

Darwinian thought

Major events in the history of Biology: Darwinian thought

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

1 10:43 AM

He says the scala is wrong and that the earth is much older than it is said to be.

The essence was based on the exterior essence, which causes variation in a particular animal. Georges-Louis looked at the change in life and talks about the cooling of the life.

Erasmus Darwin
1731-1802

Doesn't believe the scala either.

- Translated Linnaeus into English
- Zoonomia (Laws of Organic life)
- The temple of nature poem

*Organic life beneath the shoreless waves
Was born and nurs'd in ocean's pearly caves;
First forms minute, unseen by spheric glass,
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin, and feet, and wings.*

Discusses evolution and that it did not come all at once.

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

3 10:43 AM

Temple of nature poem: Gradual change over time and they did not arrive all at once (animals).

Cuvier mentions climate/geological catastrophe that could have wiped out certain species.

Darwin's five theories – No constancy of species

Extinction

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

5 10:43 AM

Wrote about 23 different species and identified the flood

Georges-Louis, Conte de Buffon wrote descriptive essays about nature (l'histoire naturel) 3 major ones, organic, plant(not touched), animals

Georges-Louis Leclerc, Comte de Buffon
(1707-1788)

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

2 10:43 AM

Animals adapt to the location that they inhabit.

Stated that there are fossils in Antarctic of animals that no longer exist. Elephant like animals started up in the poles and as they came down, they changed in their appearance (as they changed their environment).

Georges Cuvier
(1769-1832)

- Comparative biology
- Catastrophic theory
- Extinction

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

4 10:43 AM

Sees that animals are missing and that there must have been something wrong with the original animals (that arrived years ago).

Finding unheard of organisms. He questions the scalae nature and mentions that some organisms are extinct. Asks why they have gone extinct.

FLOOD Biblical.

Charles Lyell
(1797- 1875)

- Uniformitarian theory of geological change
- Stratigraphy and the geological time scale

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

6 10:43 AM

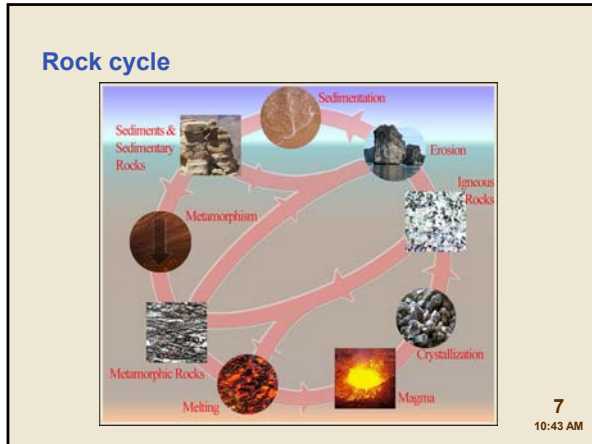
Long slow gradual process and change in the earth reflected by the rocks. Cuvier and Lyell have different views about time.

Slow graduate changes are happening on the earth (uniformitarianism). Speaks about layers and how over time you can create a geological time line because of the huge compositional changes in the rocks. He notices that there are fossils.

Cuvier-Fast Lyell- Slow

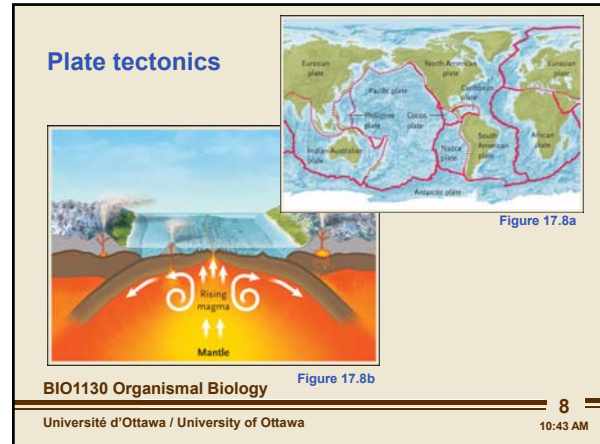
Darwinian thought

Earth is gradually changing over time and is not aware that the cause is by the plate tectonics.



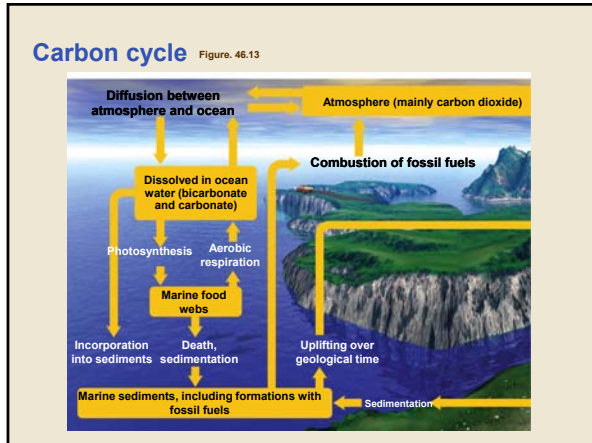
The root of all rocks is the magma that eventually erodes.

Lyell noticed (unknowingly) that the rock returns into a molten form.

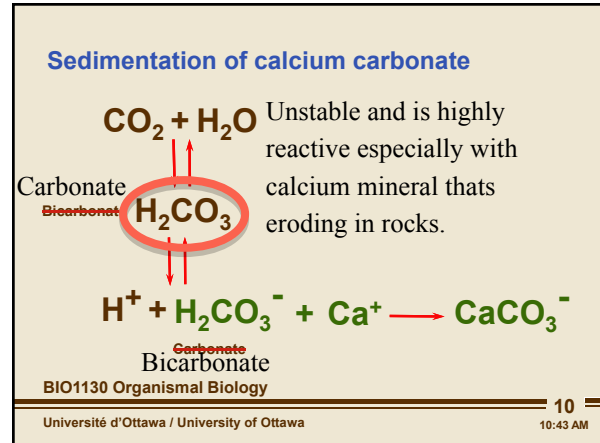


The concept of continent displacement.

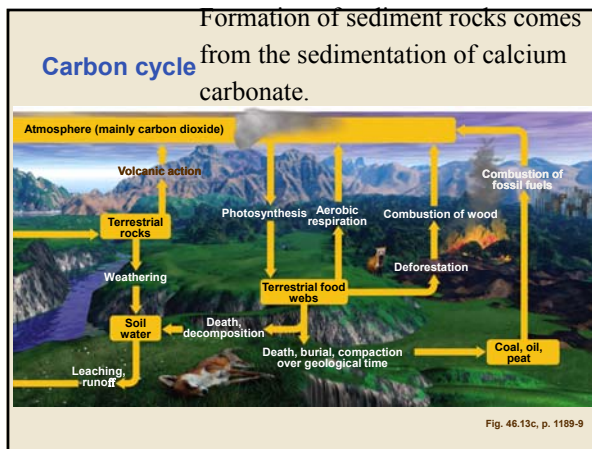
This pathway helped build complex organisms. This pathway was critical for specific areas in history.



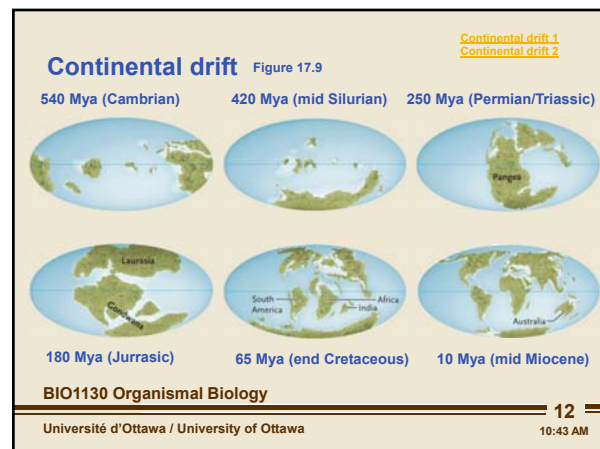
Carbon is dissolved in the oceans. It takes years to make sediments.



This is how sediment minerals are made through this process.



Organic carbon, the biggest sink of carbon is found in the oceans



Continental drift, from Pangea. Animals evolved differently from where they evolved from. All the continents formed in a large land mass (and was separated by continental drift).


Groups of animals showed proof of continental drift. This was accepted in the 1960s. This explained a lot about the difference of specific animal groups this also explained why there are fossils.

Darwinian thought

Transmutation : changing. Infusoria: the essence (over time) will get new characteristic. Complexity of organisms increases overtime.

A mechanism is born to describe the diversity in animals however he gets wrong the genetic variation that is passed on. Wrong about inheritance of acquired traits.

Jean-Baptiste Lamarck (1744-1829)



- **Transmutation of species**

Lamarck: "Lose it or use it" concept, species undergo changes and that these changes are what cause variability in the world.

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

Lamarck is accepted and says essence changes slow because of the environment.

Essentialist explanation of change

- **Transmutation** (not Lamarck)
- **Transformation**
 - Finalism
 - Environmental (this is Lamarck)

Building blocks of an essence come from the environments essence. Transmutation an adj (quick) of the essence (Lamarck talks about the organisms). Some essentialist mention time and that the essence changes automatically over time.

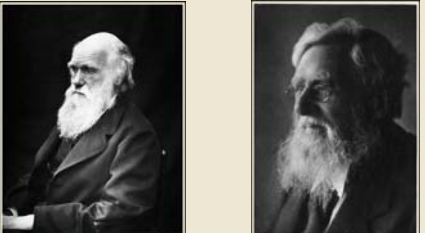
BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

However he is missing the idea of genetic variability, and that the acquired traits were not passed on and he did not know how egg and sperm work. The mutation is not in the genome and it is physically impossible for the gene to be carried out.

Darwin is very rich and when he goes on the beagle he collects as much as he wants and he has a photographic memory and he took extensive notes. When he gets Lyell gets back after 5 years he has one of the largest science collection and is large in diversion.

Darwin: Never produced a theory of evolution (he proposed the theory of natural selection). He gives us population thinking where some individuals may be more successful in mating than others (because of there variability. This means the trait will be passed on.


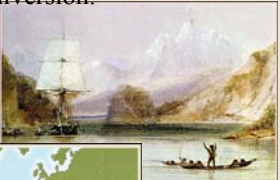
Important stages in the history of Biology
19th century: Modern biology



Darwin (1809-1882) **Wallace (1823-1913)**

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

Voyage of the HMS Beagle

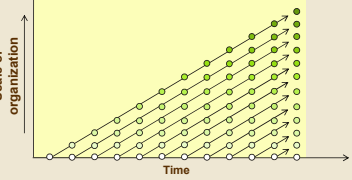
Notices that there are specific patterns in certain groups of animals. Ex. the beaks of the finches. The concept of natural selection.

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

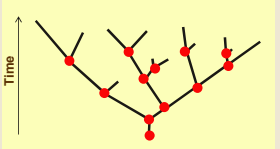
Wallace mails to Darwin he's similar idea and both presented their papers and they are both the founders of the concept of natural selection.

People accepted Lyels ideas.

Lamarck's theory



Darwin's theory



BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

Darwin's five theories NEVER MENTIONED EVOLUTION

- **No constancy of species**
- **Common ancestry**
- **Gradual Changes**
- **Multiplication of species**
- **Natural selection**

Diversity of the world is real, species composition changes over time

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

What happens and what is the gradual change and what is the inherited material (this is explained in the modern theory of evolution),

Takes the lamarck view and says that everything has a common ancestor. He gives the concept of a common ancestor.

Branching pattern creates more variability and over time they gradually appear. He provides the mechanism and Darwinian Fitness.

Changes have increased the number of species. He gets immediate acceptance on no constancy of species and common ancestry. The other three theories are not accepted. Reason being there is no idea as to what is being inherited. No

Darwinian thought

Fossils show that the species composition changes over time. Fossil records are incomplete and there is nothing in between.

Conte de Buffon

Darwin's five theories
No constancy of species

A transitional form is an animal that fills the gap between two other organisms in evolution,

- **Fossils**
- **Extinction**
- **Transitional forms**

It is the missing link and without it people say the fossil list is incomplete.

Fossil records show that some species have disappeared and it shows that there is common ancestry (Conte de Buffon)

BIO1130 Organismal Biology

19 10:43 AM

Université d'Ottawa / University of Ottawa

Transition fossils in horses are an example

Darwin's five theories – No constancy of species
Transitional forms
Evolution of the horse

Equus

Merychippus

Pliohippus

Merychippus

Mesohippus

Hyracotherium

Figure 17.13

21 10:43 AM

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

Shows that as the planet changes, animals change. For example how to feed. Horse: length change in the horse (by natural selection) in order to feed and run fast too.

Darwin's five theories – No constancy of species
Transitional forms
Puijila darwini

Paleo Breakthrough

Meet the discoverer

Lucy: link between humans and chimps.

BIO1130 Organismal Biology

23 10:43 AM

Université d'Ottawa / University of Ottawa

Transitional fossils are becoming very common. Ex. The evolution of young mammal (seals). Lived in the high arctic. It is a lot like seals and it was also able to live on land and water.

Conditions for fossils is rare and takes awhile. Soft body invertebrates were usually seen as incomplete because the transitional forms were always missing, however they were found in shale. There was hundreds of those animals found in the shale (found in the ocean) Bridge of shales.

Darwin's five theories – No constancy of species
Fossils

Petrified wood

Invertebrate

Insects in amber

Mammoth in permafrost

Figure 17.5

20 10:43 AM

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

We didn't know how the rocks moved and that's why we saw that the fossils were incomplete and why the transitional forms of the fossils were missing.

This was the first flying organism found in a shale. It was like a reptile (it had teeth). This was a transitional fossil between reptiles and birds.

Darwin's five theories – No constancy of species
Transitional forms
Archaeopteryx lithographica

Figure 17-21a

BIO1130 Organismal Biology

22 10:43 AM

Université d'Ottawa / University of Ottawa

Carbon dating helps with finding transitional fossils.

Darwin's five theories
Common ancestry - evidence

- **Comparative anatomy**
- **Comparative embryology**
- **Vestigial structures**
- **Biogeography**
- **Molecules**

BIO1130 Organismal Biology

24 10:43 AM

Université d'Ottawa / University of Ottawa

Darwinian thought

Structures that share the same internal structure (can help determine common ancestry).

Darwin's five theories - Common ancestry
Comparative anatomy
Homology – Divergent evolution

BIO1130 Organismal Biology
25
Université d'Ottawa / University of Ottawa 10:43 AM

It would be hard to determine common ancestry between whales and bats unless we look closely at the homology of species.

By looking into embryology we can determine common ancestry. Gives us a way to look at the internal structural changes in the organisms in order to compare. It is hard to determine what the organism will be in the first few weeks of the embryos growth because it is so common in many organisms and species.

Darwin's five theories - Common ancestry
Comparative embryology

BIO1130 Organismal Biology
26
Université d'Ottawa / University of Ottawa 10:43 AM

Darwin's five theories - Common ancestry
Vestigial structures

BIO1130 Organismal Biology
27
Université d'Ottawa / University of Ottawa 10:43 AM

*Nictating membrane

Darwin's five theories - Common ancestry
Molecules

BIO1130 Organismal Biology
28
Université d'Ottawa / University of Ottawa 10:43 AM

Molecules help show common ancestry. DNA sequencing (was not available to Darwin).

Darwin's five theories

- No constancy of species
- **Common ancestry**
- Gradual Changes
- Multiplication of species
- Natural selection

BIO1130 Organismal Biology
29
Université d'Ottawa / University of Ottawa 10:43 AM

Types of taxonomies

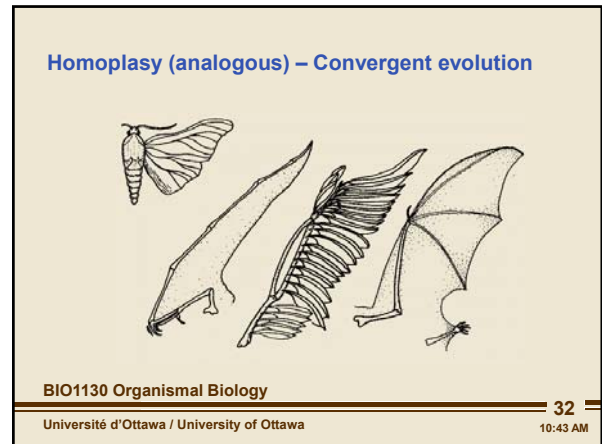
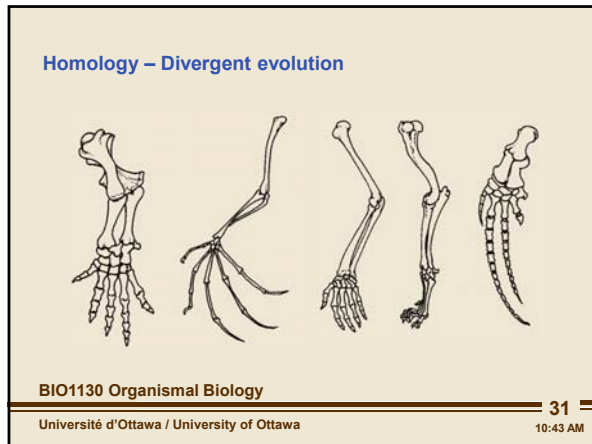
- Folk
- Artificial
- Mechanical
- **Natural (Evolutionary)**
- Cladistic (Phylogenetic)

BIO1130 Organismal Biology
30
Université d'Ottawa / University of Ottawa 10:43 AM

Darwin helps develop natural (evolutionary) (phylogeny of a group).

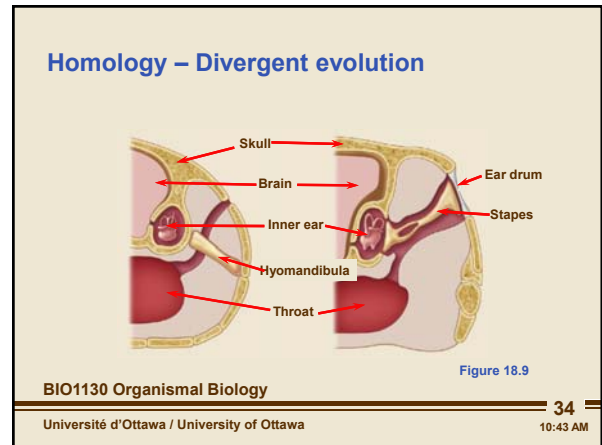
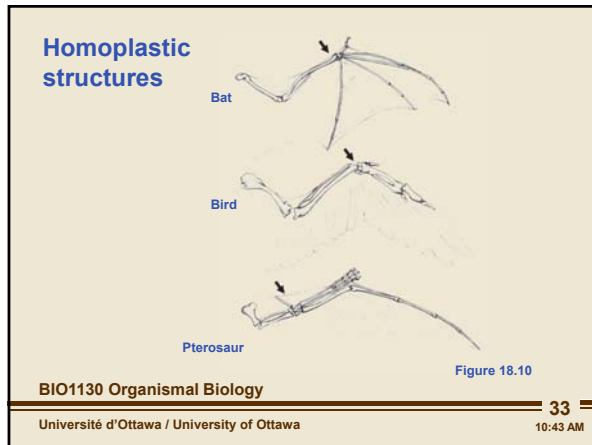
Biologist look closely at divergent evolution which hides the common ancestry.

Darwinian thought



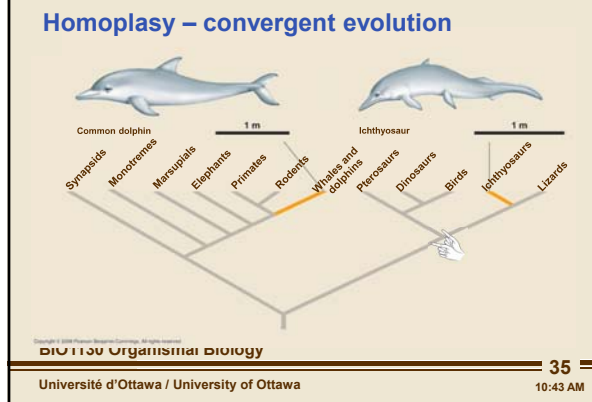
When animals come on land the bone modification occurs.

Dramatically different

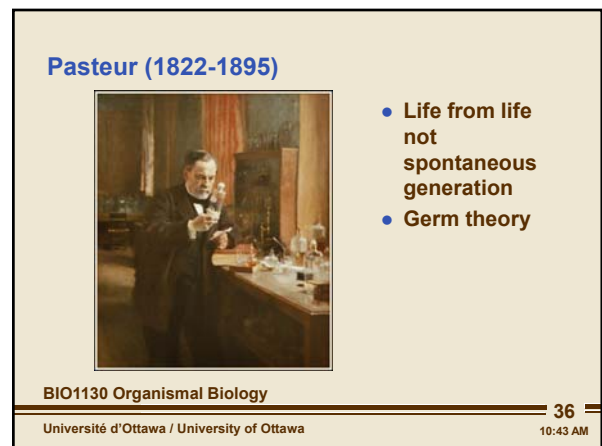


Breaks the rule of spontaneous generation.

Environment caused this solution for organisms in water.



Evolutionary sequence. ancestry stories are thus created.




Darwinian thought

They used microscopes to help identify cells and how they work.

Cell theory not law and the only way to get new cells is from old cells and there is no spontaneous

Important stages in the history of Biology
19th century: Modern biology

- **Cell theory** (Schleiden and Schwann – 1860)
 - The basic unit of all organisms is the cell
 - Individual cells have all the characteristics of life and
 - All cell come from the division of other cells




Schleiden
(1804-1881)

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

37
10:43 AM

Mendel
(1822-1884)



- Rediscovered 1900.
- Law of segregation of characters
- Law of independent assortment

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

38
10:43 AM

What cells are and why they are important.

Scwann-animals

Schleiden-plants