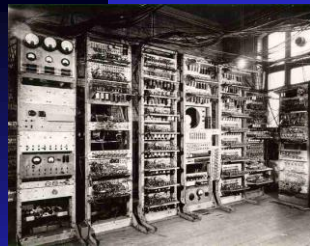


The  
*Evolution*  
of  
Evolutionary Thought

# Evolution simply means change over time



So, what has evolved?



With new information and discoveries, our thoughts on how living things have evolved ...have evolved as well!!



# The *Evolution* of Evolutionary Theory



**Carolus  
Linnaeus**  
1707-1778

Living things do NOT evolve:

- Linnaeus recorded precise descriptions of nature, categorized living things – “Father of Taxonomy”
- did little analysis or interpretation
- believed that he was just revealing the unchanging order of life created by God, documenting change in nature would not have made sense to him
- was troubled by the fact that plant hybrids could be created by cross pollination. These were varieties that had not existed before. Linnaeus stopped short of concluding that these plants had evolved.

# The *Evolution* of Evolutionary Theory



**Buffon**  
1707-1788

## Living things DO evolve (SHHH!!! Keep it Quiet):

- Late in the 18th century, a small number of European scientists began to quietly suggest that life forms are not fixed.
- The French zoologist, George Louis Leclerc, Comte de Buffon, said that living things do change through time and this was somehow a result of influences from the environment or chance.
- Speculated that the earth must be at least 75,000 years old. He also suggested that humans and apes are related.
- Carefully hid his radical views in a limited edition 44 vol. natural history book series called *Histoire Naturelle*
- While asserting species can change over generations, he publicly rejected the idea that species evolve into other species.

# The *Evolution* of Evolutionary Theory



Erasmus  
Darwin  
1731-1802

## Living things DO evolve (SHHH!!! Keep it Quiet):

- grandfather of Charles Darwin, an English country physician, poet, and amateur scientist.
- believed that evolution has occurred in living things including humans, but he only had rather fuzzy ideas about what might be responsible for this change.
- wrote of his ideas about evolution in poems and a relatively obscure two volume scientific publication entitled *Zoonomia; or, the Laws of Organic Life* (1794-1796).
- also suggested that the earth and life on it must have been evolving for "millions of ages before the commencement of the history of mankind."

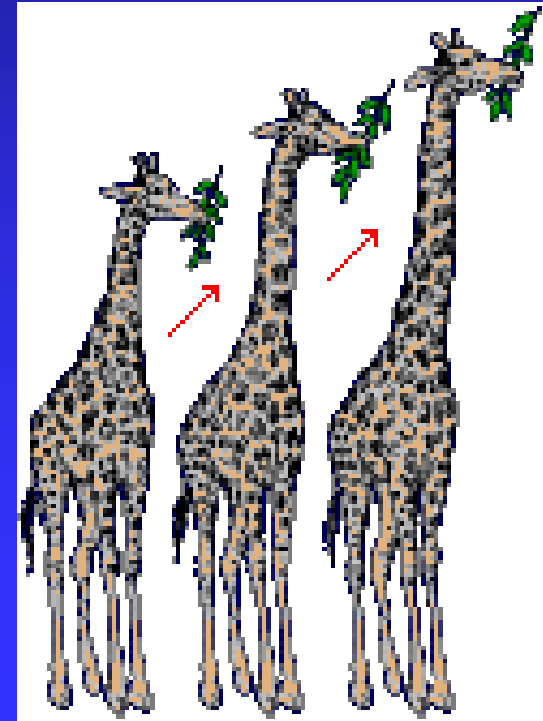
# The *Evolution* of Evolutionary Theory

Living things **DO** evolve (And I can explain HOW!!):



Lamarck  
1744-1829

- Jean Baptiste Chevalier de Lamarck believed organisms strive to improve themselves through the acquisition of favorable traits (**Acquired Traits**)
- advocated the **Principle of Use/Disuse**:
  - If used, part is emphasized, more pronounced
  - If not, part is deemphasized, diminished, perhaps ultimately lost altogether.
- The traits acquired throughout the lifetime of the individual are passed down to offspring



Lamarck's incorrect idea  
of the cause of evolution

# The *Evolution* of Evolutionary Theory



George  
Cuvier  
1769-1832

No, Living things do NOT evolve (You're NUTS!):

- Criticized Lamarck and acquired traits
- did not reject the idea that there had been earlier life forms, was the first scientist to document extinctions of ancient animals and was a respected expert on dinosaurs.
- rejected the idea that their existence implied that evolution had occurred--he dogmatically maintained the "fixity" of species.
- advocated the theory of **catastrophism**, that there have been violent and sudden natural catastrophes - plants and animals were often killed off then new life forms moved in from other areas. The fossil record shows abrupt change in species.
- Did rely on scientific evidence rather than biblical interpretation.

# The *Evolution* of Evolutionary Theory



Charles  
Darwin  
1809-1882

Living things DO evolve (Through Natural Selection!):

- Proposed evolution could be explained by the process of **Natural Selection** in 1844, but did not publish until 1858.

## Natural Selection – Five Key Components:

1. There is genetic variation in populations.
2. Some of these are considered **Adaptations** (they act to increase the chances of survival)
3. More offspring are produced each generation than can possibly survive (influenced by Thomas Malthus)
  - Population limiting factors – competition, predation, disease etc



Thomas Malthus  
(1766-1834)



# The *Evolution* of Evolutionary Theory



Charles  
Darwin  
1809-1882

Living things DO evolve (Through Natural Selection!):

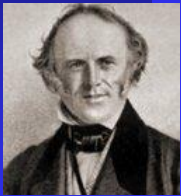
## Natural Selection – Five Key Components:

4. Those that survive reproduce and may pass their adaptations that happened help them survive on to offspring.

*“If you’re dead, you can’t reproduce.”*

5. Over LONG time periods, small changes accumulate leading to changes in population characteristics that are noticeable.

(Influenced by Charles Lyell – who proposed the age of the Earth was MILLIONS of years old!)



Charles Lyell  
1797-1875

# The *Evolution* of Evolutionary Theory



Charles  
Darwin  
1809-1882



Alfred  
Wallace  
1823-1913

Living things DO evolve (Through Natural Selection!):

## So, why didn't Darwin publish right away?

- There was a Christian evangelical fervor in England during the 1830's and 1840's. He could have been charged with sedition and blasphemy for publishing his unpopular theory.
- Darwin received the draft of an essay summer of 1858 from a younger British naturalist named Alfred Wallace, who was then hard at work collecting biological specimens in Southeast Asia for sale to museums and private collectors. This essay contained ideas that paralleled Darwin's thoughts on Natural selection.
- Darwin later insisted that Wallace also get credit
- 1859 - *On the Origin of Species* was very popular and controversial. The first edition sold out in one day, and six editions by 1872.

# Natural Selection

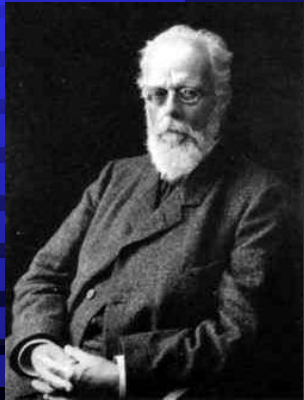
Not all mutations are considered advantageous for the survival of the species. In fact, the benefits of some favorable adaptations (such as increased speed over long distances) may be offset by other random mutations (such as decreased depth perception).



# Natural Selection



# The *Evolution* of Evolutionary Theory



August  
Weismann  
1834-1914

Living things DO evolve, (but Lamarck is WRONG!):

- In 1883, August Weismann began cutting the tails off mice to see if any mice would be born without a tail.
- After 20 generations (901 mice) rats continued to be born with normal length tails. This experiment dealt a fatal blow to the Theory of Acquired Traits proposed by Lamarck.
- This and other brilliant research led him to hypothesize that there was a difference between somatic and germ-line cells (found only in reproductive organs) and that only germ-line cell mutations could be transmitted to the offspring.
- These ideas were elaborated in Weisman's classic book entitled, *On Heredity: Essays upon Heredity and Kindred Biological Problems*, published around 1890.



# The *Evolution* of Evolutionary Theory



So, living things DO evolve, and:

- Charles Darwin's theory of evolution by means of Natural Selection has weathered the criticism of his peers and those of contemporary scientists.
- To this day, no other theory has proven to be a better model, predictor, or explanation for the changes that species exhibit over time.

A historical footnote: Cuvier did not live long enough to learn about Charles Darwin's proof of evolution, but Lyell did. He came to accept this proof in the early 1860's along with most leading scientists of that time. Lyell also became a friend of Darwin.

Much information in this powerpoint came from the following website – visit to learn even more:

[http://anthro.palomar.edu/evolve/evolve\\_1.htm](http://anthro.palomar.edu/evolve/evolve_1.htm),

[http://anthro.palomar.edu/evolve/evolve\\_2.htm](http://anthro.palomar.edu/evolve/evolve_2.htm)

# The *Evolution* of Evolutionary Theory



Charles  
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1809-1882

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