

The Living World

Biodiversity, Microbes

What is Life??

- Response to stimuli
- Growth
- Metabolism
- Reproduction, etc.

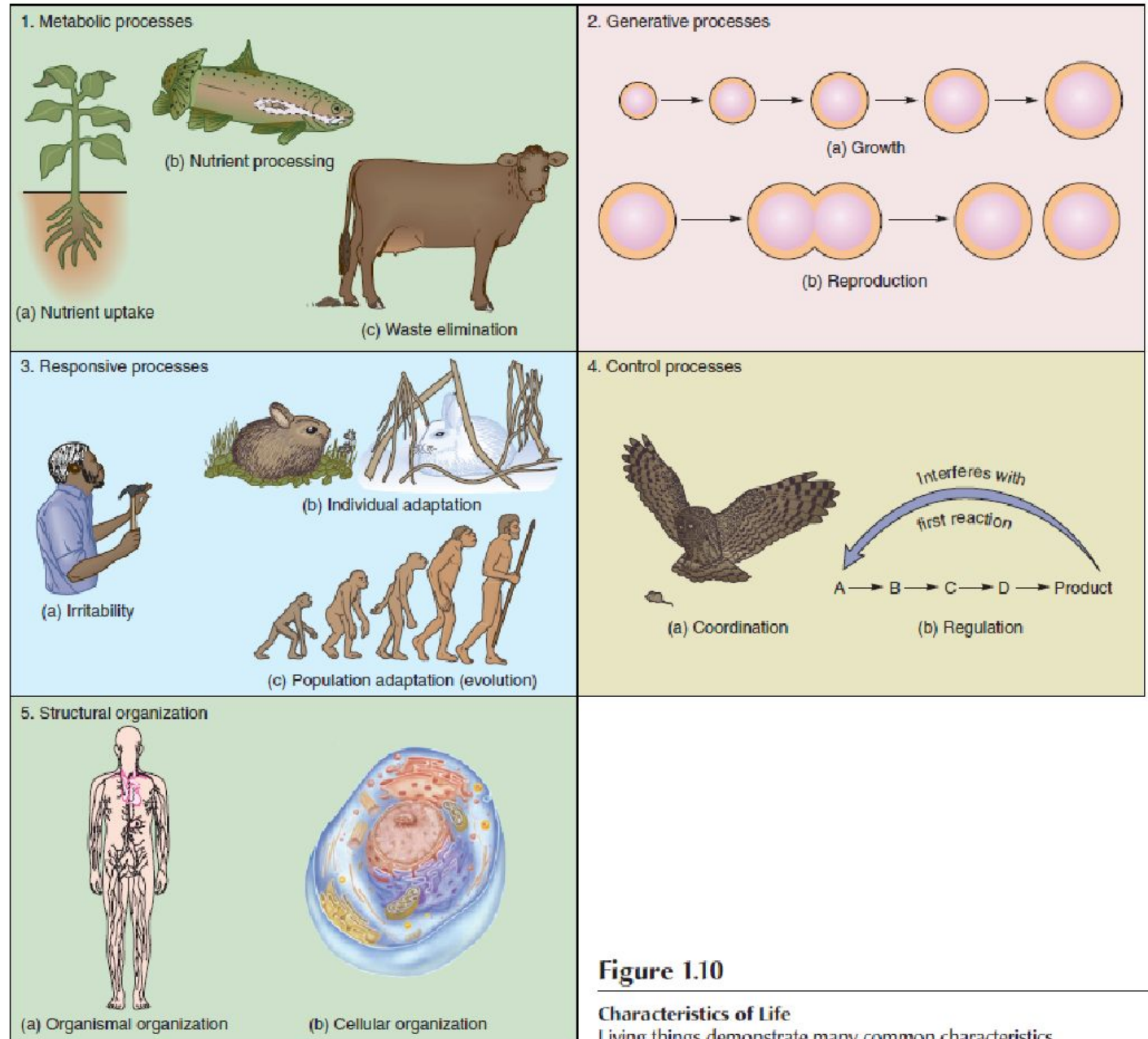
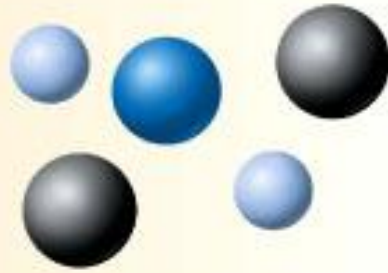


Figure 1.10

Characteristics of Life

Living things demonstrate many common characteristics.

CELLULAR LEVEL



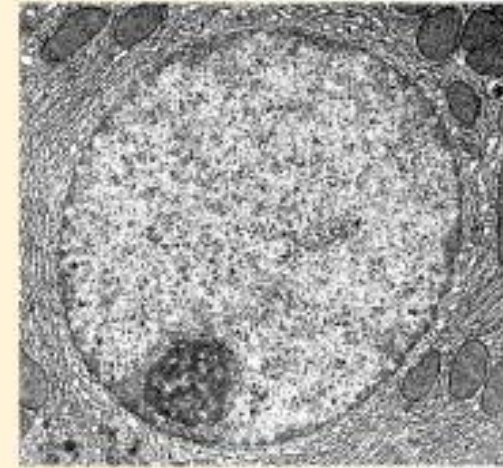
Atoms (Hydrogen, carbon, nitrogen)



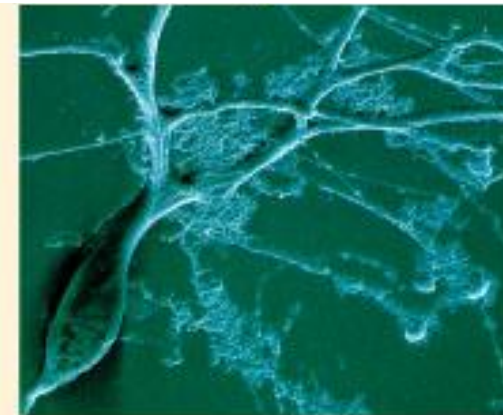
Molecule (Adenine)



Macromolecule (DNA)

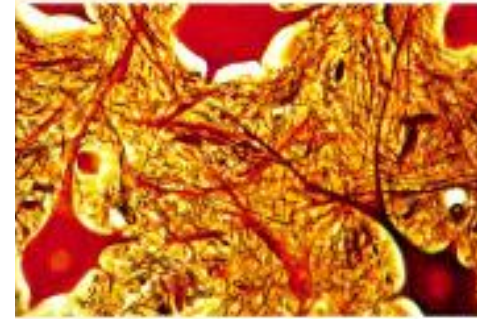


Organelle (Nucleus)

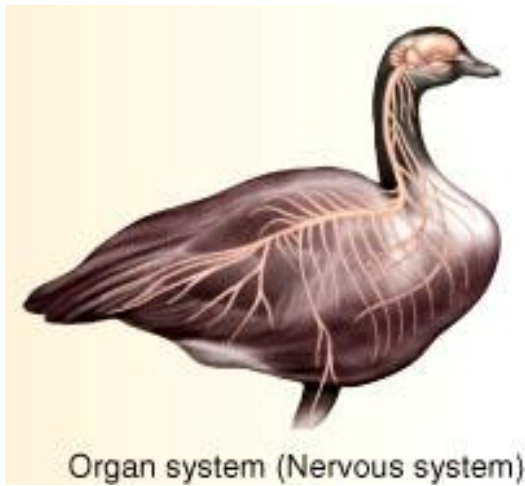


Cell (Nerve cell)

ORGANISMAL LEVEL



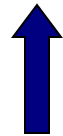
Tissue (Nerve tissue)



Ecosystem



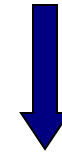
Ecosystem



Community



Species



Population



What do we get from biodiversity?

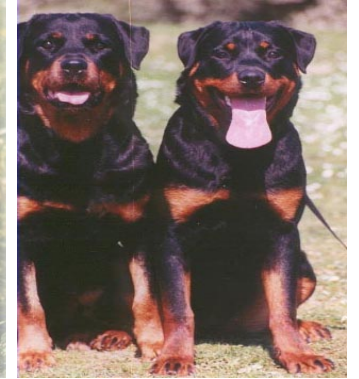
- Oxygen
- Food
- Clean Water
- Medicine
- Aesthetics
- Ideas



Levels of Biodiversity

Genetic Diversity:

Variety of genetic material within a species. Source of biodiversity at all levels



Species Diversity:

Diversity Between Species



Ecosystem Diversity:

Diversity Between Ecosystems



Threats to biodiversity

- **habitat destruction** (slash and burn agric. or felling of old-growth forests)
- **overexploitation** (fishing, hunting)
- **pollution** (domestic and industrial emissions)
- **global climate change** (the greenhouse effect and destruction of the ozone layer)
- **invasion by introduced species** (displacement of native species)
- **underlying social conditions** (increased per-capita consumption, poverty, rapid population growth, unsound economic and social policies)

What is causing these threats to biodiversity?

1. Habitat Loss



2. Invasive Species



3. Pollution



4. Overexploitation

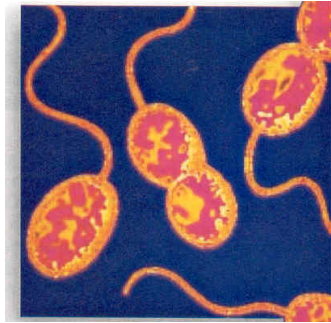


5. Climate Change

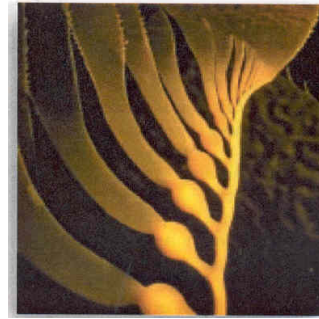


The Diversity of Life

- Biology is the study of living things
- Living things can be divided into **five kingdoms**



Monera



Protista



Fungi



Plantae



Animalia

Microorganisms

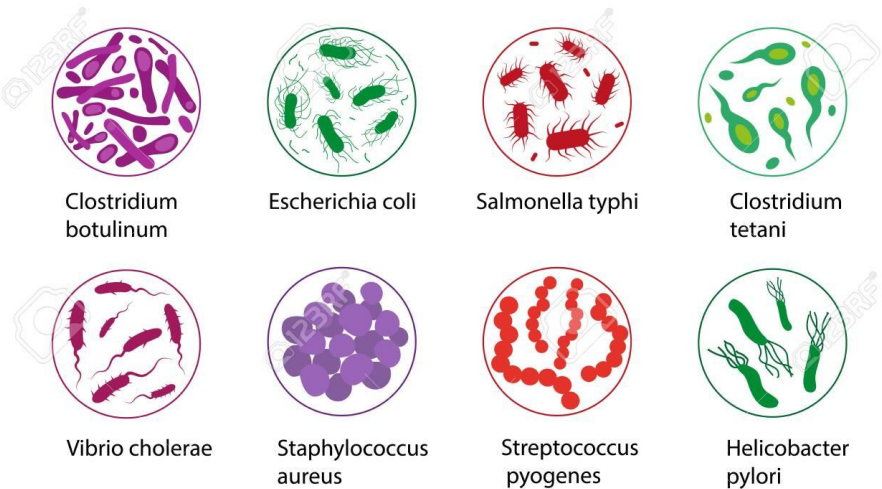
- Invisible to Naked eye
- Cosmopolitan: Microbes thrive in an amazing diversity of habitats in extremes of heat, cold, radiation, pressure, salinity, acidity, and darkness, and often where no other life forms could exist.
- Microbes outnumber all other species and make up most living matter (~60% of the earths biomass).
- Microbial cycling of critical chemical elements such as carbon and nitrogen helps keep the world inhabitable for all life forms.
- Microbes generate at least half the oxygen we breathe.
- Microbes are roots of life's family tree. An understanding of their genomes will help us understand how more complex genomes developed.
- Microbial communities are excellent models for understanding biological interactions and evolution.

Microorganisms

- Fast Movers: Some bacteria can move by flagella that enable them to obtain speeds as high as 0.00017 km/ hr. This may not seem very fast, but remember that we are talking about very small organisms. They are travelling at about 50-60 body lengths/ sec which is equivalent to a 6 ft tall man running at 100 m/ sec, 9 times faster than the world record. Cheetahs, are the fastest animals on land but even they only move at about 25 body lengths/ sec.
- Without microbes, the whole ecosystem would collapse.
- Aesthetics: interestingly some microbes produce light in by a process called bioluminescence.
- The color of light (orange, yellow, yellow-green, or blue-green) depends on the kind of luciferase and amount of oxidation of the vitamin attached to the luciferin.

Microorganisms- Bad

- Ever heard of Salmonella or E. Coli, these can make you very sick.
- They are found on raw chicken and other meat, raw eggs, and other foods.
- Cold -virus



Bacteria



Virus



Fungi

Microorganisms- Good

In a way we can not live without microorganisms.

Without algae and other tiny plants floating in the ocean, we would not even have enough oxygen to stay alive!

Algae and Plankton



Bacteria



penicillin



Algae and Bacteria



- **Recombinant DNA Technology**

- Genes in microbes, plants, and animals manipulated for practical applications
- Production of human blood-clotting factor by *E. coli* to aid hemophiliacs



- **Gene Therapy**

- Inserting a missing gene or repairing a defective one in humans by inserting desired gene into host cells

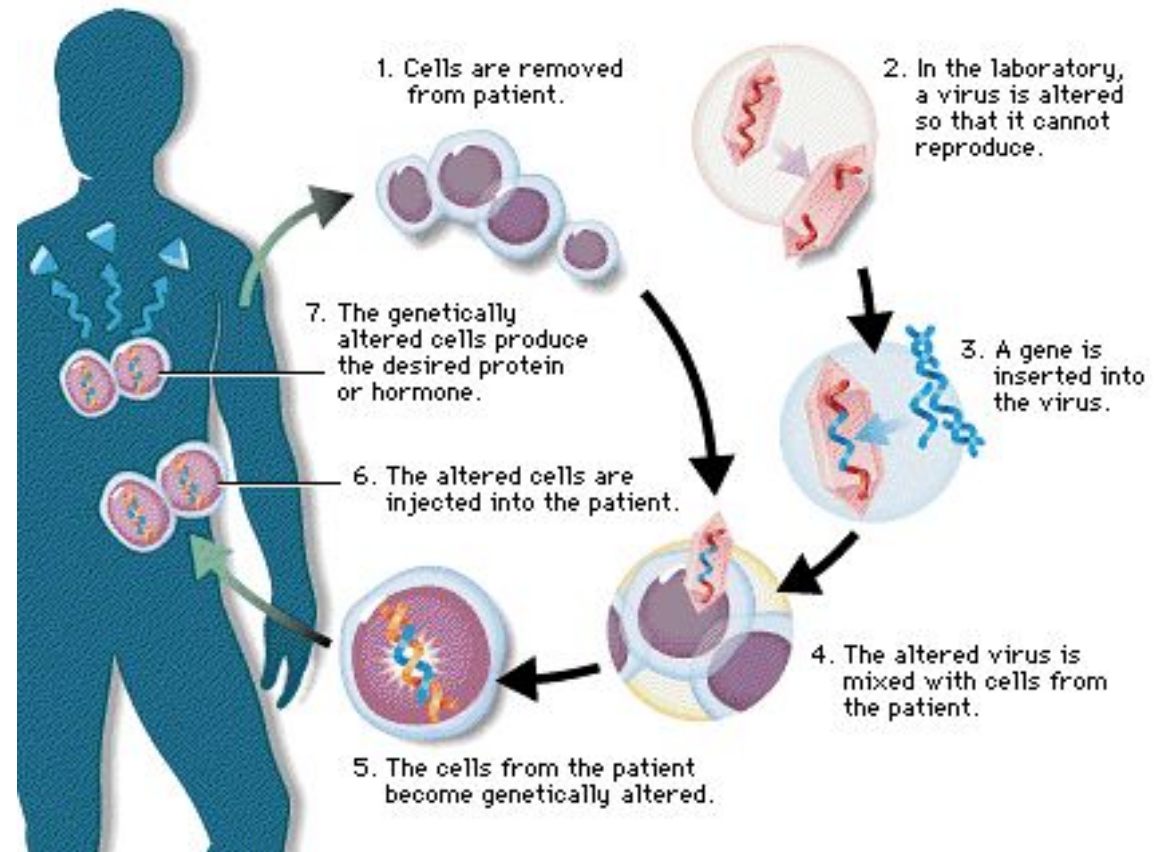


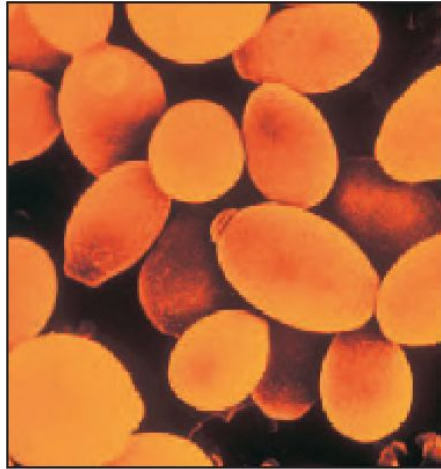
Table 1.1 Some Industrial Uses of Microbes

Product or Process	Contribution of Microorganism
Foods and Beverages	
Cheese	Flavoring and ripening produced by bacteria and fungi; flavors dependent on the source of milk and the type of microorganism
Alcoholic beverages	Alcohol produced by bacteria or yeast by fermentation of sugars in fruit juice or grain
Soy sauce	Produced by fungal fermentation of soybeans
Vinegar	Produced by bacterial fermentation of sugar
Yogurt	Produced by bacteria growing in skim milk
Sour cream	Produced by bacteria growing in cream
Artificial sweetener	Amino acids synthesized by bacteria from sugar
Bread	Rising of dough produced by action of yeast; sourdough results from bacteria-produced acids

Table 1.1 Some Industrial Uses of Microbes

Product or Process	Contribution of Microorganism
Other Products	
Antibiotics	Produced by bacteria and fungi
Human growth hormone, human insulin	Produced by genetically engineered bacteria
Laundry enzymes	Isolated from bacteria
Vitamins	Isolated from bacteria
Diatomaceous earth (used in polishes and buffing compounds)	Composed of cell walls of microscopic algae
Pest control chemicals	Insect pests killed or inhibited by bacterial pathogens
Drain opener	Protein-digesting and fat-digesting enzymes produced by bacteria

Thank You



Yeast



Euplotes



Humans



Orchid