

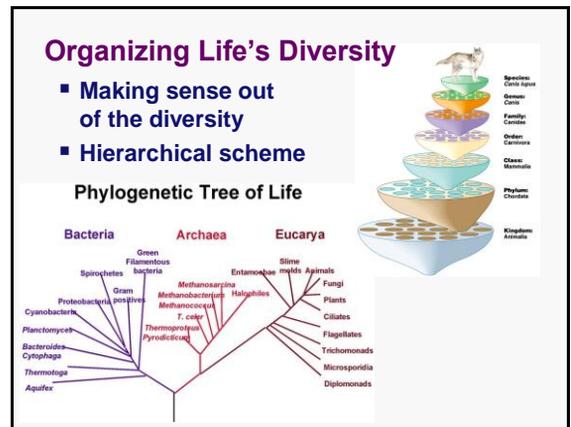


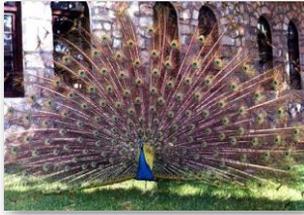
**Why study Big Ideas in Biology?**

- 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.**



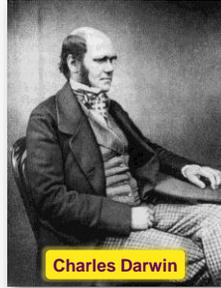


Nothing in biology makes sense except in the light of evolution.

— Theodosius Dobzhansky

## Evolution

- core theme of biology

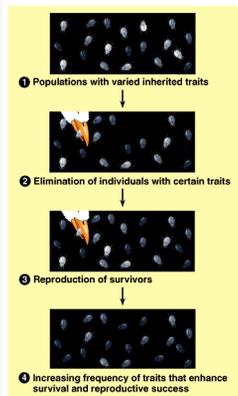


Charles Darwin



## Evolution

- evolutionary adaptation is a product of natural selection



## Unity & Diversity

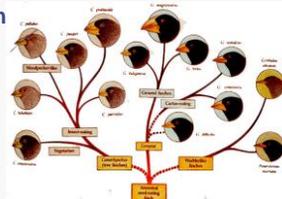
- Dual aspects of life on earth

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



## Unity & Diversity

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



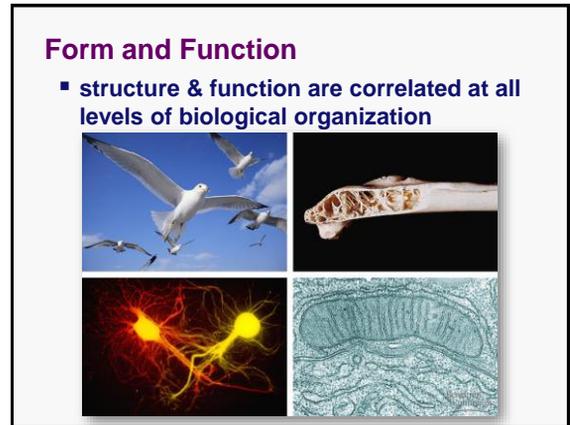
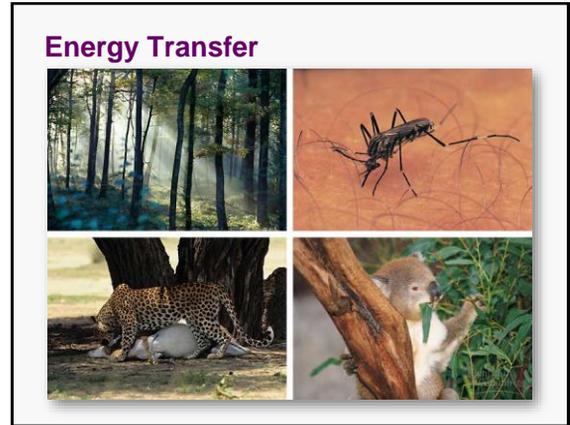
## Big Idea #2

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

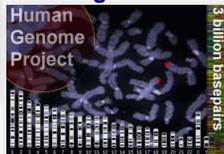
- Continuity of life is based on heritable information in the form of DNA
  - DNA – the genetic material – carries biological information from one generation to the next

Which science is growing the fastest in new knowledge?

**TAKE MOLE BIO!!**



Genomics & proteomics projects are driving research

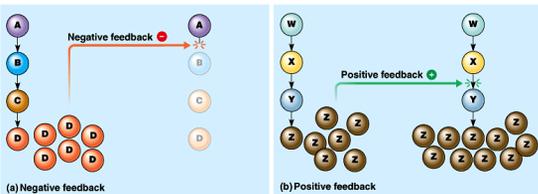


Big Idea #4

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

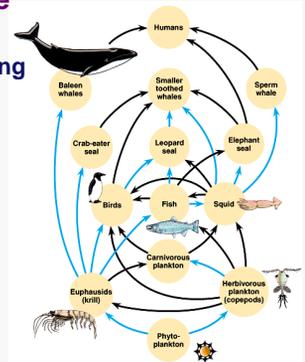
Regulation

- 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



Any Questions?