Chapter 1 Biology 103

Properties of Life

Living organisms:

- are composed of cells
- are complex and ordered
- respond to their environment
- can grow and reproduce
- obtain and use energy
- maintain internal balance
- allow for evolutionary adaptation

Characteristics of Living Things.

- **1. Cellular Organization or Made up of cells**. One cell (unicellular) or many cells (Multicellular)
- **2. Ordered Complexity**. All living things are both complex and Highly ordered.
- **3. Grow and Develop Reproduce**: Make new cells or new offspring.
- **A. Asexual Reproduction.** Cells divide to form new cells.
- **B. Sexual Reproduction:** New Organisms reproduce from two parent organisms.
- *Both animals and some plants reproduce this way.

Characteristics of Living Things.

- **4. Energy utilization or Obtain and use energy**. To give off heat, move and allow cells to grow and develop
- **5. Sensitivity to stimuli or Respond to their environment.** To allow the organism to move and interact with other organism in their environment.
- Could be flight, attack, talk or any other gestures.

Characteristics of Living Things.

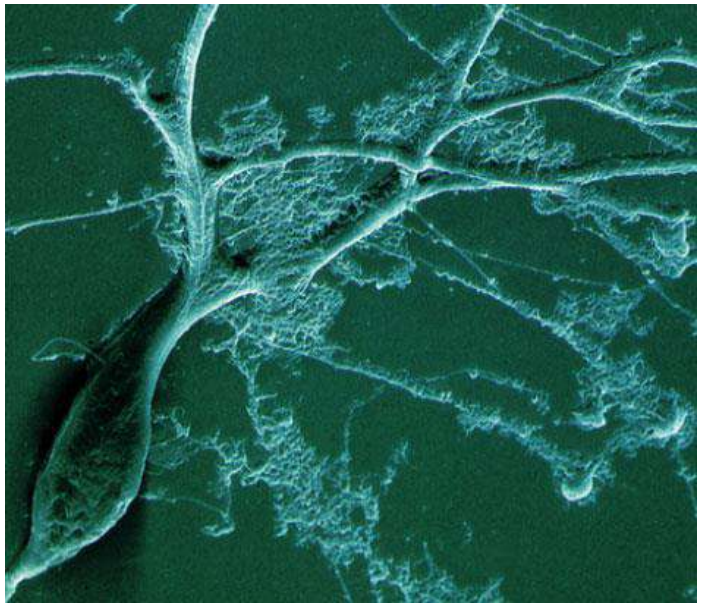
- **6. Homeostasis**: All organisms maintain constant internal conditions that are different from their environment.
- **7. Evolutionary adaptation**: All organisms interact with biotic and abiotic factors. These factors influence their survival, and adaptations.

Levels of Organization

Cellular Organization

atoms → molecules → organelles → cells

The **cell** is the basic unit of life.



- **Biology** is the study of life.
- **Bio:** means life.
- **logy:** means the study of

- **II. Branches of Biology**

- **A. Multicellular Biology**

- **1. Zoology**: Study of animals.
- **2. Botany** : The study of plants.
- **3. Paleontology**: Study of Ancient and Extinct species.

B. Molecular Biology: Studies the Chemical units of life.

Effects of pollution or drugs on cells.

Genetics and how DNA works.

C. Cell Biologists: Study Cells. How they communicate with other cells.

How cancer cells respond to treatment.

D. Ecologists:
Study how organisms interact with their surroundings and with other organisms.

Microscopes:Compound or Simple light, Electron, & Probe.

Compound Light Microscope:

Is the most commonly used microscope.

How to Use:

1. Need a Slide and a coverslip.

2. Use **Low power Objective** first. Focus in with Course Adjustment.

3. Turn to **Higher Power Objective** Use Fine Adjustment to focus in object.

Resolution and power:
Resolution: Is the limit that the microscope magnifies an object.
Limit of Resolution is about 0.2 Micrometers

Electron Microscope:
Use to study very tiny objects. (Viruses and individual atoms.)

These work on electromagnets
They send a beam of electrons out in lines to bend light waves.

T.V. works on the same principle.

Limit of resolution is abot 1000x finer than the light microscope.

Levels of Organization

Each level of organization builds on the level below it but often demonstrates new features.

Emergent properties: new properties present at one level that are not seen in the previous level

The Nature of Science

Science aims to understand the natural world through observation and reasoning.

Fundamental and Applied Research

Science begins with observations, therefore, much of science is purely descriptive.

Science uses both deductive and inductive reasoning.

The Nature of Science

Deductive reasoning uses general principles to make specific predictions.

Inductive reasoning uses specific observations to develop general conclusions.

The Nature of Science

Scientists use a systematic approach to gain understanding of the natural world.

-Observation
-Hypothesis formation
-Prediction
-Experimentation
-Conclusion

The Nature of Science

A **hypothesis** is a possible explanation for an observation.

A hypothesis

-must be tested to determine its validity

-is often tested in many different ways

-allows for predictions to be made

The Nature of Science

The **experiment**

-tests the hypothesis

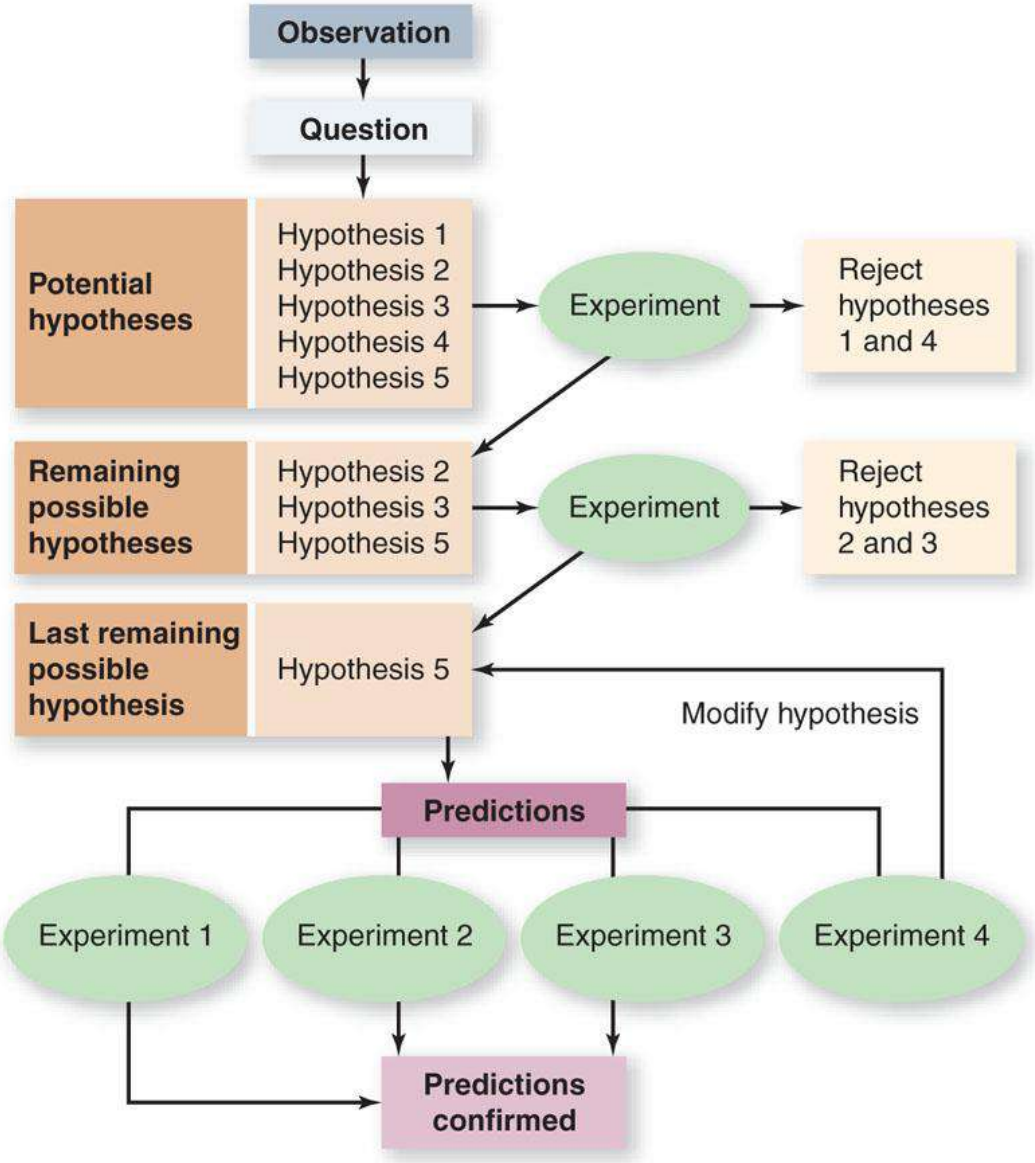
-must be carefully designed to test only one **variable** at a time

-consists of a **test experiment** and a **control experiment**

The Nature of Science

If the hypothesis is valid, the scientist can predict the result of the experiment.

Conducting the experiment to determine if it yields the predicted result is one way to test the validity of the experiment.



The Nature of Science

A Scientific **Theory**

-is a body of interconnected concepts

-is supported by much experimental evidence and scientific reasoning

-expresses ideas of which we are most certain and known to be true at this time.

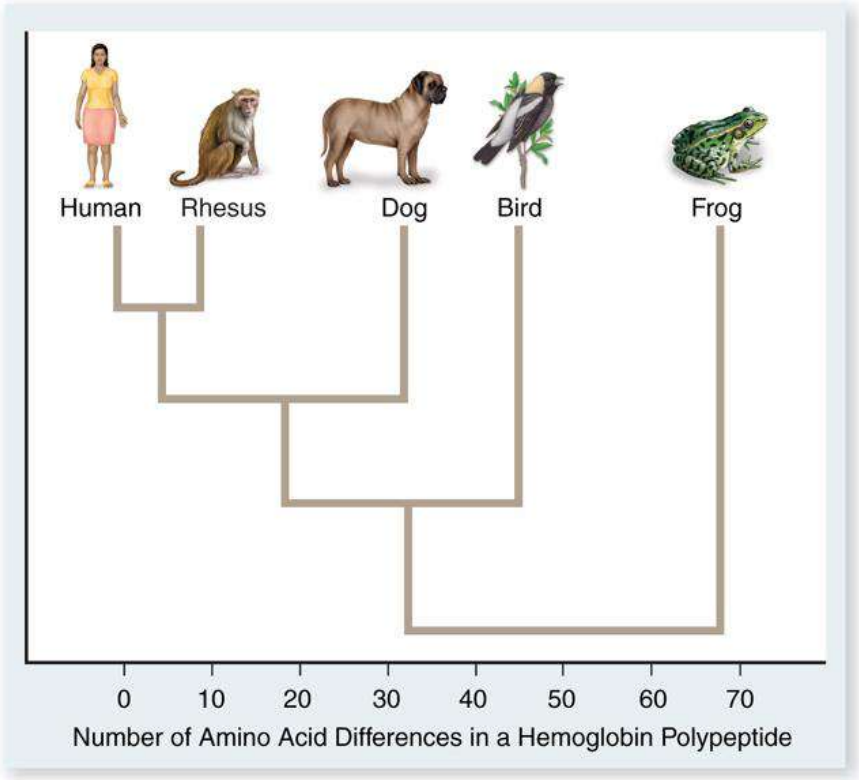
The Nature of Science

- Theories are not laws because they can have small variations as new advancements in measurements are made.
- However the Major Concepts and Ideas will remain intact.

Post-Darwin Evolution Evidence

Molecular Evidence

- Our increased understanding of DNA and protein structures has led to the development of more accurate **phylogenetic trees**.



Unifying Themes in Biology

Cell theory

- All living organisms are made of cells, and all living cells come from preexisting cells.

Molecular basis of inheritance

- DNA encodes genes which control living organisms and are passed from one generation to the next.

Unifying Themes in Biology

Structure and Function

-The proper function of a molecule is dependent on its structure.

-The structure of a molecule can often tell us about its function.

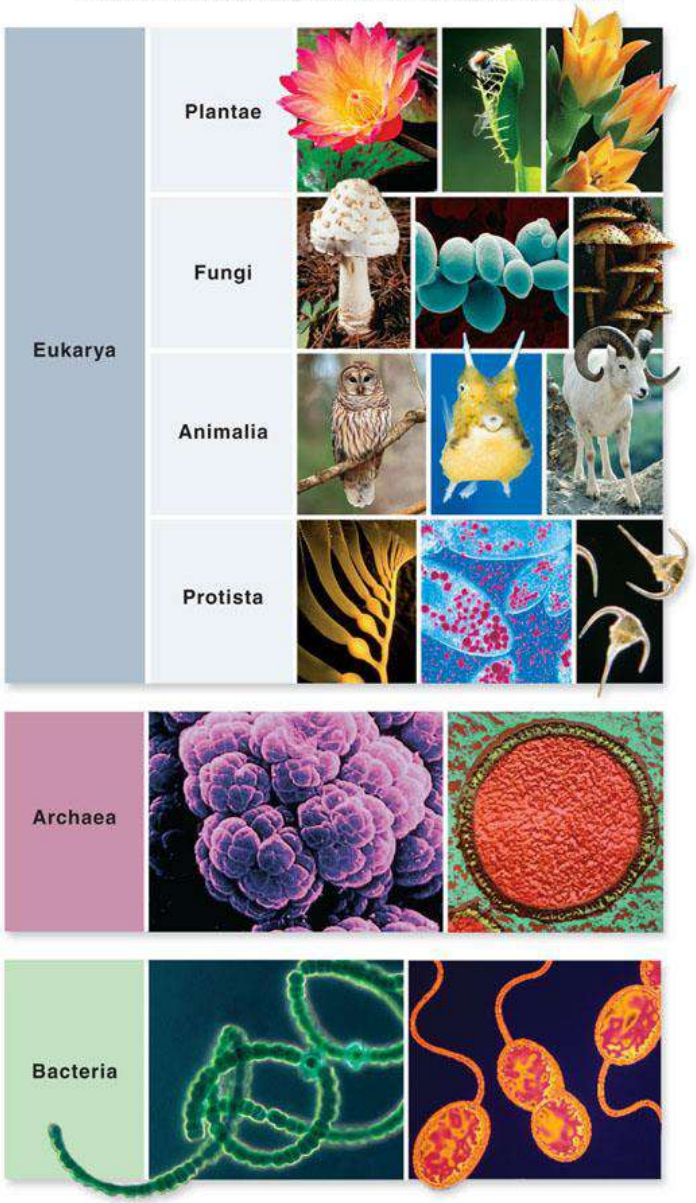
Unifying Themes in Biology

Evolutionary change

- Living organisms have evolved from the same origin event. The diversity of life is the result of evolutionary change.

Evolutionary conservation

- Critical characteristics of early organisms are preserved and passed on to future generations.



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Unifying Themes in Biology

Cells - information processing systems

- Cells process information stored in DNA as well as information received from the environment.

Emergent properties

- New properties are present at one level of organization that are not seen in the previous level.