

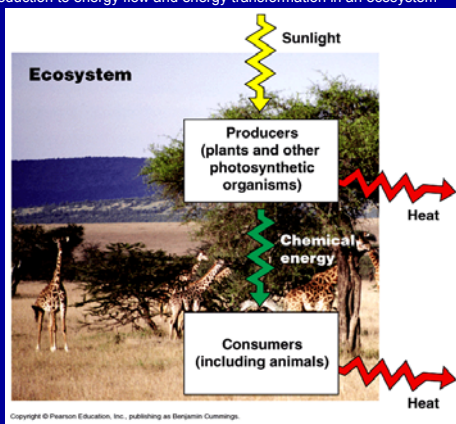
# Lecture Series 1

## Introduction for Biology 201

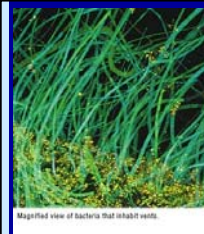
### A. Evolutionary Milestones

- A major theme in evolution is increasingly diverse ways of capturing external energy for biologically useful reactions.

An introduction to energy flow and energy transformation in an ecosystem



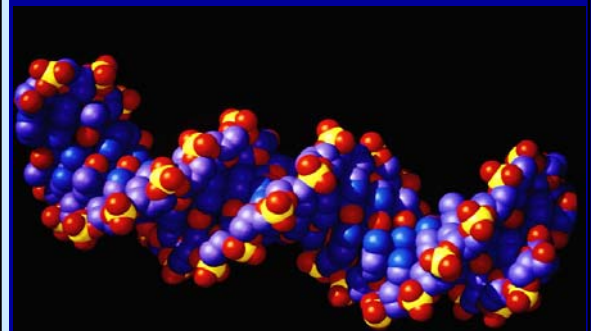
### Chemosynthesis: Hydrothermal Vents



### A. Evolutionary Milestones

- All living organisms contain the large molecules—carbohydrates, lipids, proteins, and nucleic acids.
- Ordered “bags of biochemistry” insulated from the chaos of the environment. Not a closed system.
- Storage, transfer and expression of genetic information.

DNA

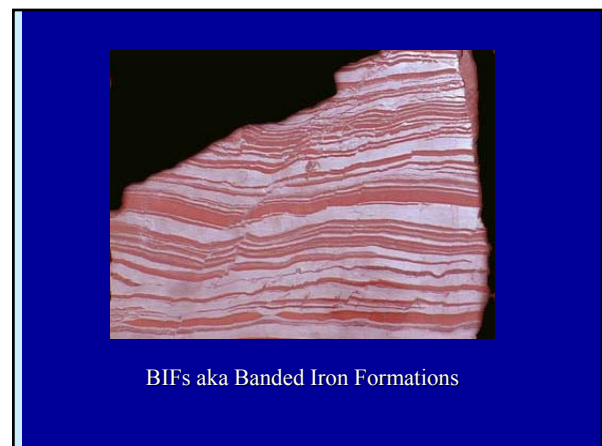
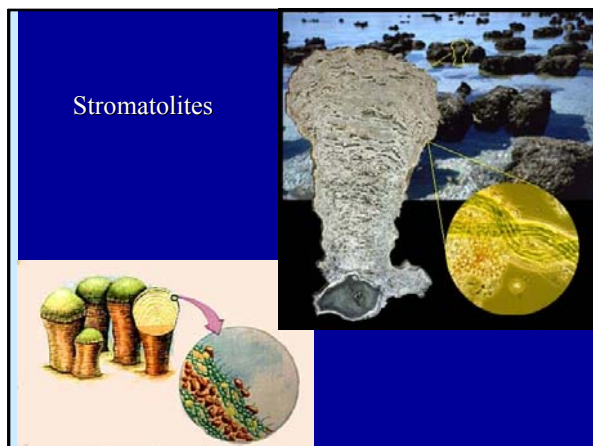
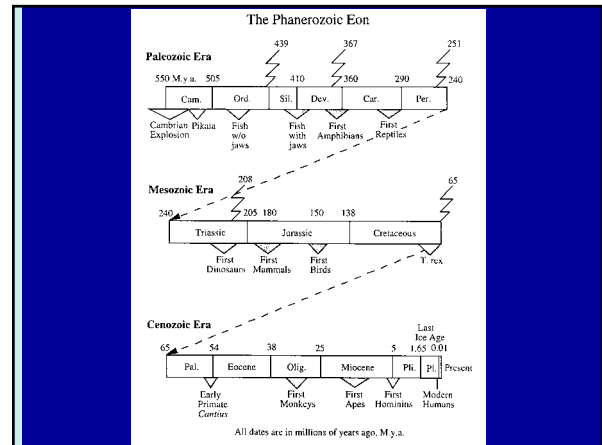
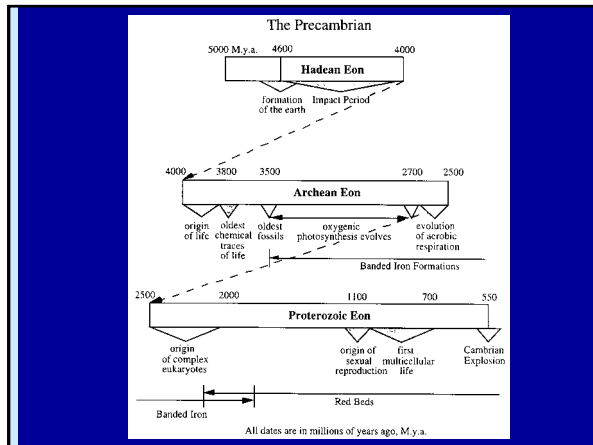


## A. Evolutionary Milestones

- Life arose from nonlife about 3.8 to 4.0 billion years ago.
- This process occurred over only a couple hundred million years! Not 2 billion.
- Now all cells come from cells.....why?

## A. Evolutionary Milestones

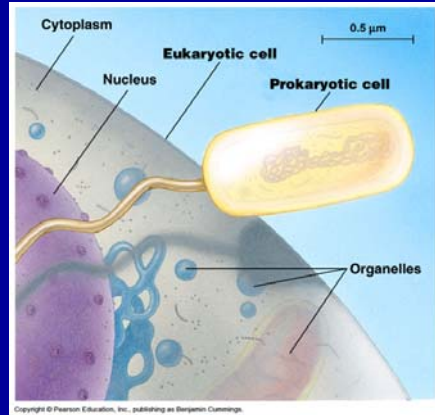
- Photosynthetic single-celled organisms released oxygen, allowing oxygen-based metabolism of large cells and eventually multicellular organisms.
- Oxygen began getting released very early on, but only accumulated in atmosphere after "Rust the Crust" and movement onto land only after Ozone shield.



## A. Evolutionary Milestones

- Complex eukaryotic cells evolved from prokaryotic cells. Eukaryotic cells developed into multicellular organisms whose cells became modified for specific functions.
- The evolution of sexual reproduction enhanced the ability of organisms to adapt to changing environments.
- Adaptation to environmental change is the result of evolution by natural selection, the filter for innate variability.

Structural organization of Eukaryotic and Prokaryotic cells



Natural selection

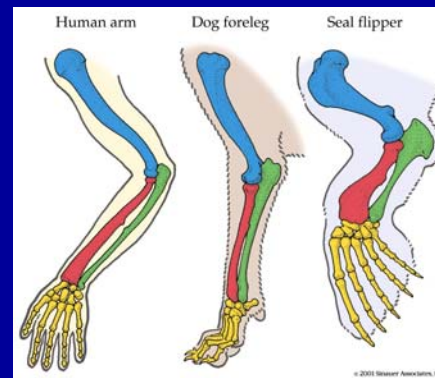
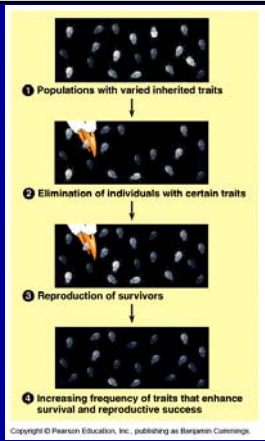


Figure 1.2

## B. The Hierarchy of Life

- Biology is organized into a hierarchy of levels. Each has "emergent properties" not found at lower levels.
- Emergent properties are where the sum is greater than the parts.
- Basic unit of biology is the cell, we go up or down from there.

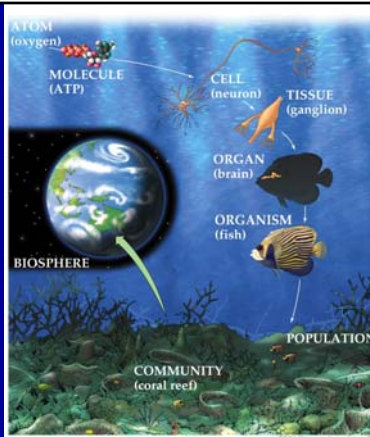


Figure 1.9

## B. The Hierarchy of Life

- Domains vs Kingdoms...etc.
- Species are classified into domains Archaea, Bacteria, and Eukarya. Archaea and Bacteria consist of prokaryotic cells. Eukarya contain the protists and the kingdoms Plantae, Fungi, and Animalia.
- Crown Groups all require endosymbiosis!

## Classifying life

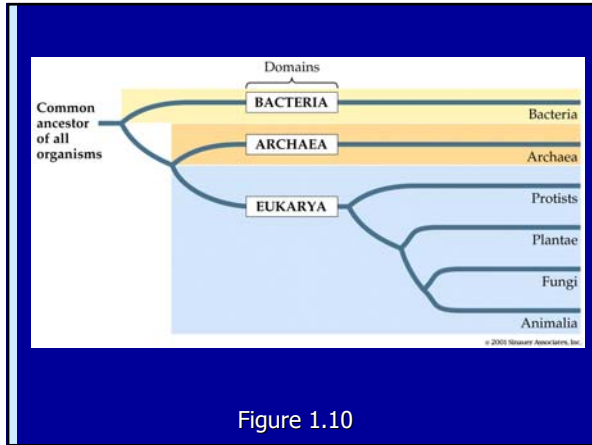
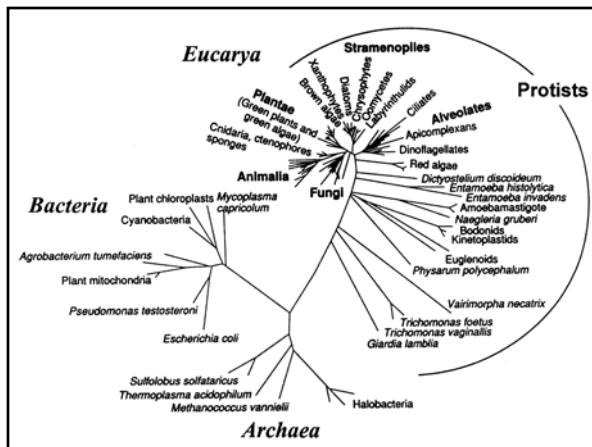
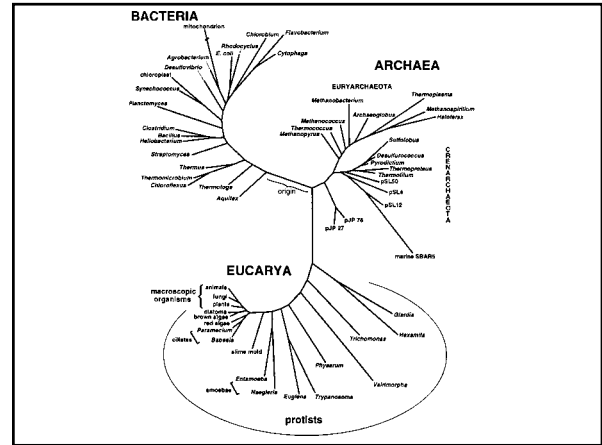


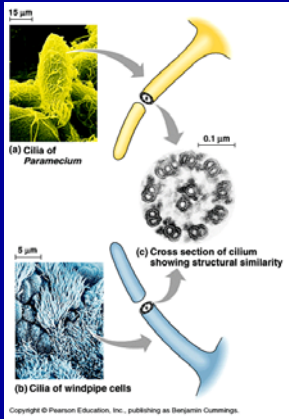
Figure 1.10



## Examples of the three Domains of life



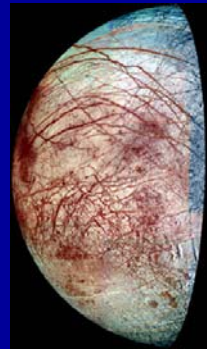
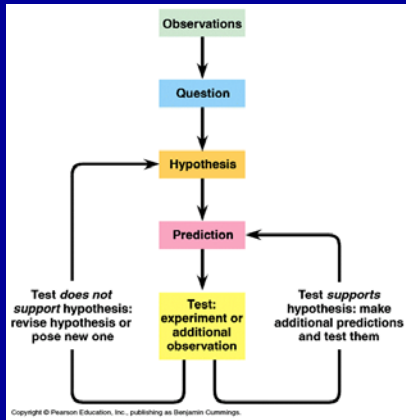
Unity underlying the diversity of life: the architecture of Eukaryotic cilia



## C. Fundamental Concepts Used Throughout Biology

- Evolution unites all of biology. It's mechanism is Natural Selection.
- Emergent Properties
- Hierarchical Organization
- Hypothesis Testing/Deductive Reasoning

Idealized version of the scientific method



Life on Europa?

