

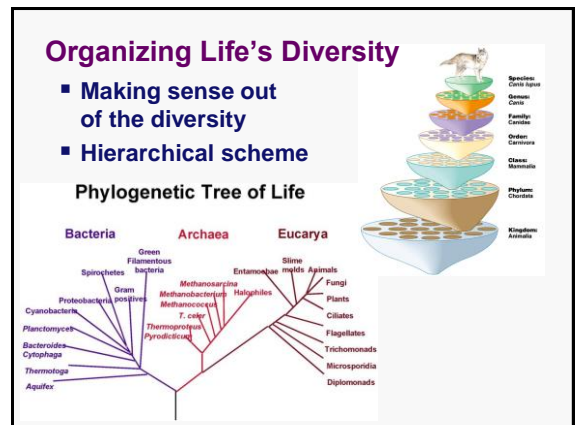


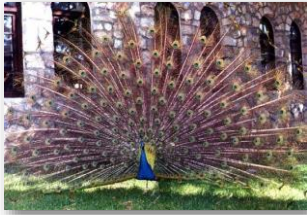
Why study Big Ideas in Biology?

- Biology is an ever expanding body of knowledge...
 - ◆ too much to memorize it all
 - ◆ need to generalize
 - ◆ create a framework upon which to organize new knowledge
 - ◆ themes (Big Ideas) are fundamental in understanding the nature of living organisms

Big Idea #1

The process of evolution drives the unity and diversity of life.



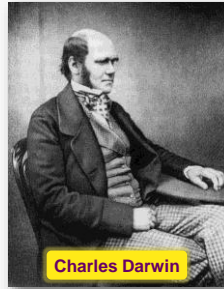


Nothing in biology makes sense except in the light of evolution.

— Theodosius Dobzhansky

Evolution

- core theme of biology

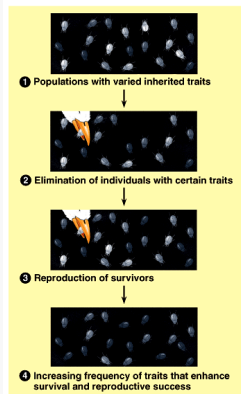


Charles Darwin



Evolution

- evolutionary adaptation is a product of natural selection



Unity & Diversity

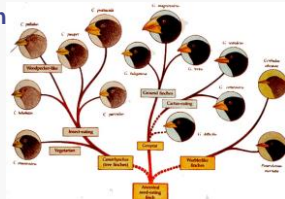
- Dual aspects of life on earth

- **Unity**
 - ◆ What do organisms have in common?
 - ◆ Why do similarities exist?
- **Diversity**
 - ◆ What differences are there between organisms?



Unity & Diversity

- **Unity**
 - ◆ evolutionary relationships
 - ◆ connected through a common ancestor
- **Diversity**
 - ◆ natural selection
 - ◆ adaptations in different environments



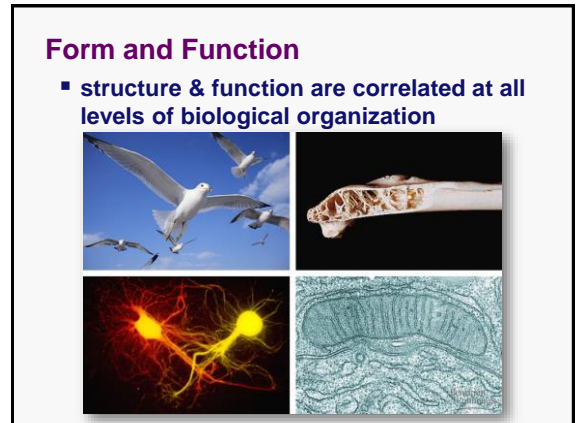
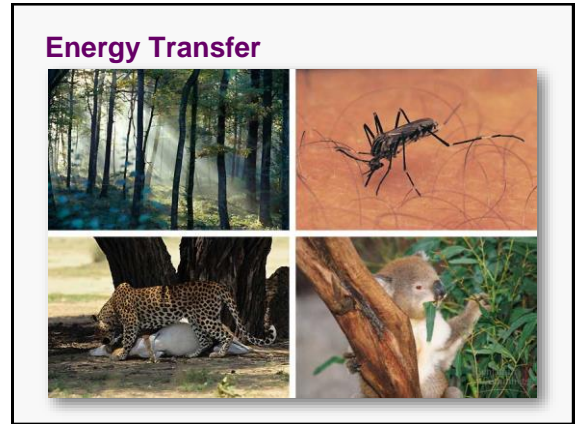
Big Idea #2

Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.

Energy Transfer

- life is an open system
 - organisms continuously interact with the environment
 - stuff comes in stuff goes out
 - energy is used

Entropy rules!



Big Idea #3

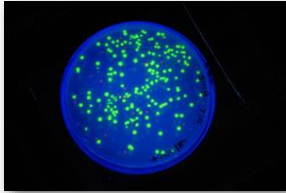
Living systems store, retrieve, transmit, and respond to information essential to life processes.

Continuity & Change

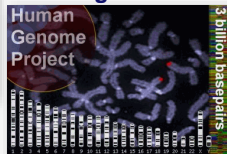
- Continuity of life is based on heritable information in the form of DNA
 - DNA – the genetic material – carries biological information from 1 generation to the next

Which science is growing the fastest in new knowledge?

MOLECULAR BIOLOGY!!



Genomics & proteomics projects are driving research

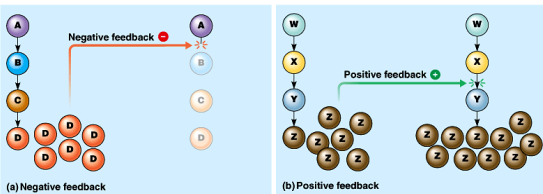


Big Idea #4

Biological systems interact, and these systems and their interactions possess complex processes.

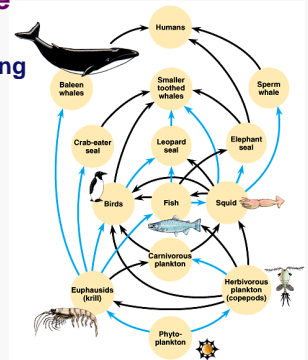
Regulation

- regulatory mechanisms ensure a dynamic balance through feedback



Interdependence

- no organism is an island standing alone



Science, Technology & Society

- science & technology must function within the framework of society
- bioethics




Science Practices...

Really, what this course is all about!

Science as a Process of Inquiry

- repeatable observations & testable hypothesis



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graph TD; Observations[Observations] --> Question[Question]; Question --> Hypothesis[Hypothesis]; Hypothesis --> Prediction[Prediction]; Prediction --> Test[Test: experiment or additional observation]; Test --> Observations; Test --> Question; Test --> Hypothesis; Test --> Prediction;
```

Test does not support hypothesis; revise hypothesis or pose new one

Test supports hypothesis; make additional predictions and test them

Science as a Process of Inquiry

