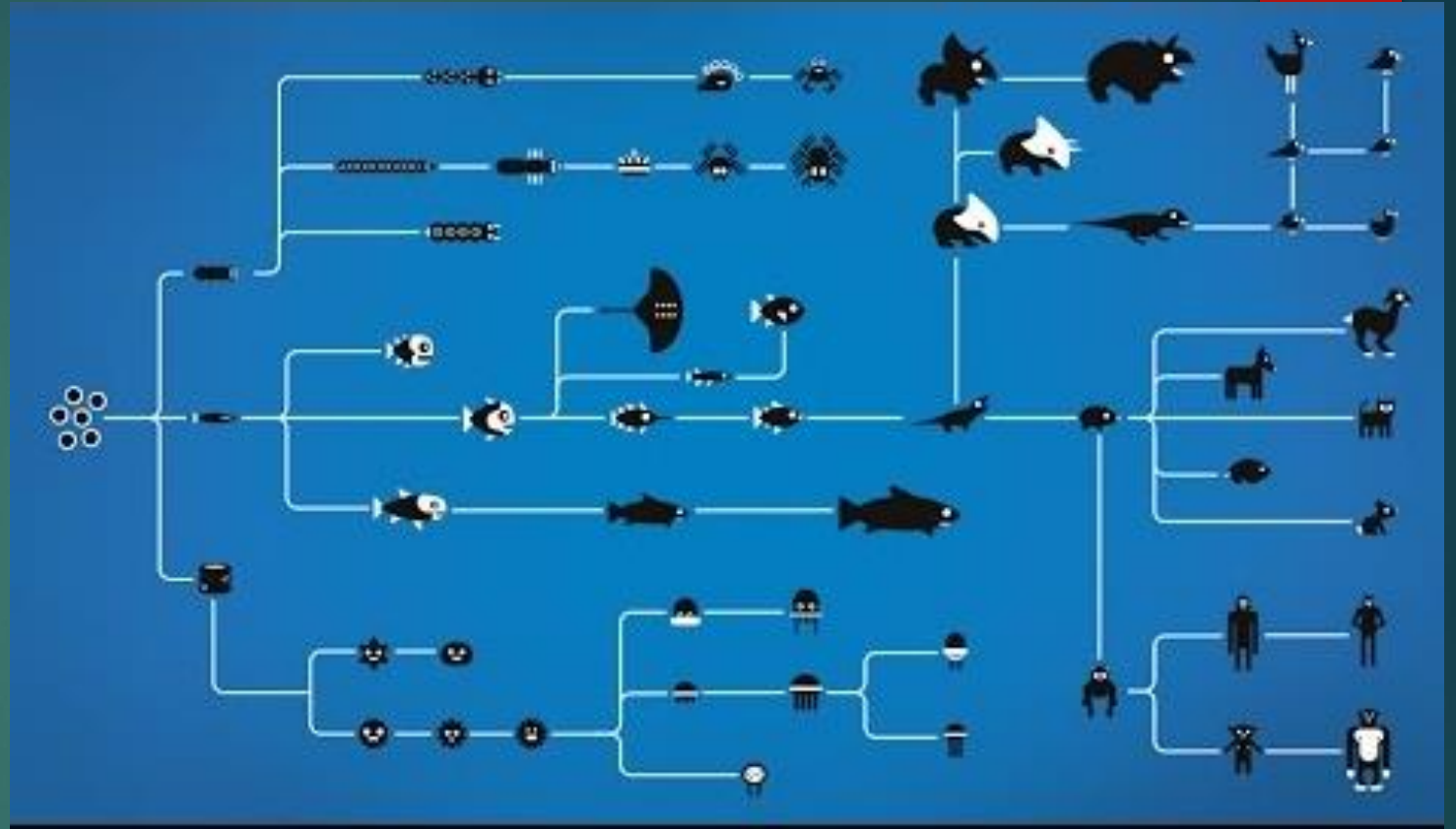


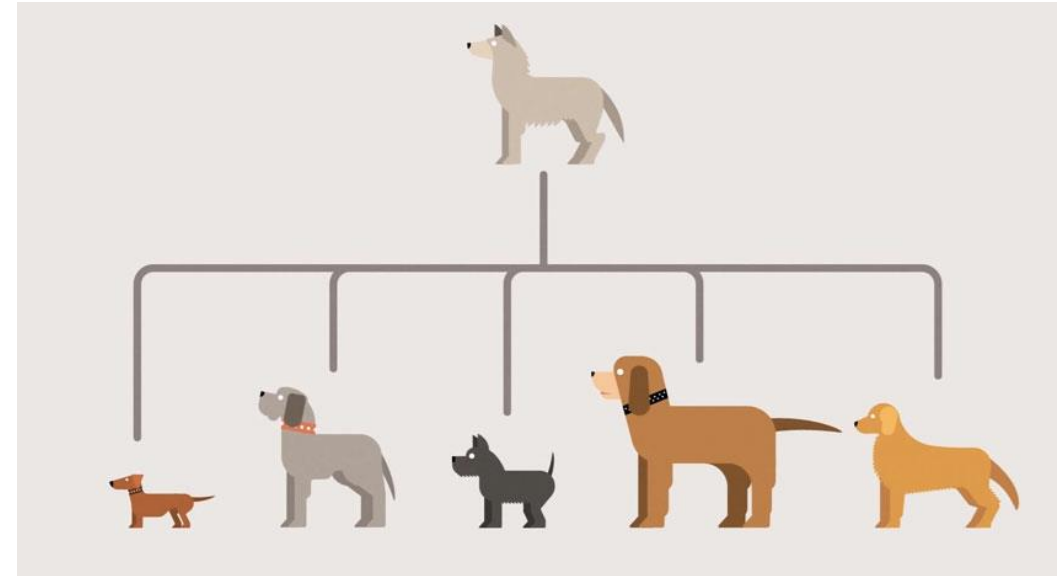
Evolution

HOW AND WHY?



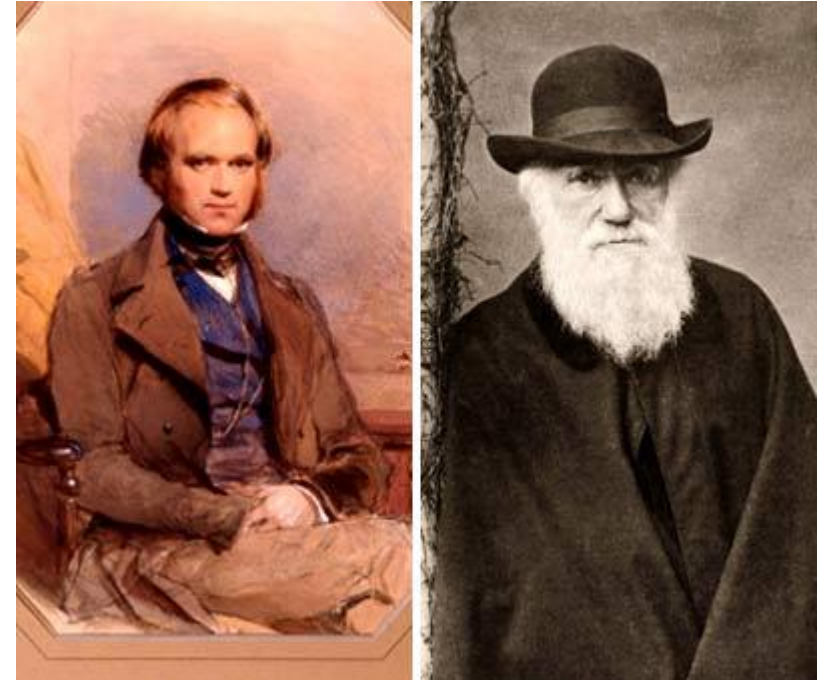
What is evolution?

- ▶ Change over time
 - ▶ Specifically, a change in the frequency of a gene or allele in a population over time
- ▶ Process by which modern organisms have descended from ancient organisms
- ▶ Scientific Theory
- ▶ Well tested



Charles Darwin

- “Father of Evolution”
- Proposed a mechanism for evolution
 - Natural Selection
- Darwin went on a 5-year trip around the world on the ship, the HMS Beagle
 - As the ship’s naturalist, he made observations of organisms in South America and the Galapagos Islands
 - Made important observations and collected evidence supporting how life changes over time
 - Wrote a book, “Origin of the Species”



► The voyage of the *Beagle*

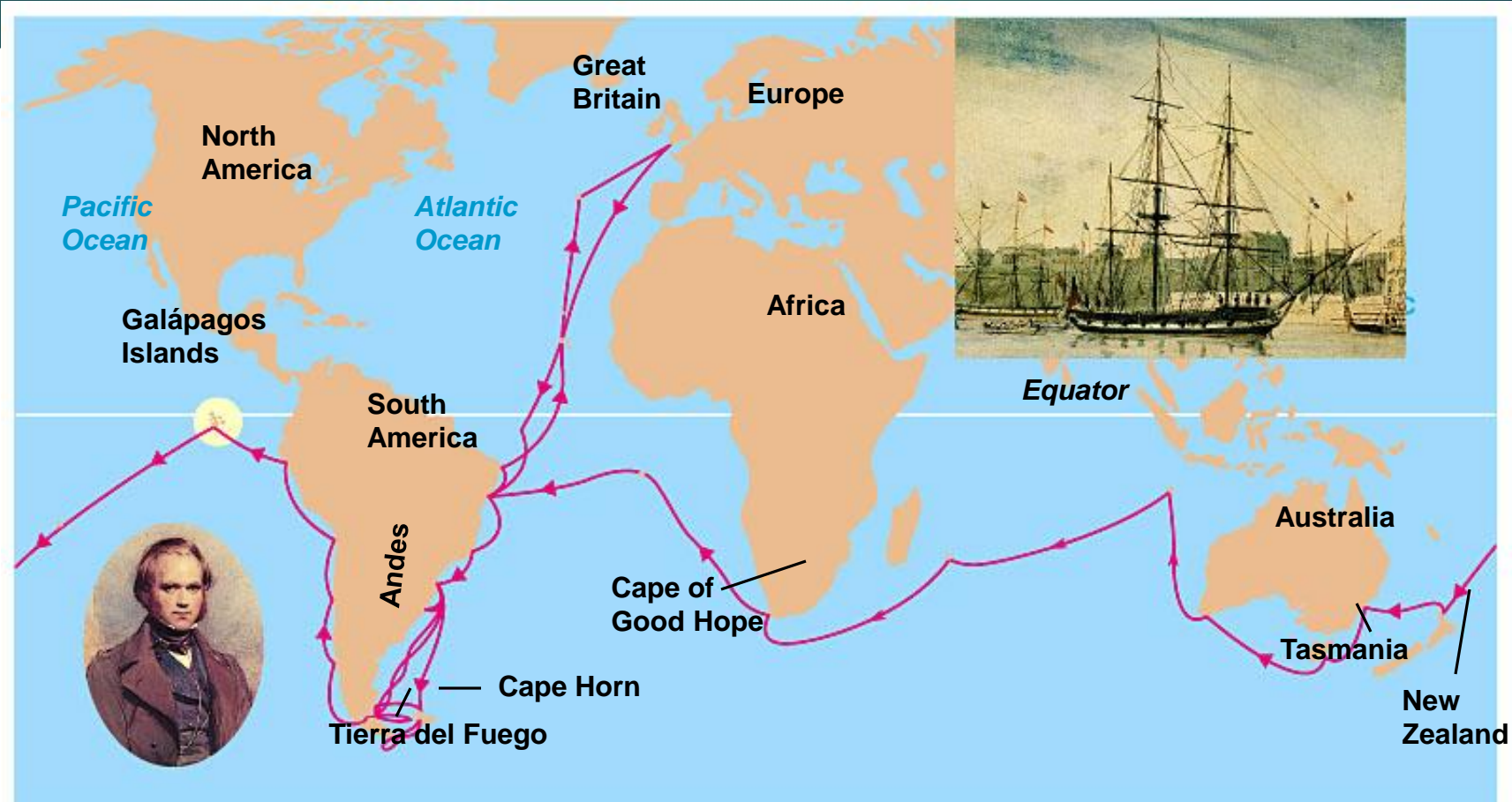
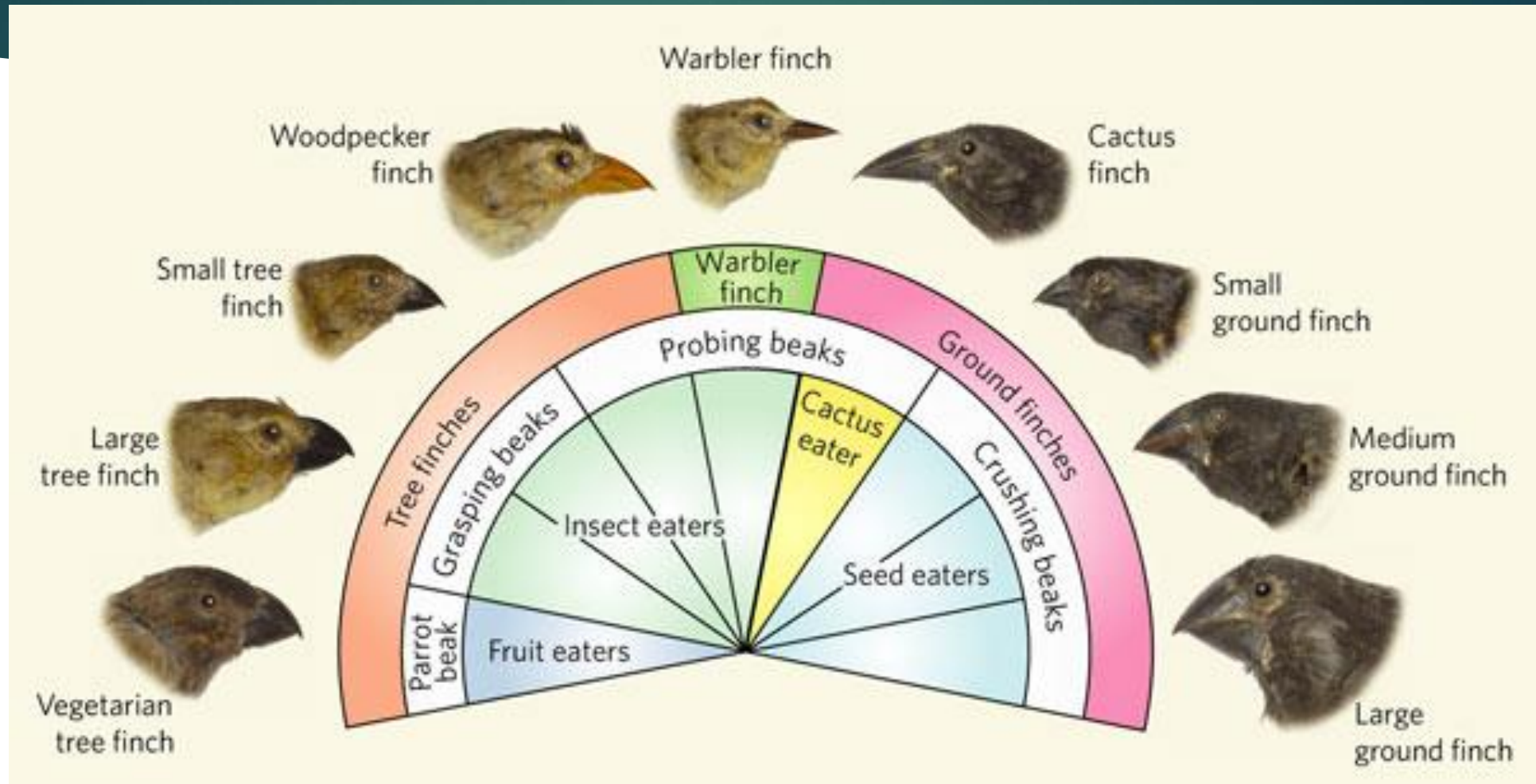


Figure 13.1B

Darwin's Finches



Time out

- ▶ 15-1
 - ▶ The Puzzle of Life's Diversity

Ideas around Darwin's Time

- ▶ Most Europeans believed that the earth and all of its life forms were created only a few thousand years ago
- ▶ Since creation, no change has occurred



Origins of Evolutionary Thought Timeline



1785- James Hutton

Hutton proposes that Earth is shaped by geological forces that took place over extremely long periods of time. Earth may be millions--not thousands--of years old.



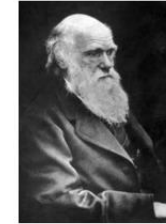
1809- Jean-Baptiste Lamarck

Lamarck publishes his theory of the inheritance of acquired traits. The theory is flawed, but he is one of the first to propose a mechanism explaining how organisms change over time.



1833- Charles Lyell

In the second and final volume of Principles of Geology, Lyell explained that processes occurring now have shaped Earth's geological features over long periods of time.



1859

Darwin publishes On the Origin of Species

1750

1800

1850

1900

1798- Thomas Malthus

In his Essay on the Principle of Population, Malthus predicts that the human population will grow faster than the space and food supplies needed to sustain it.



1831- Charles Darwin

Darwin set sail on the H.M.S. Beagle, a voyage that would provide him with vast amounts of evidence that lead to his theory of evolution.



1858- Alfred Wallace

Wallace writes to Darwin, speculating on evolution by natural selection, based on his studies of the distribution of plants and animals. Darwin presents Wallace's essay to the Linnaean Society.



James Hutton and Charles Lyell

- ▶ recognized that the earth is millions of years old
- ▶ Processes that change the earth in the past are still happening
- ▶ Learn that layers of rock form slowly and are moved by forces beneath the earth's surface
- ▶ Rock is then shaped by natural forces (wind/rain)
- ▶ These processes are very slow and have shaped the Earth's geologic features over long periods of time.

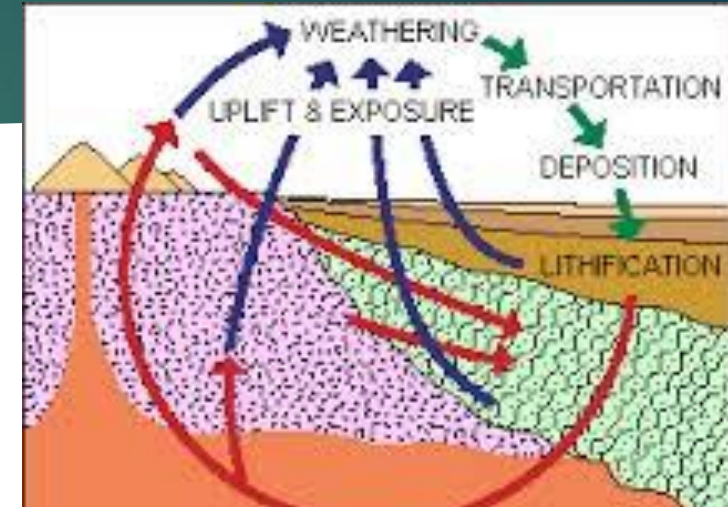


Fig. 56



Curved strata of slate near St. Abb's Head, Berwickshire. (Sir J. Hall)

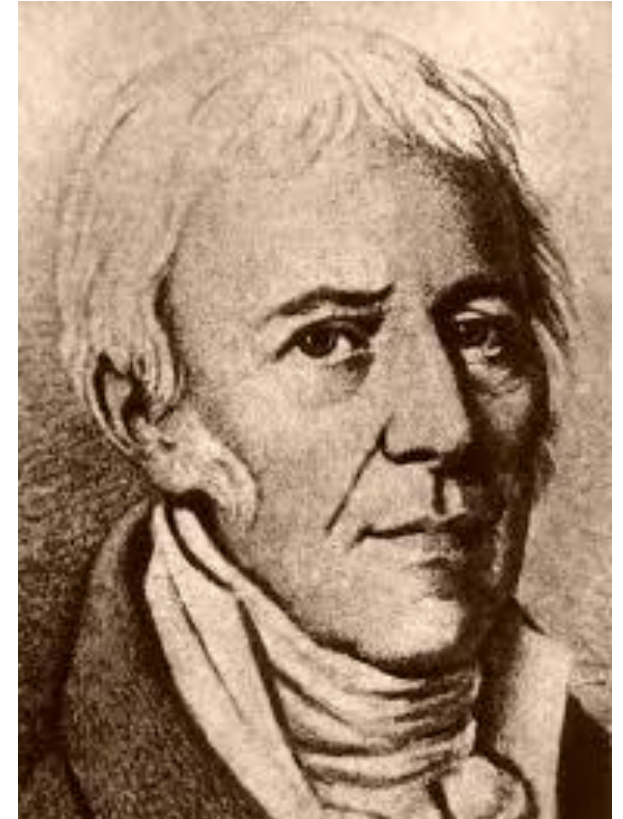
Darwin Witnesses Geology at work

- ▶ Volcanic Eruption
- ▶ New rock forming
- ▶ Earthquake lifting rocky shoreline 3 meters above its previous position
- ▶ All helped him recognize that Earth changes over time.....then why not life?

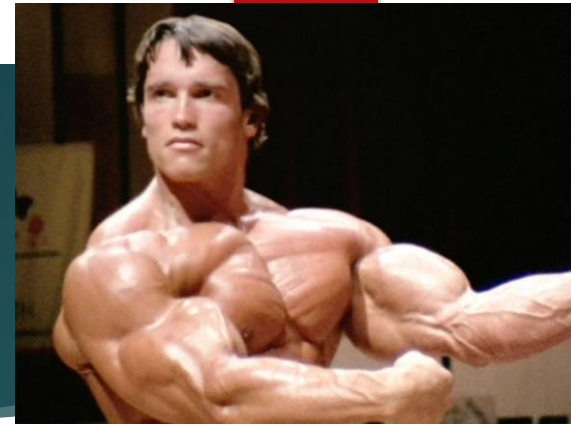


Lamarck

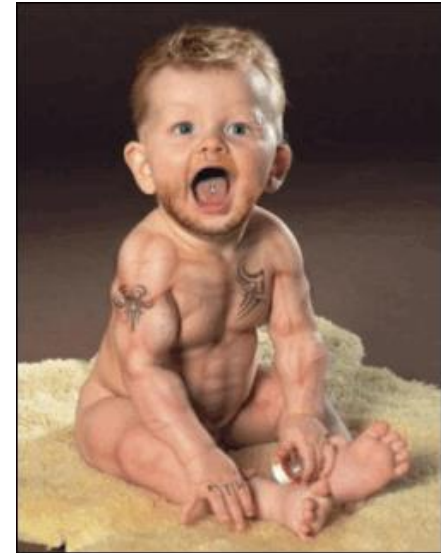
- ▶ French Naturalist
- ▶ One of the first to propose a mechanism explaining how organisms change over time
- ▶ Also realized that organisms were somehow adapted to their environments
- ▶ His hypothesis:
 - ▶ By selective use or disuse of organs, organisms acquired or lost certain traits during their lifetime. These traits are then passed on and over time it leads to change.
 - ▶ Though flawed ideas about inheritance about acquired traits Lamarck was a pioneer for evolution



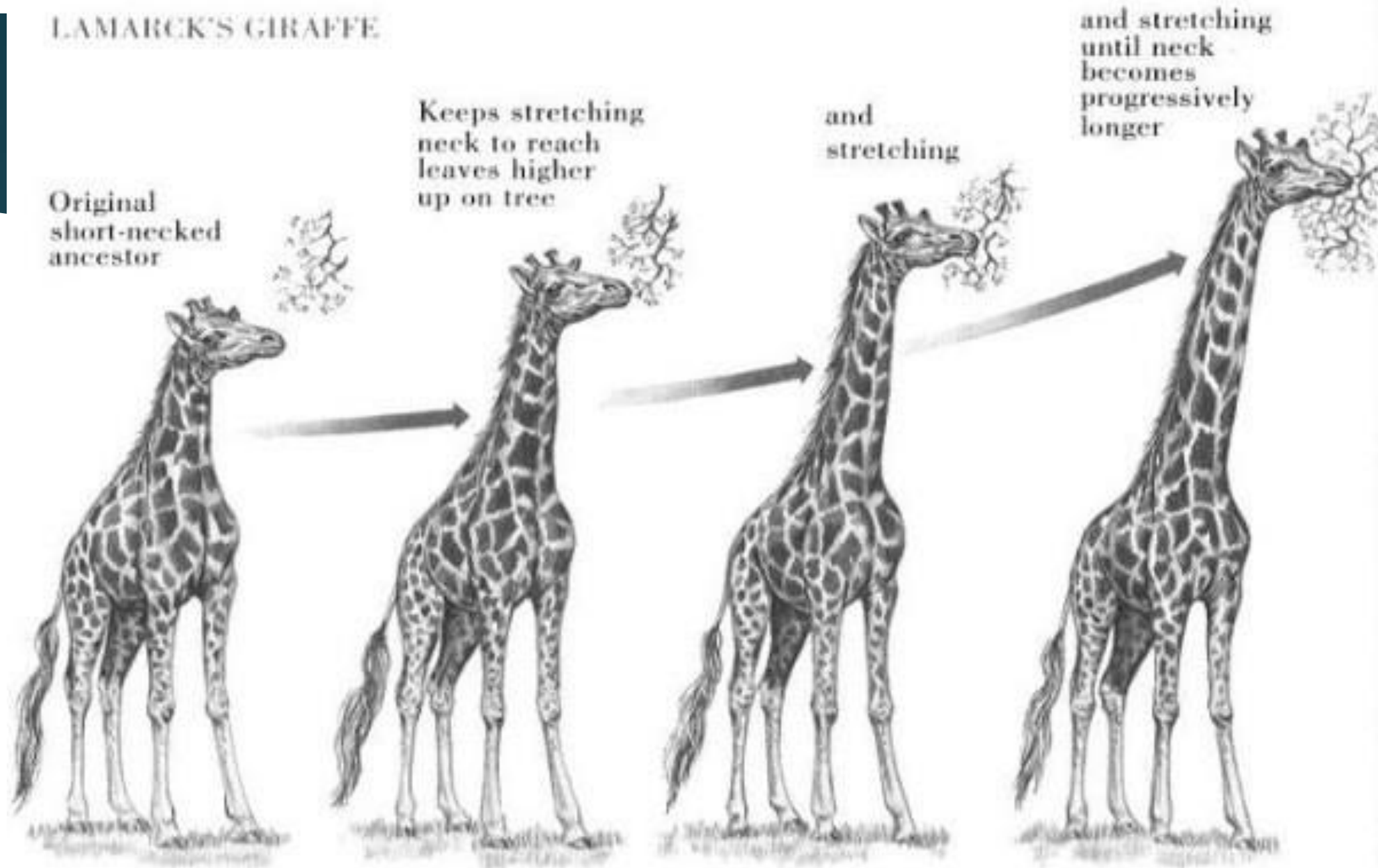
Lamarck's Main Ideas



- ▶ Organisms have an innate tendency towards complexity and perfection
 - ▶ Inner desire to change
- ▶ Use/Disuse
 - ▶ Organisms could alter the size/shape of organs by using their body in a new way
 - ▶ Disused organs would eventually disappear
- ▶ Acquired characteristics could then be inherited



LAMARCK'S GIRAFFE



Driven by inner "need"

Thomas Malthus

- ▶ Population growth
 - ▶ If human population continued to grow sooner or later there would be insufficient living space and food
 - ▶ Forces against: War, famine, disease
- ▶ Darwin observed plants and animals
 - ▶ Noticed
 - ▶ The majority of a species offspring die
 - ▶ Only a few that survive produce offspring
 - ▶ Lead to questions
 - ▶ **“What causes the death of so many individuals?”**
 - ▶ **“What factors determine which one survives and which ones do not?”**



Time out

- ▶ Complete 15-2
 - ▶ Ideas that Shaped Darwin's Thinking