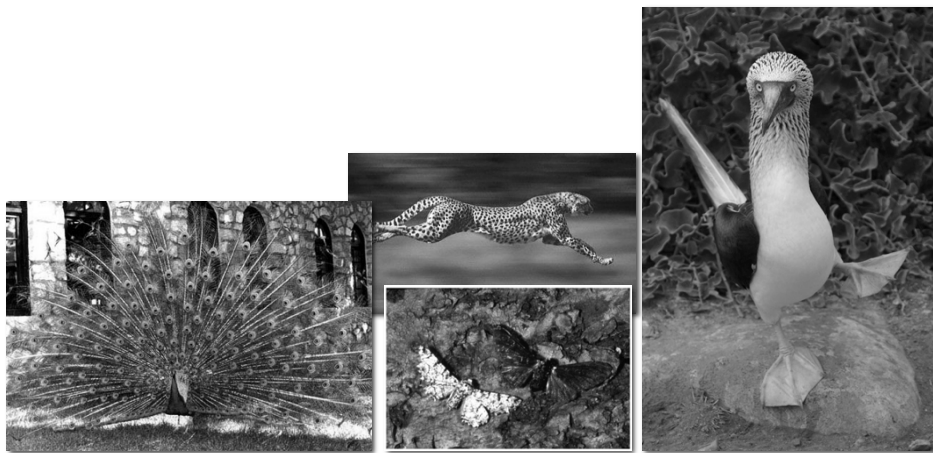


**Force #1:**

**Natural selection:** individuals who are better suited to their environment will survive and pass their genes on to the next generation.

Natural Selection is also known as “**survival of the fittest.**”

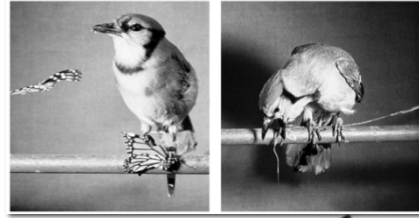
- Two types of natural selection:
  - predation selection
  - sexual selection



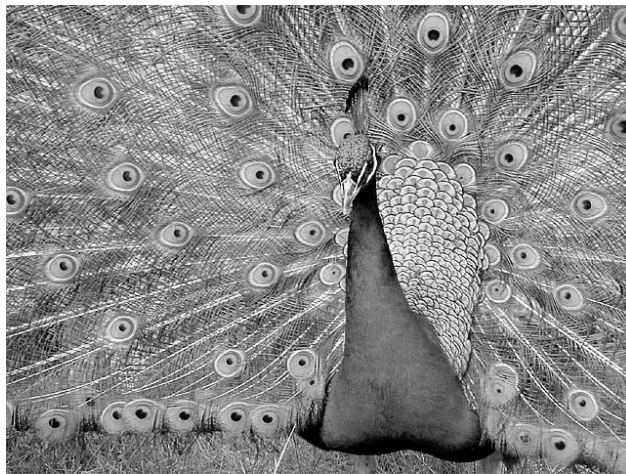
## Predation Selection



- Predation selection
  - act on both predator & prey
  - Includes:
    - behaviors
    - camouflage & mimicry
    - speed
    - defenses (physical & chemical)



So how did traits like THIS evolve?



## Sexual Selection

- Acting on reproductive success
  - attractiveness to potential mate
  - fertility of gametes
  - successful rearing of offspring

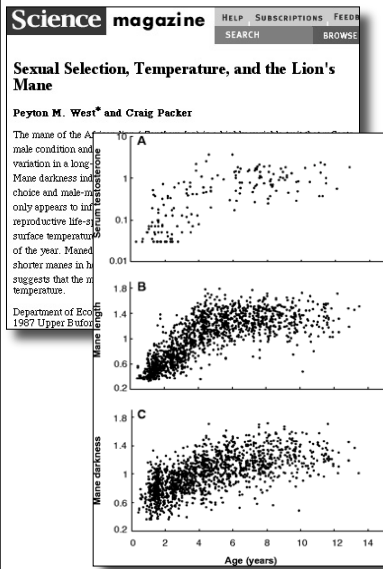


## Sexual selection

It's FEMALE CHOICE, baby!



## The lion's mane...



- Females are attracted to males with larger, dark manes
- Correlation with higher testosterone levels
  - Better health
  - more muscle
  - Better fertility
  - longer life
- But imposes a cost to male
  - *HOT!* Is it worth it??

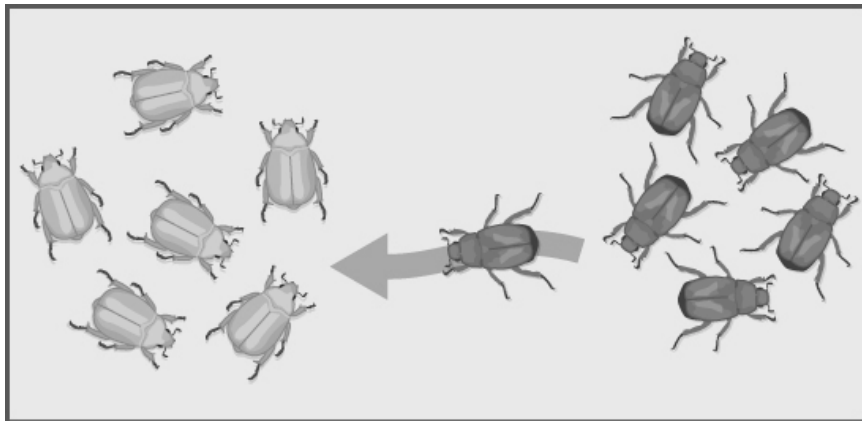
## Sexual dimorphism and sexual selection



## **Force #2: Gene Flow**

**Gene flow:** the movement of genes/alleles from one population to another.

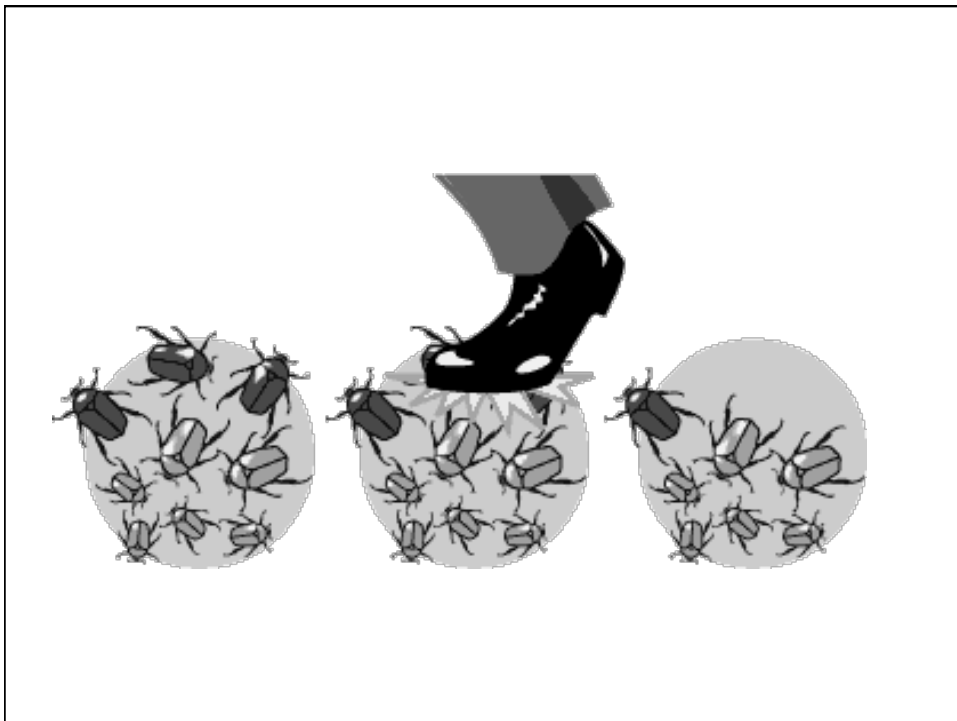
Gene flow is commonly called **migration**.



### Force #3: Genetic Drift

**Genetic drift:** the change in the amount or type of alleles in a population because of random events. This does not always leave “adaptations” that are helpful.

Genetic drift can be caused by random, often catastrophic, events (natural disasters, separation of population from the original, etc).



Evolutionary fitness is measured by

- a. reproductive potential
- b. physical fitness
- c. lifespan
- d. competition
- e. reproductive success

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- e. the one that has the most mates

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