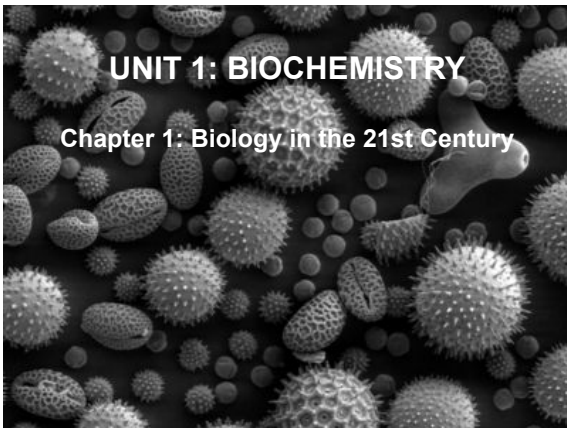
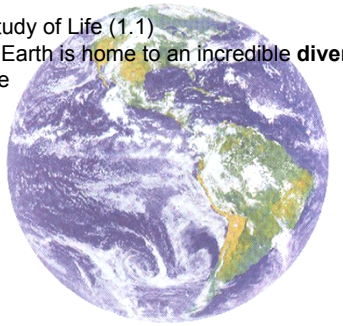


UNIT 1: INTRODUCING BIOLOGY

Chapter 1: Biology in the 21st Century

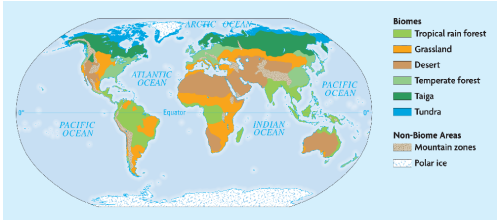
I. The Study of Life (1.1)

A. Earth is home to an incredible **diversity** of life



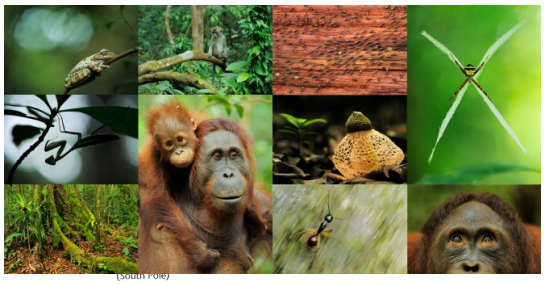
1. The **biosphere** includes all living things and all the places they are found.
2. Every part of the biosphere is connected with every other part.
3. The biosphere includes many **environments**

a. Land environments



b. Saltwater and freshwater environments
c. Portions of the atmosphere

4. **Biodiversity** is the **variety of life**



5. A **species** is one particular type of living thing.

a. Members of a species can **interbreed** and produce **fertile** offspring.

b. Estimated to be about 8.7 million different living species.

(with 6.5 million species on land and 2.2 million in oceans)

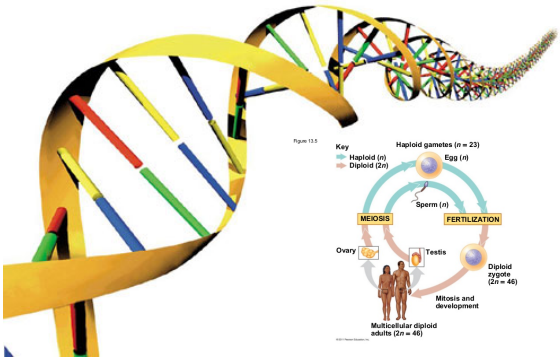
B. All organisms <u>share</u> certain **characteristics**

1. **Biology** is the scientific study of all forms of life.

2. An **organism** is any individual living thing.

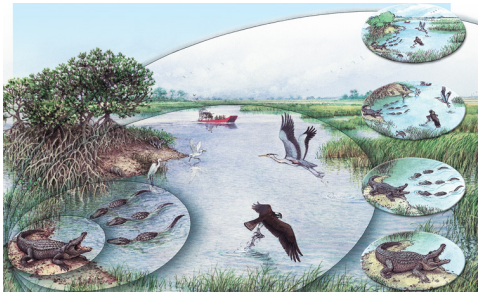
a. All are made of **one or more cells**
b. All need **energy** for **metabolism**
c. All **respond** to their **environment**

d. All have **DNA** that they pass on to offspring.



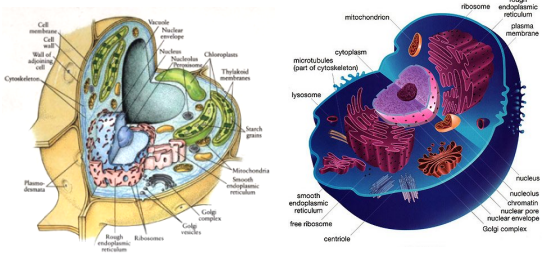
II. Unifying Themes of Biology (1.2)

A. All levels of life have **systems** of related parts

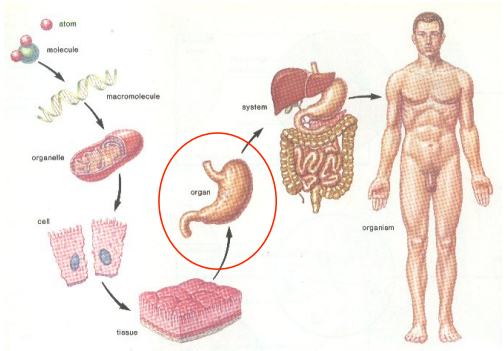


1. A **system** is an <u>organized group of interacting parts</u>.

a. A **cell** is a **system** of **chemicals** and **processes**.

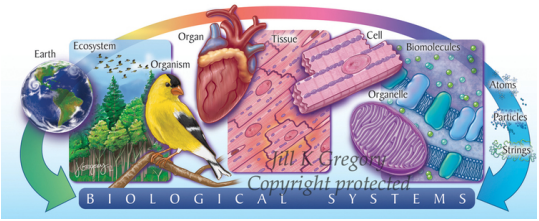


b. A **body system** includes **organs** that interact



c. An **ecosystem** includes **living** and **nonliving** things that interact.

2. Biologists study many different **systems**

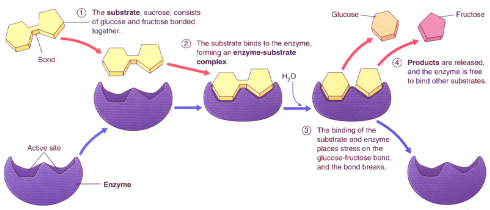


http://www.jillkgregory.com/#/new-gallery-17/

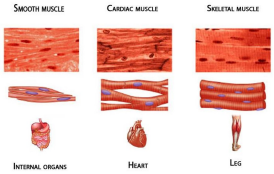
B. **Structure** and **function** are related in biology

1. **Structure** determines **function**

a. **Proteins** with different structures perform different functions.



b. Heart muscle cells have a different structure and function than stomach muscle cells.

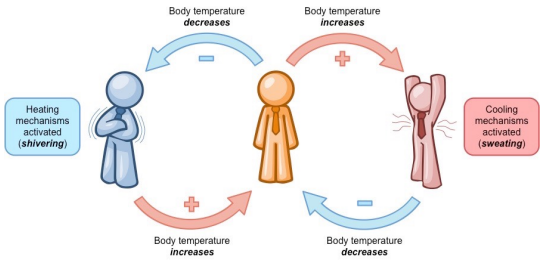


c. Different species have different anatomical structures with different functions.

C. Organisms must maintain **homeostasis** to survive in diverse environments.

1. **Homeostasis** is the <u>maintenance</u> of **constant internal conditions.**

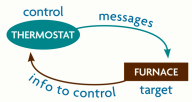
a. **Homeostasis** is usually <u>maintained</u> through **negative feedback**
b. **Negative feedback** systems **return** a condition to its **normal** (set) point.



2. **Behaviors** and **adaptations** can help maintain homeostasis.

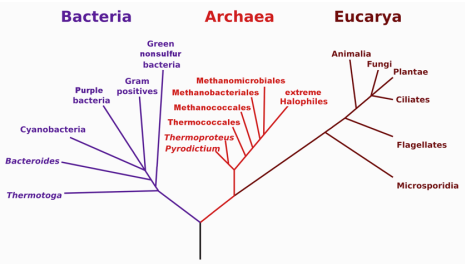
VISUAL VOCAB

Thermoregulation maintains a stable body temperature under a variety of conditions, just as a thermostat regulates a furnace. Both mechanisms use feedback to keep temperatures within set ranges.



D. **Evolution** explains the unity and diversity of life

1. **Evolution** is the change in living things over time.



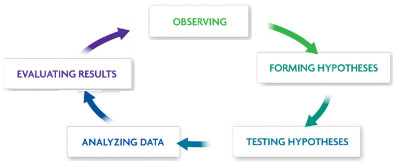
a. The **genetic makeup** of a population of a species changes
b. **Evolution** can occur through **natural selection** of **adaptations**.

c. **Adaptations** are <u>beneficial</u> <u>inherited</u> <u>traits</u> that are passed to future generations.

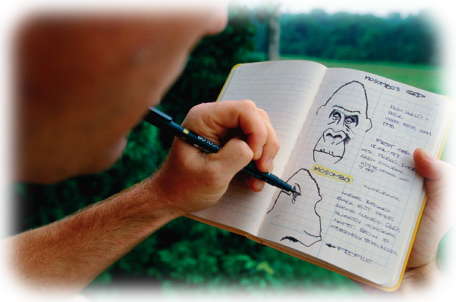
2. Evolution accounts for both the **diversity** and **unity** of life.

III. Scientific Thinking and Processes (1.3)

A. Like all science, biology is a **process of inquiry**



1. Scientists make careful and systematic **observations**.

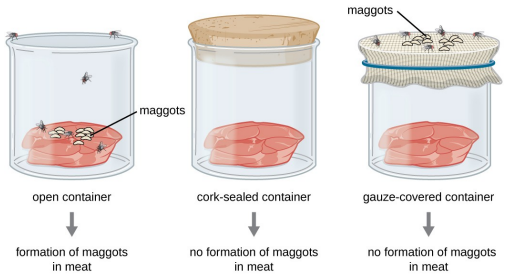


2. Scientists record observations as **data**

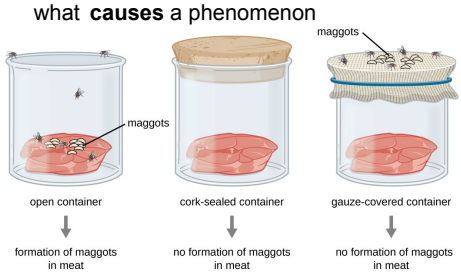
3. Scientists form a **hypothesis** as a possible answer to a question

4. Scientists test their hypotheses and analyze their data.

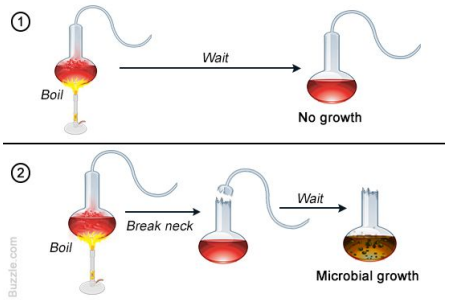
Francesco Redi (1600's)- *designed one of the first controlled experiments. Redi designed experiment to determine what caused appearance of maggots on meat*



B. Biologists use **experiments** to test hypotheses
1. Observational studies allow scientists to describe a phenomenon
2. **Experiments** allow scientists to determine what **causes** a phenomenon



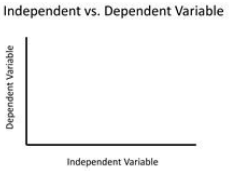
Pasteur's *experiment showed that boiled broth would remain free of microorganisms even if air was allowed in, as long as dust and other particles were kept out*



a. **Independent variables** are manipulated

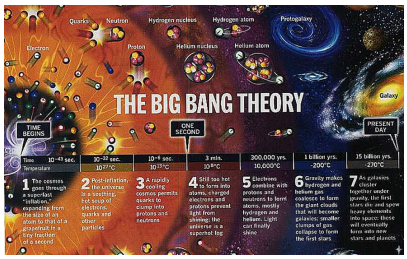
b. **Dependent variables** are observed and measured.

c. **Constants (controlled variables)** are conditions that are kept the same

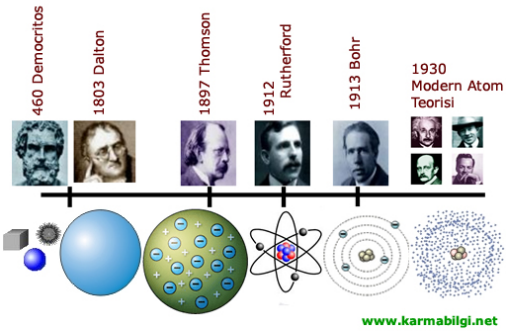


C. A **theory** explains a wide range of observations

1. Theories explain a wide range of observations and experimental results.
2. A **theory** is <u>supported</u> by a wide range of scientific **evidence**.



3. **Theories** <u>can change</u> based on evidence

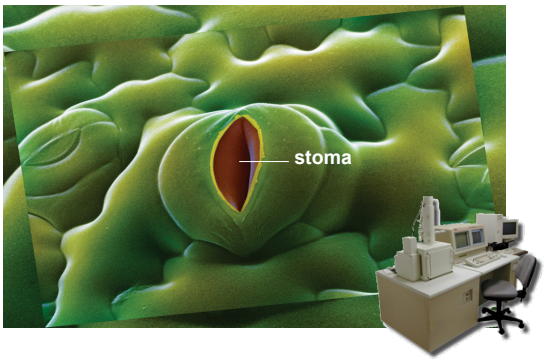


IV. Imaging technologies provide new views of life (1.4)

A. A **microscope** provides enlarged image of an object.

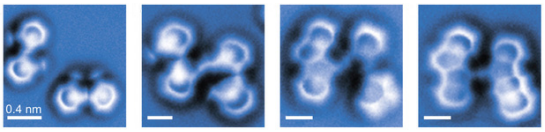
1. **Light microscope**

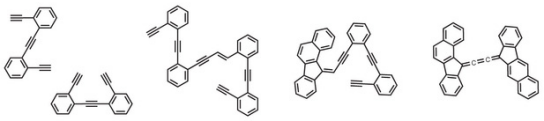
2. **Scanning electron microscopes** (SEM)



3. **Transmission electron microscope** (TEM)

4. **Atomic Force Microscope** (AFM)

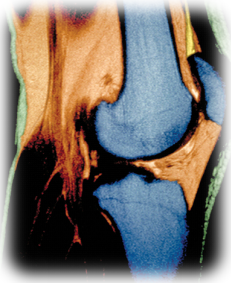


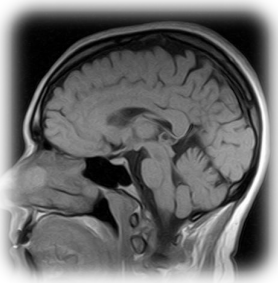


B. **Imaging technology** is used in **medicine**

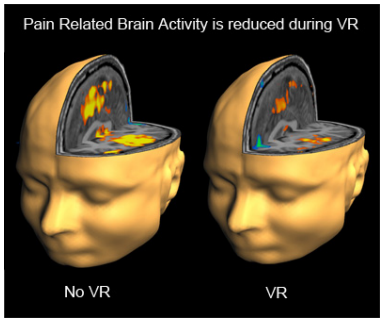
1. **X-ray images**

2. **Magnetic resonance imaging** (MR)





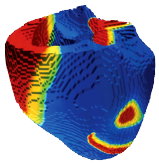
3. **Functional MRI** (fMRI)



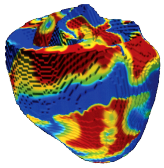
C. Complex systems are **modeled** on computers

1. Computer models are used to study systems that cannot be studied directly

a. Heart attacks

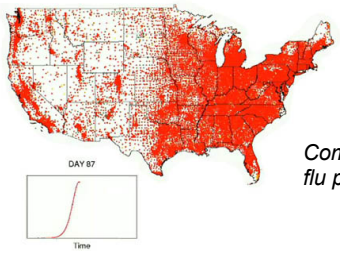


Normal heartbeat



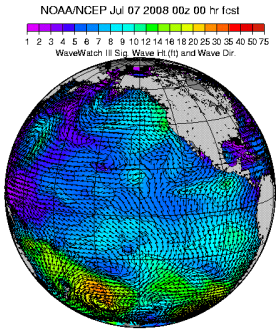
Heart attack

b. Effect of medicines on the human body
c. Movement of water molecules into and out of a cell
d. Spread of a diseases through a population



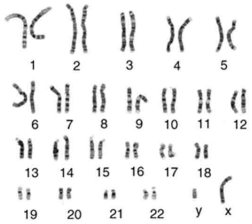
Computer model of flu pandemic

2. Computer models are used when experiments are not safe, ethical, or practical



D. The tools of **molecular genetics** give rise to new biological studies.

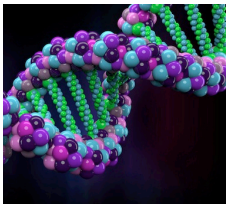
1. A **gene** is segment of **DNA** that stores genetic information

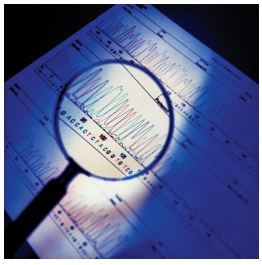


2. Through our understanding DNA, we can study genetics on a molecular level

a. Molecular genetics

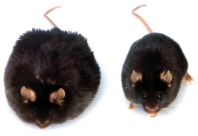
b. **Genomics**





V. Your health and the health of the environment depend on your knowledge of biology (1.5)

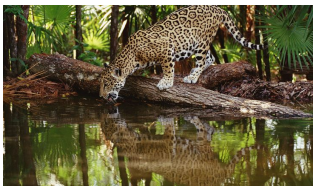
A. Knowledge of biology helps you understand your health

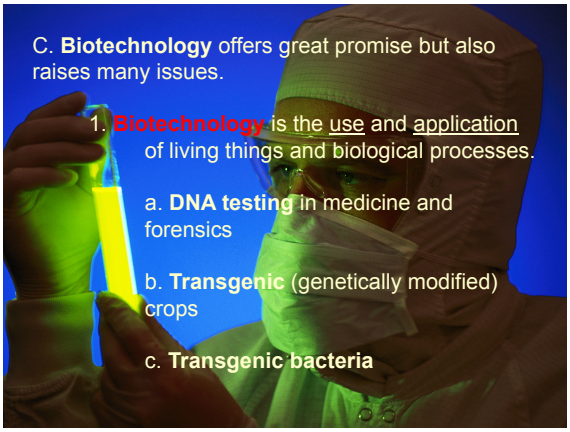


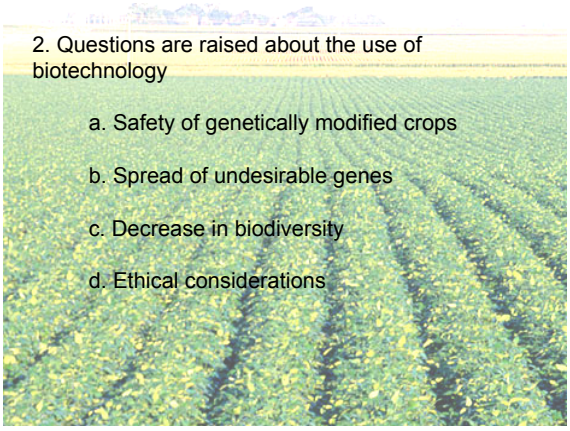
1. Food allergies
2. Potential effects of obesity
3. cancer
4. Effects of alcohol, tobacco, and other drugs.

B. Knowledge of biology can help you understand environmental issues.

1. Interactions in ecosystems
2. Pollution
3. Biodiversity



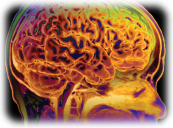




D. **Biology presents many unanswered questions**

1. Over the past 50 years, biological knowledge has greatly increased.

2. There are still many questions to answer in biology.



a. How are memories stored in the brain?
b. How do viruses mutate?

3. Advances in technology may help answer questions.