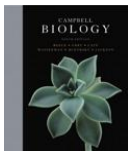


## Biology 6 Survival Kit

Prof. Sara Huang



## What Does Biology 7 Cover?

- Evolution
- Biodiversity
- Plant Structure and Function
- Animal structure and function
- Ecology

## Factors That Contribute to Your Success in Biology 7

- Motivation
  - Why are you here?
  - The will to succeed is important, but what is more important is the will to prepare."  
Basketball Coach Bobby Knight

## Factors That Contribute to Your Success in Biology 7

### Priority

- How much effort and time are you willing to invest in this class?
- Is this class on the top of your priority list?

If you don't have time to do it right, when will you have time to do it over?  
John Wooden

- The average study time after school:

22 hours for an A (6 hours per day)  
16 hours for a B (4 hours per day)  
14 hours for a C (3.5 hours per day)  
10 hours for a D (2.5 hours per day)  
0 hours for an F (0 hours per day)

<http://tep.uoregon.edu/resources/faqs/outsidehelp/study.html>



## Factors That Contribute to Your Success in Biology 7

### •Time Management

- Be efficient
  - Make the best out of the class time
- Review frequently to enforce memory



### Factors That Contribute to Your Success in Biology 7

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- Study methods
  - Know your learning style
  - Improve your study skills
  - Polish your test taking skills

### What does “learn” mean?

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- Learn = Make neurological connections and be able to
  - Retain and Recite
  - Explain
  - Apply

### How to Retain Information?

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- Before class
  - Plan your day the night before
  - Put all class materials in a ring binder
  - Have extra note paper
  - Have at least two different color pens
  - Read the chapters the night before

### How to Retain Information?

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- During class
  - Attend classes on time
  - PARTICIIPATE actively by
    - Being an active listener
    - Highlighting or underlining the important points
    - Asking questions
  - Taking notes

### How to Retain Information?

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- After class
  - Daily review
  - Complete chapter study questions posted by your instructor
  - Write your own notes
  - Make flash cards
  - Make table and flow charts to organize the concepts

### Prepare for Tests

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- Take practice quizzes at the end of chapter and online
- Analyze your answer
  - Why this is the right answer?
  - Why you miss the answer?
  - Why the rest answers are wrong?
- Use the: “Quick Test and Exercises” section in your textbook”

### Prepare for Test

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- Form a study group and quiz each other
- Write your own exam questions
- Use Mastering Biology

### Useful Links To Improve Learning

- Study Skill
  - <http://www.ucc.vt.edu/stdysk/stdyhlp.html>
- Time management
  - <http://ub-counseling.buffalo.edu/studytime.shtml>
- How to take exam?
  - <http://ccc.byu.edu/learning/strategy.php#mc>

### Investments

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- Text Book : \$ 180
- Supplies: \$20
- Tuition: \$180
- Study time: 10 hour/week

### Return

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- Life time achievement
- Better paid jobs
- A person with a bachelor degree earns more than 1 million dollars than a person with a high school degree

**If you care at all, you'll get some results. If you care enough, you'll get incredible results.**  
**Jim Rohn**

## WELCOME TO BIOLOGY 7



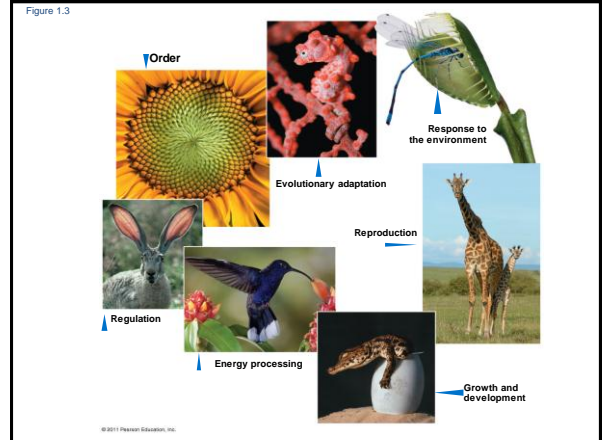
## Chapter 1

### Introduction: Themes in the Study of Life



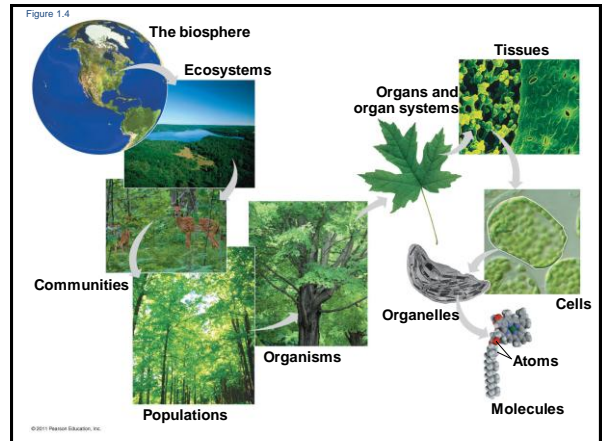
## What is Biology?

- Biology
  - Is the scientific study of life



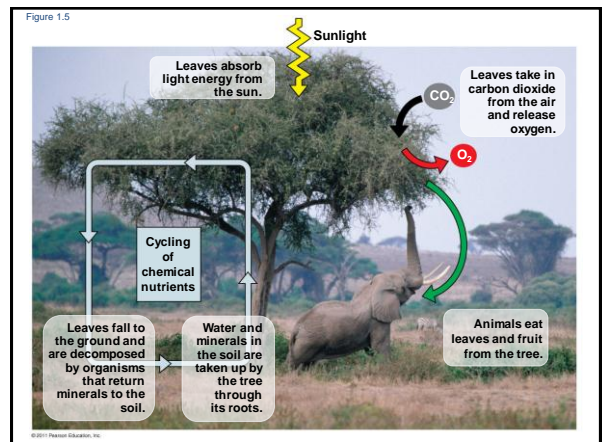
## Order: A Hierarchy of Biological Organization

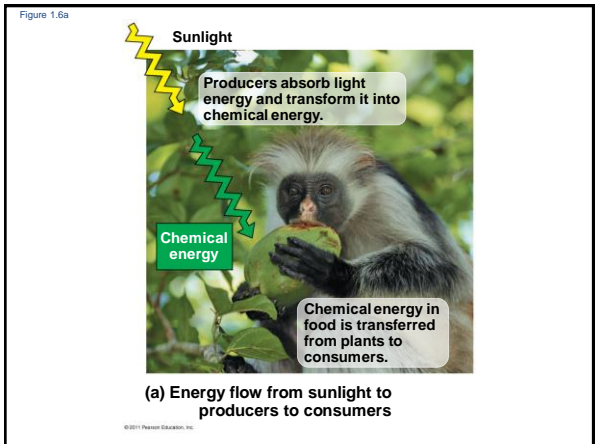
- The hierarchy of life
  - Extends through many levels of biological organization (from large to small)
    - Biosphere, ecosystem, community, population, organism, organ system and organ, tissue, cell, organelle, molecule



## Ecosystem Dynamics

- The dynamics of any ecosystem include two major processes
  - Cycling of nutrients, in which materials acquired by plants eventually return to the soil
  - The flow of energy from sunlight to producers to consumers



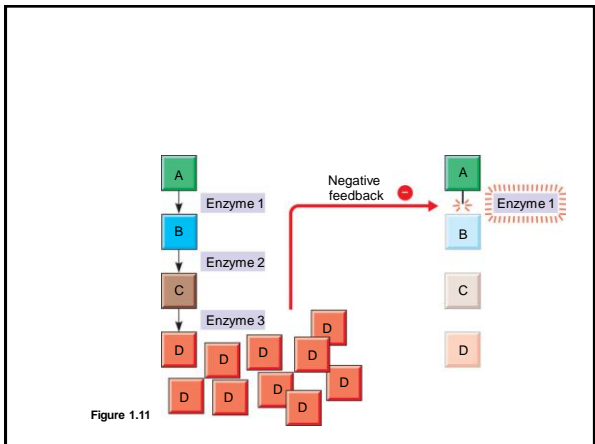
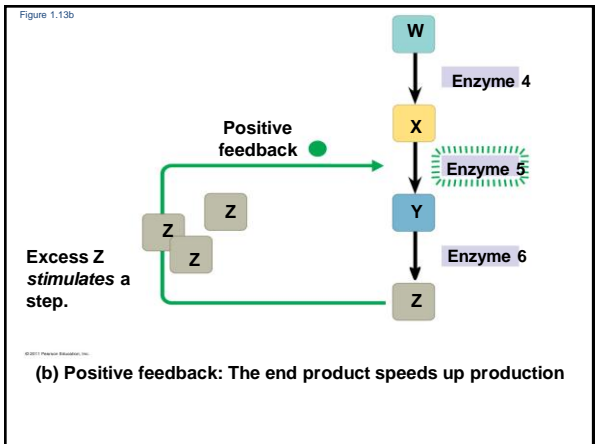
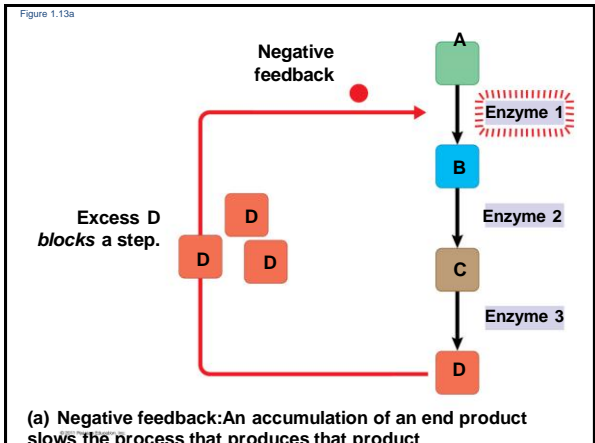


### The Emergent Properties of Systems

- Due to increasing complexity
  - New properties emerge with each step upward in the hierarchy of biological order

### Homeostasis and Feedback Regulation

- **Homeostasis** is process that maintains the internal environment relative constant.
- Feedback regulation
  - A kind of supply-and-demand economy
  - The output, or product, of a process regulates that very process



## Evolution Accounts for Life's Unity and Diversity

- Evolution
  - Is the change of genetic make up from one generation to another over time

## The Evolutionary View of Life

- Charles Darwin published *On the Origin of Species by Natural Selection* in 1859

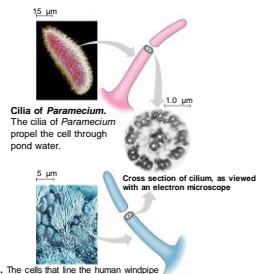
- Descent with modification
  - Contemporary species came from a succession of ancestors
- Natural selection
  - A process in which organisms with certain inherited characteristics have differentiated reproductive success than others.



Figure 1.18

## Unity in the Diversity of Life

- As diverse as life is, there is also evidence of remarkable unity



Cilia of *Paramecium*. The cilia of *Paramecium* propel the cell through pond water.

Cross section of cilium, as viewed with an electron microscope

Cilia of windpipe cells. The cells that line the human windpipe are equipped with cilia that help keep the lungs clean by moving a film of mucus-trapping mucus upward.

Figure 1.16

## The Tree of Life

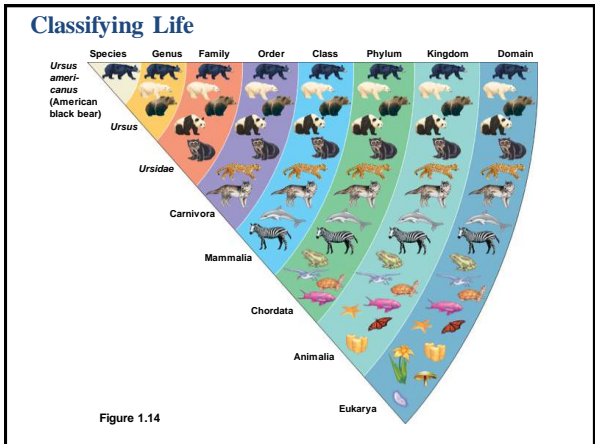
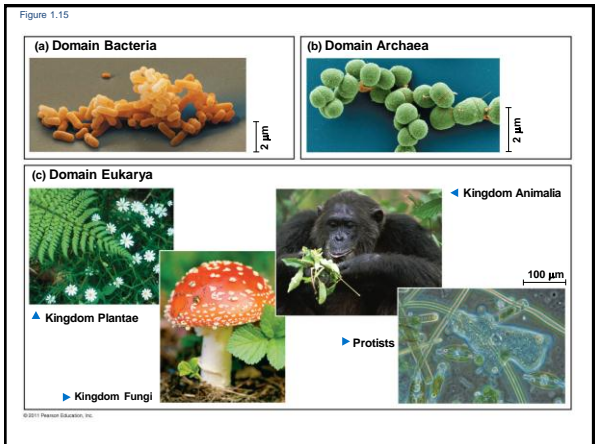
- Many related organisms
  - Have very similar anatomical features, adapted for their specific ways of life
- Such examples of kinship
  - Connect life's "unity in diversity" to Darwin's concept of "descent with modification"

## Grouping Species: The Basic Idea

- Taxonomy
  - Is the branch of biology that names and classifies species according to a system of broader and broader groups

## The Three Domains of Life

- Domain Bacteria and domain Archaea
  - Consist of prokaryotes
- Domain Eukarya, the eukaryotes
  - Includes the various protist kingdoms and the kingdoms Plantae, Fungi, and Animalia



### Inquiry to Explore Life

- Biology blends two main processes of scientific inquiry
  - Discovery science
  - Hypothesis-based science

### Discovery Science

- Describes natural structures and processes as accurately as possible through careful observation and analysis of data

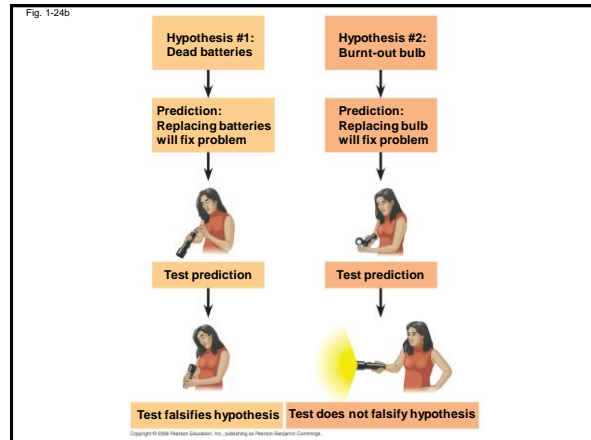
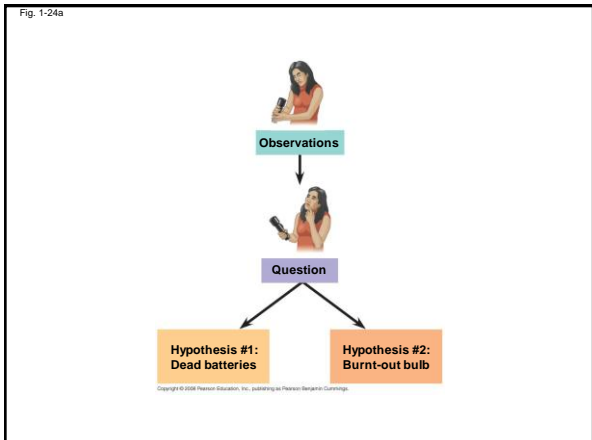
### Types of Data

- Data
  - Are recorded observations
  - Can be quantitative or qualitative

Figure 1.24

### Hypothesis-Based Science

- In science, inquiry that asks specific questions
  - Usually involves the proposing and testing of hypothetical explanations, or hypotheses
- In science, a hypothesis
  - Is a tentative answer to a well-framed question, an explanation on trial
  - Makes predictions that can be tested



*Deduction: The “If...then” Logic of Hypothesis-Based Science*

- In deductive reasoning
  - The logic flows from the general to the specific
- If a hypothesis is correct
  - Then we can expect a particular outcome

*A Closer Look at Hypotheses in Scientific Inquiry*

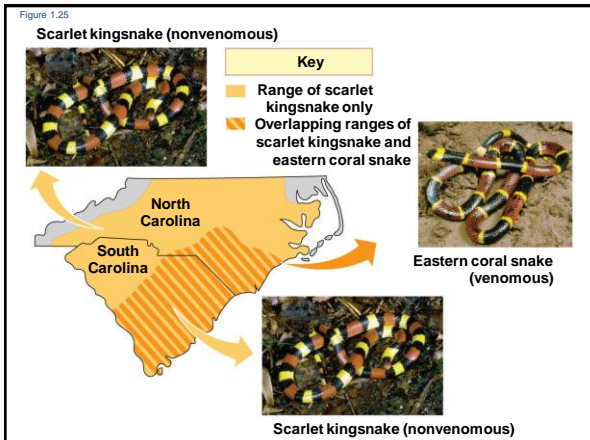
- A scientific hypothesis must have two important qualities
  - It must be testable
  - It must be falsifiable

**A Case Study in Scientific Inquiry: Investigating Mimicry in Snake Populations**

- Many poisonous species are brightly colored, which warns potential predators
- Mimics are harmless species that closely resemble poisonous species

**Hypothesis**

- Henry Bates hypothesized that this mimicry evolved in harmless species as an evolutionary adaptation that reduces their chances of being eaten
- If predators inherit an avoidance of the coral snake’s coloration, then the colorful kingsnake will be attacked less often in the regions where coral snakes are present

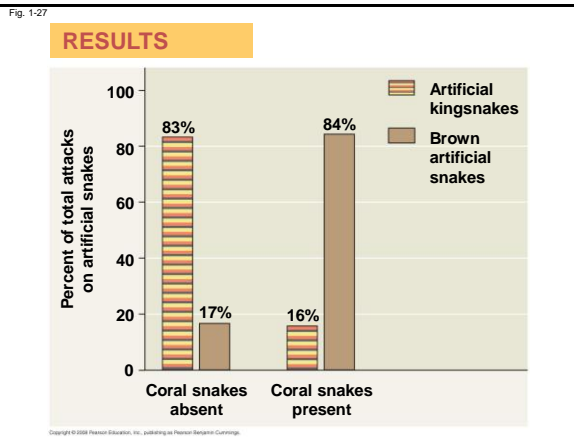


### Designing Controlled Experiments

- A **controlled experiment** compares an experimental group (the artificial kingsnakes) with a control group (the artificial brown snakes)
- Ideally, only the variable of interest (the color pattern of the artificial snakes) differs between the control and experimental groups
- A controlled experiment means that control groups are used to cancel the effects of unwanted variables
- A controlled experiment does *not* mean that all unwanted variables are kept constant

### Field Experiments with Artificial Snakes

- To test this mimicry hypothesis, researchers made hundreds of artificial snakes:
  - An experimental group resembling kingsnakes
  - A control group resembling plain brown snakes
- Equal numbers of both types were placed at field sites, including areas without poisonous coral snakes



- After four weeks, the scientists retrieved the artificial snakes and counted bite or claw marks
- The data support the predictions of the mimicry hypothesis: the ringed snakes were attacked less frequently in the geographic region where coral snakes were found

### Theories in Science

- A scientific theory
  - Is broad in scope
  - Generates new hypotheses
  - Is supported by a large body of evidence