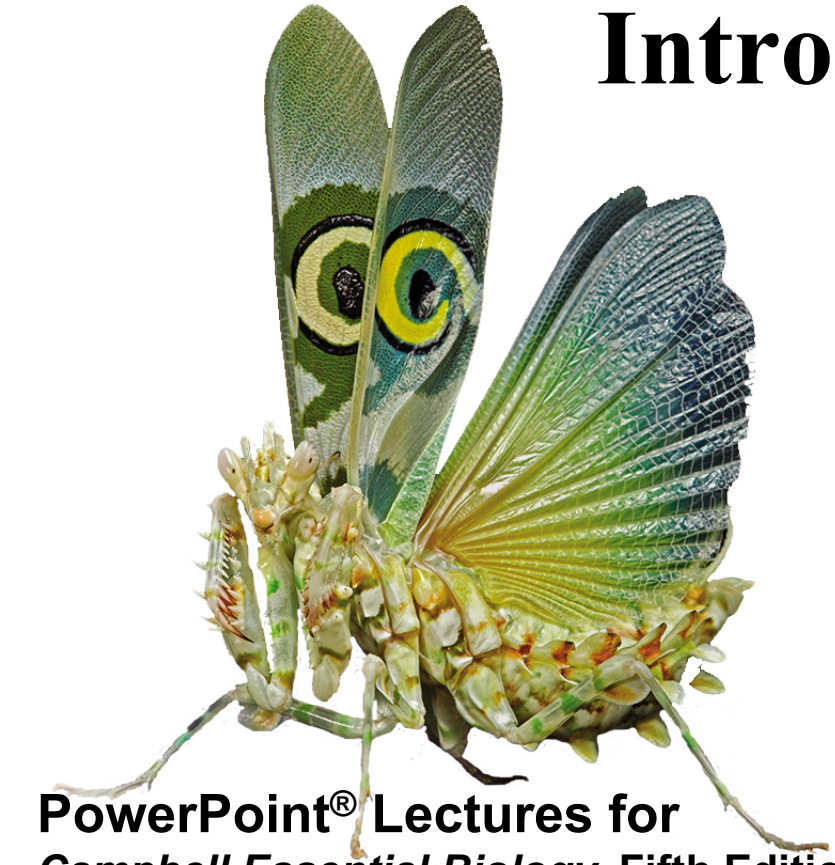
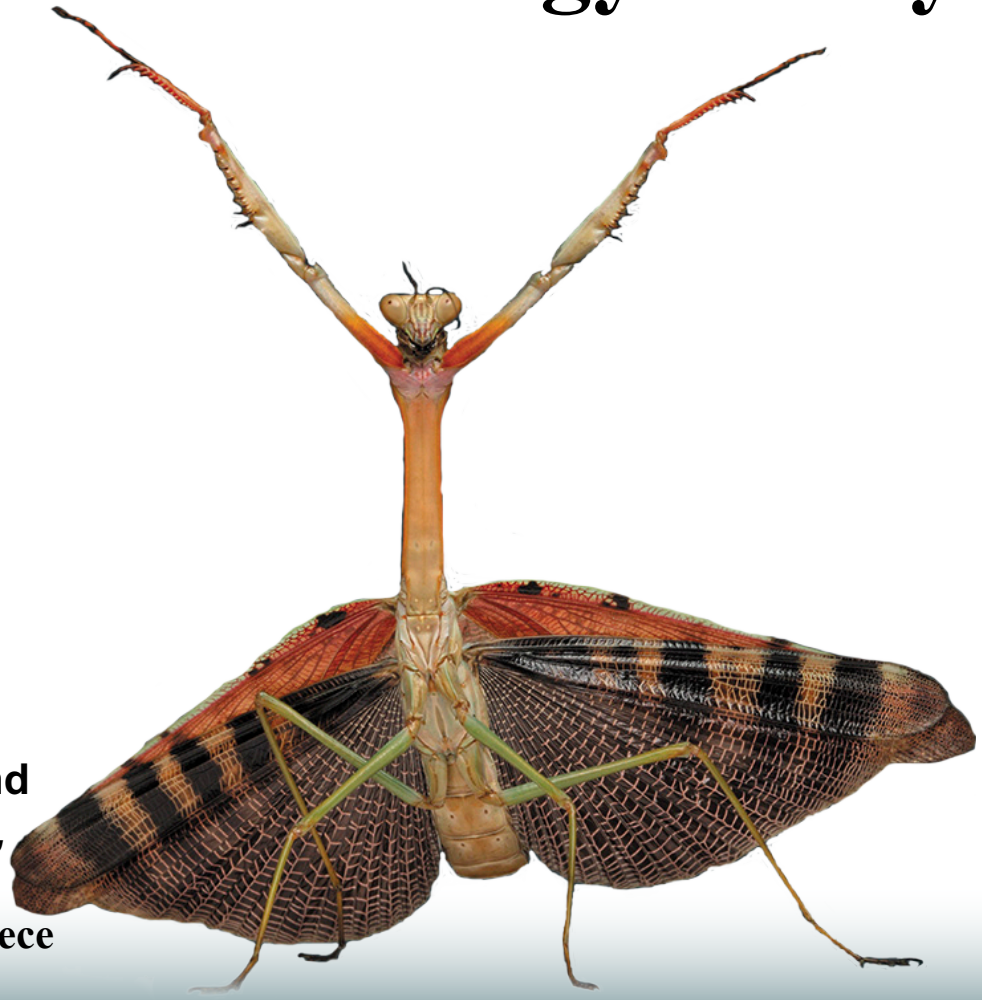
Chapter 1

Introduction: Biology Today





PowerPoint® Lectures for
***Campbell Essential Biology,* Fifth Edition, and**
***Campbell Essential Biology with Physiology,* Fourth Edition**
– Eric J. Simon, Jean L. Dickey, and Jane B. Reece

Lectures by Edward J. Zalisko

THE SCOPE OF LIFE

- **Biology** is
- Biology is everywhere!
- Organized

Figure 1.1a

Properties of Life

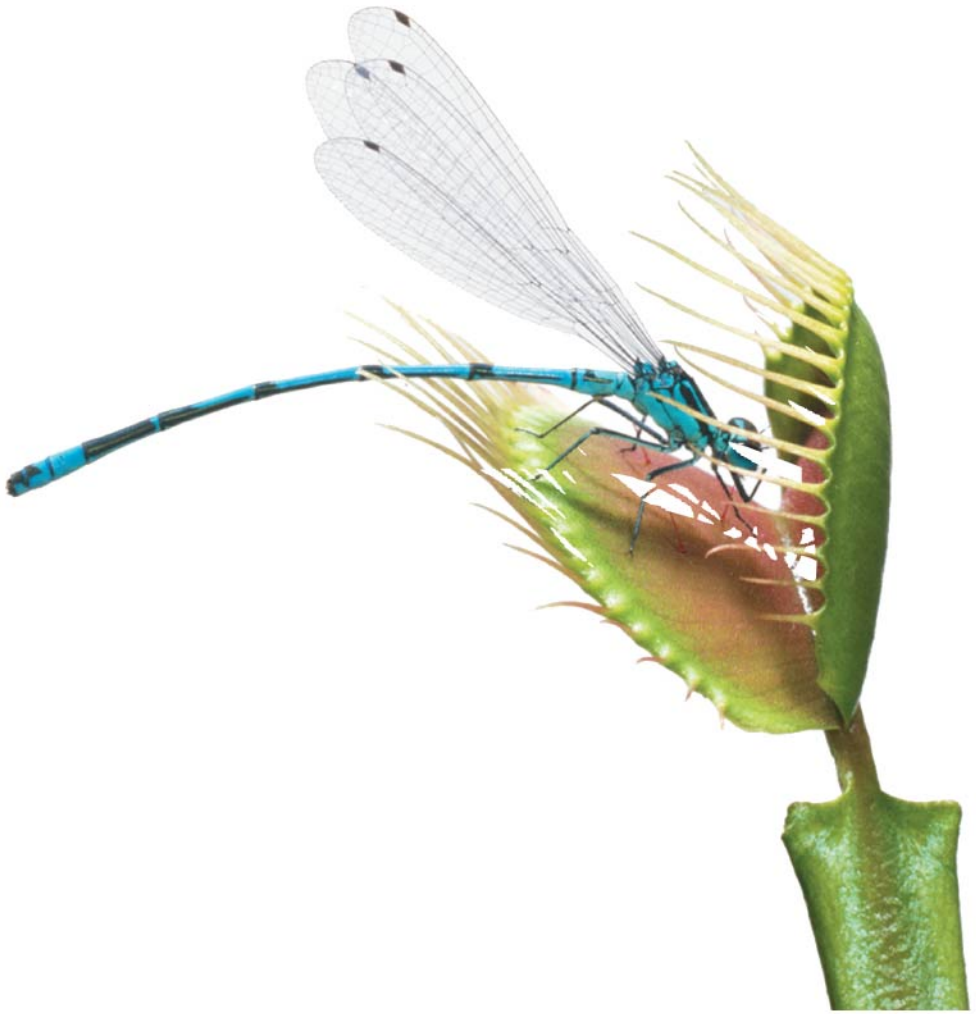
(a) Order

(b) Regulation

(c) Growth and development

(d) Energy processing

Figure 1.1b

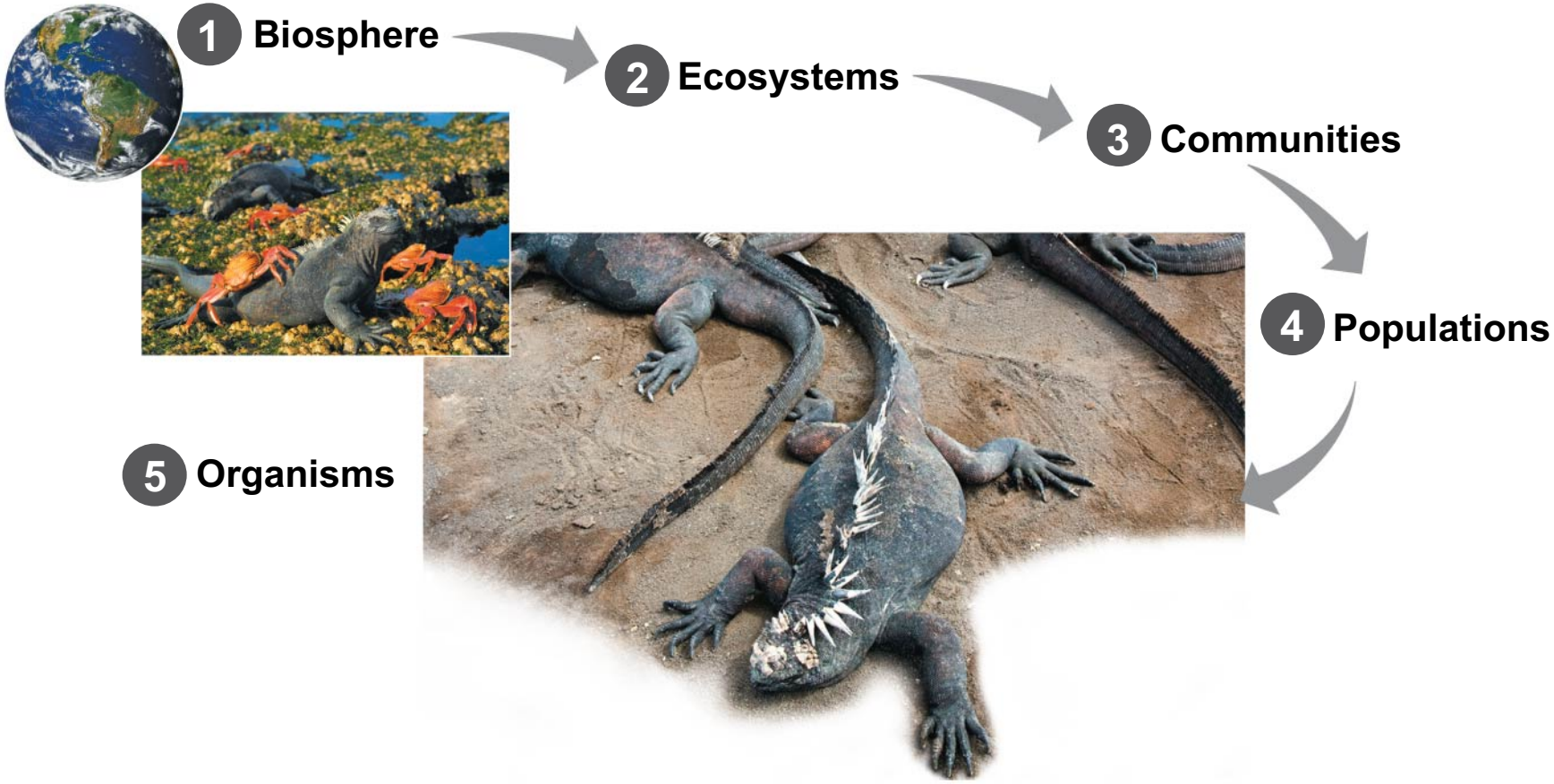


(e) Response to the environment

(f) Reproduction

(g) Evolution

Figure 1.2-1



Life at Its Many Levels (10 in all)

Figure 1.2-2

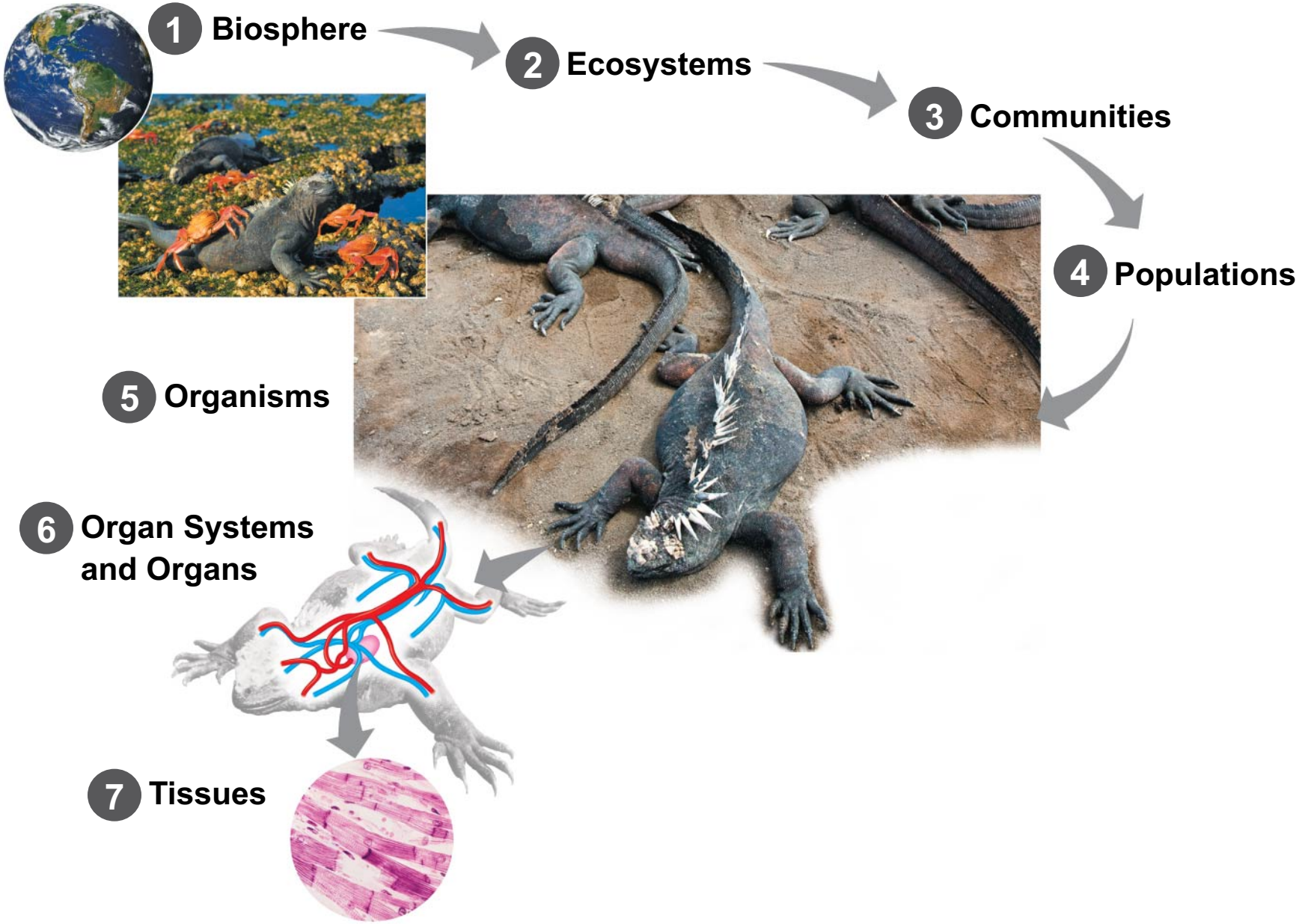


Figure 1.2-3

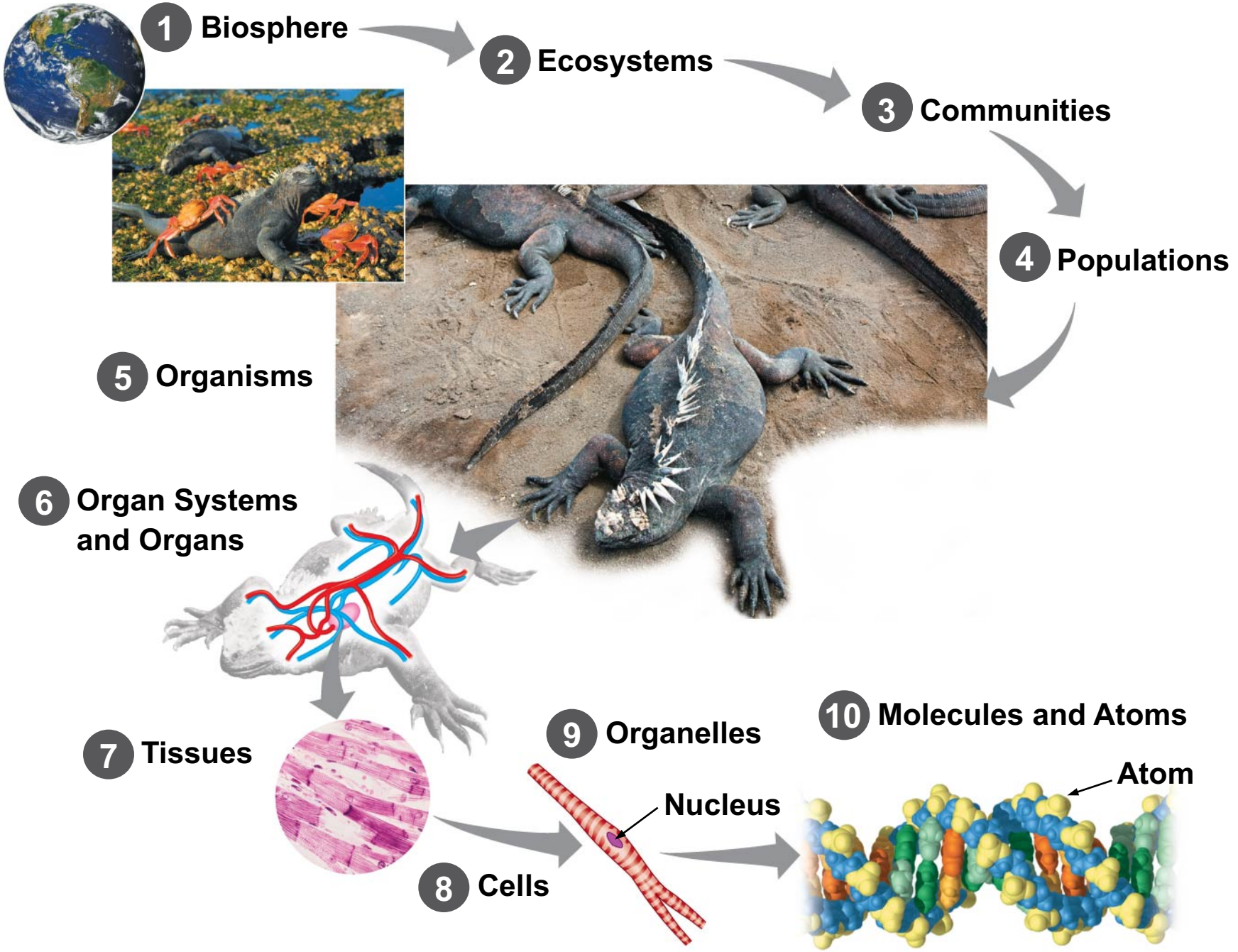
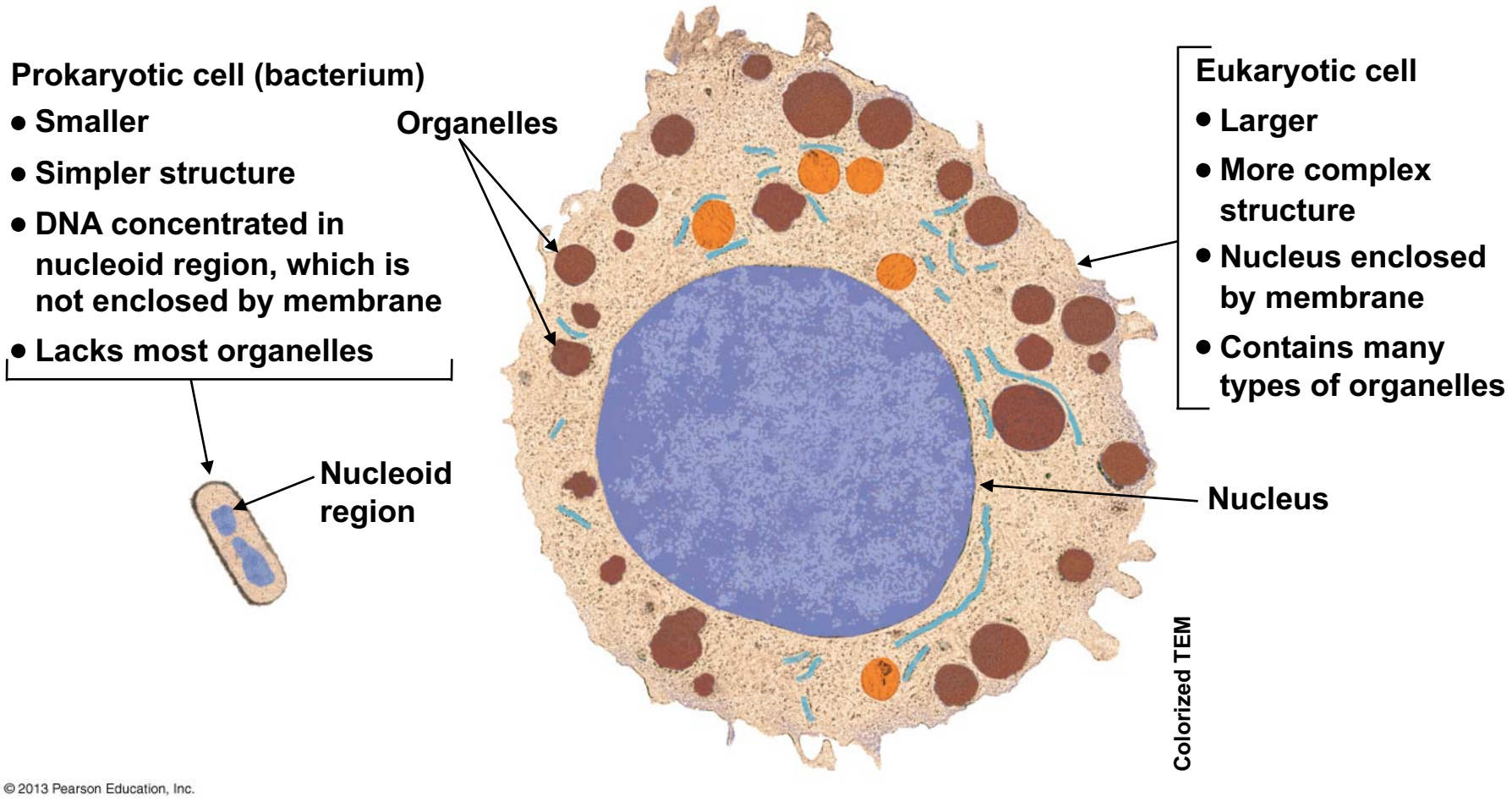


Figure 1.4

Two Categories of Cells:



Cell Types

Prokaryotes	Eukaryotes
1. Smaller	Larger
2. Simple in structure	Complex
3. DNA found in nucleoid region	DNA found in nucleus
4. Lacks most organelles	Have many organelles
5. Ex.- Bacteria and Archaea	Ex.- Plants, animals, fungi, and protista

Prokaryotic vs Eukaryotic Cells

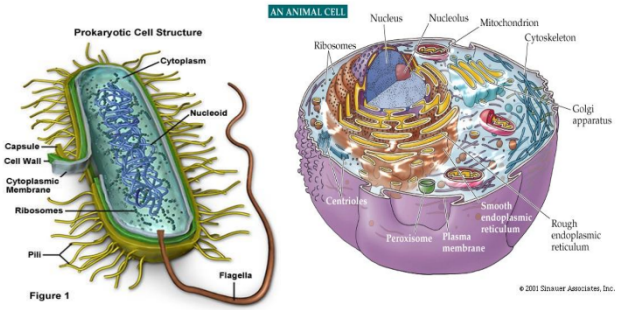
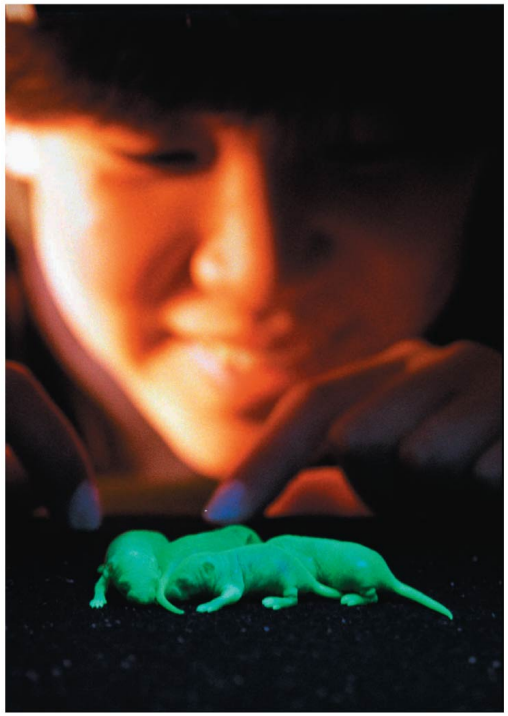
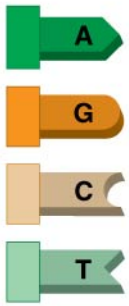


Figure 1.5

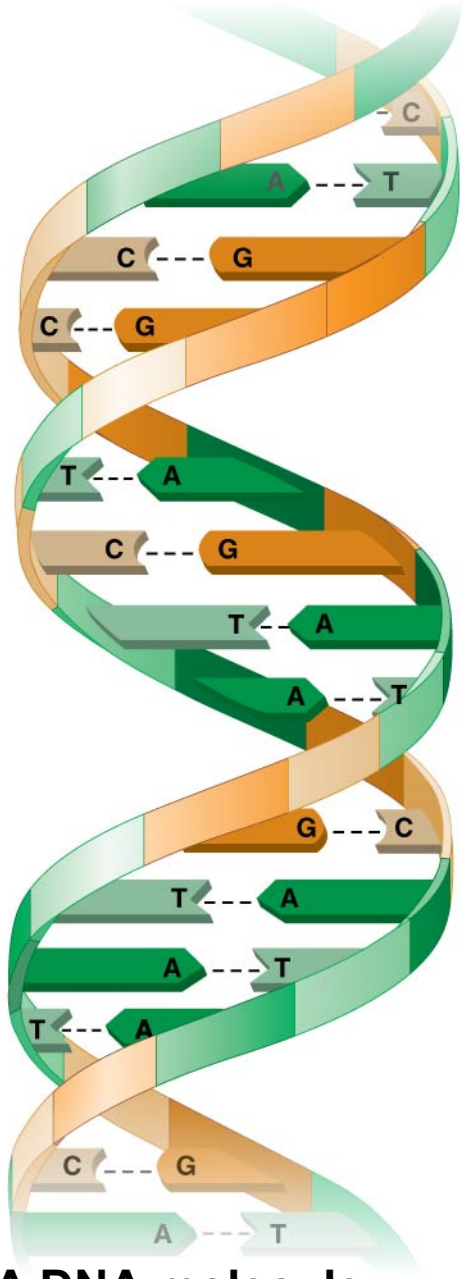
All cells have DNA

- Deoxyribose Nucleic Acid
- Genetic material responsible for heredity
- Genetic Engineering





The four chemical building blocks of DNA



A DNA molecule

Biodiversity

- Diversity is a hallmark of life.
  - The diversity of known life includes about 1.8 million species that biologists have identified and named.
  - Estimates of the total number of species range from 10 million to over 100 million.

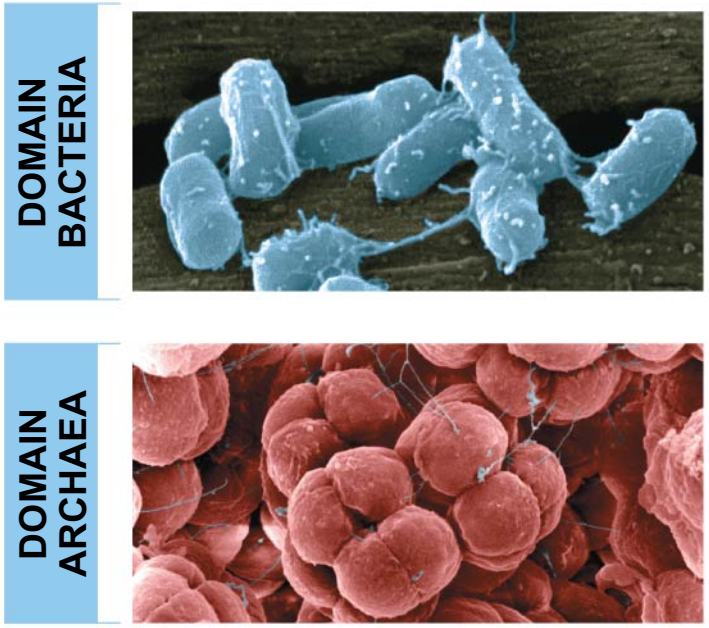
Taxonomy

- The branch of biology that names and classifies species.
  - It formalizes the hierarchical ordering of organisms into broader and broader groups.

The three domains of life are:

-Bacteria,
-Archaea
-Eukarya.

Figure 1.8



-Bacteria and Archaea have prokaryotic cells.

-Eukarya have eukaryotic cells.

THE PROCESS OF SCIENCE

- The word *science* is derived from a Latin verb meaning "to know."
  - **Science** is a way of knowing, based on inquiry.
  - Science developed from our curiosity about ourselves and the world around us.

Discovery Science

- Verifiable observations and measurements are the data of **discovery science**.
  - In biology, discovery science enables us to describe life at its many levels, from ecosystems down to cells and molecules.

Hypothesis-Driven Science

- **Scientific Method**
- Most modern scientific investigations can be described as **hypothesis-driven science.**
  - A **hypothesis** is a tentative answer to a question—an explanation on trial.

Figure 1.15-1

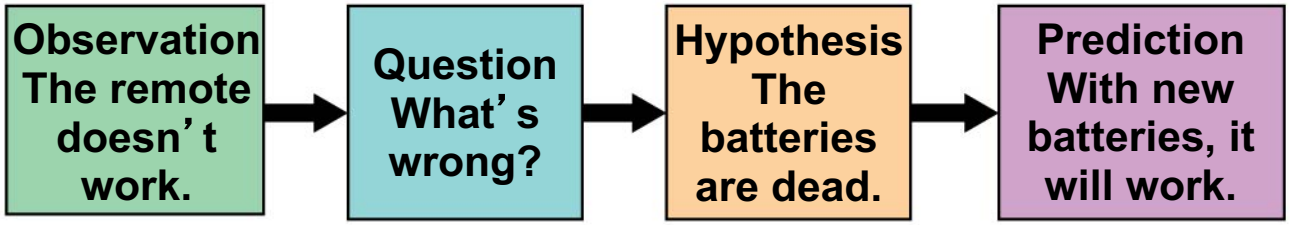


Figure 1.15-2

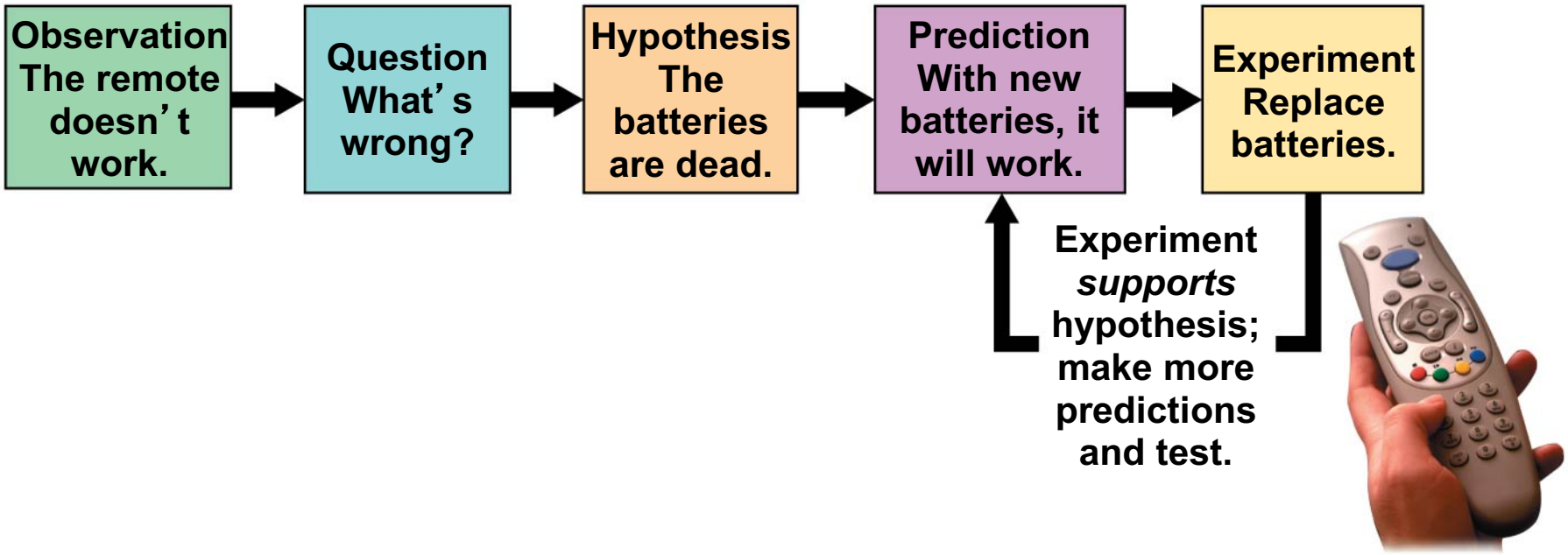
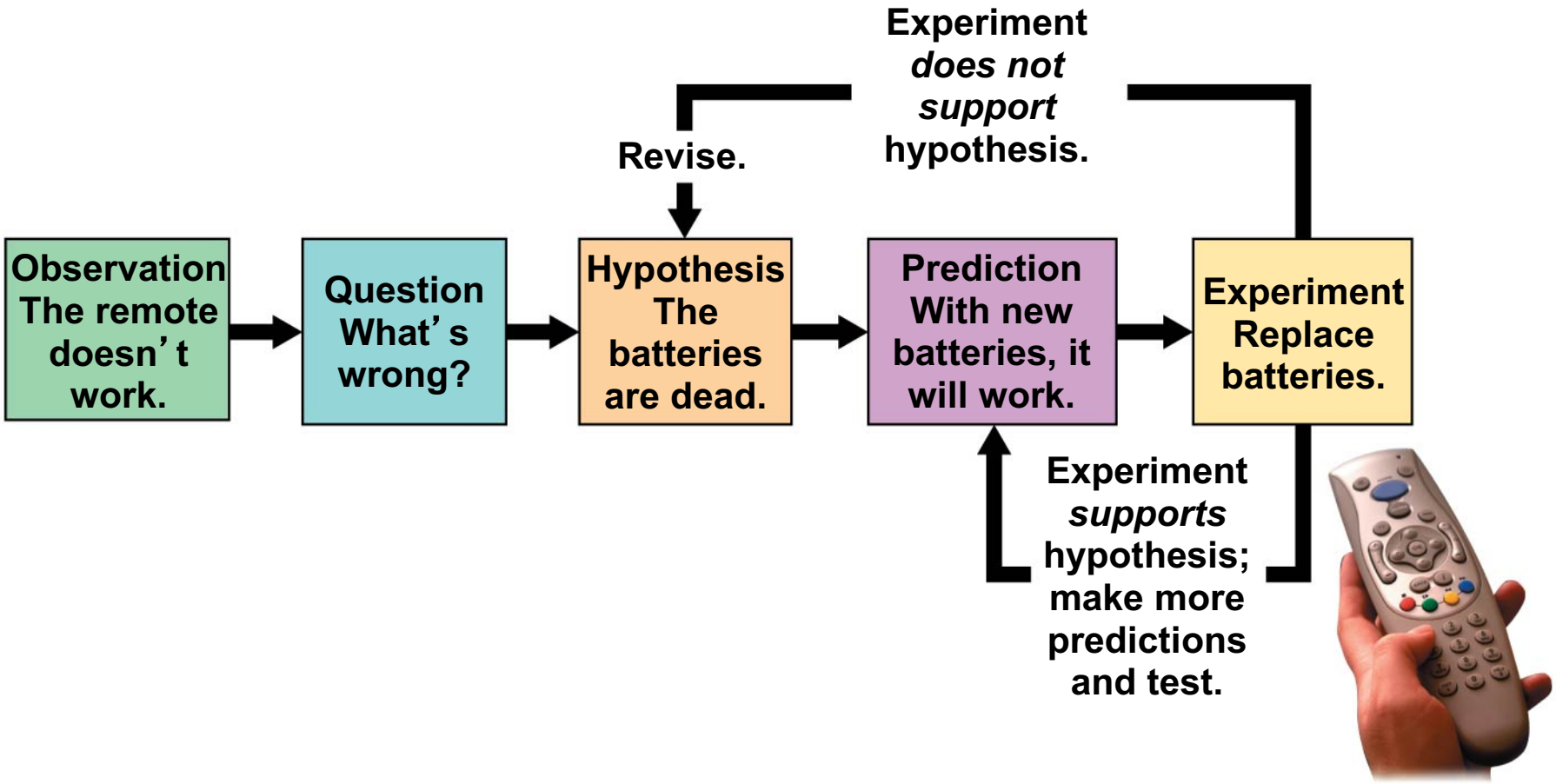


Figure 1.15-3



A Controlled Study

- Experiments in controlled studies have two types of groups:
  - Control Group – receives no treatment
  - Experimental Group – receives treatment

Experimental Variable (Independent Variable)	Response Variable (Dependent Variable)
Factor of the experiment being tested	Result or change that occurs due to the experimental variable

Theories in Science

- What is a scientific theory, and how is it different from a hypothesis?
  - A scientific **theory** is much broader in scope than a hypothesis.
  - Theories only become widely accepted in science if they are supported by an accumulation of extensive and varied evidence.

Figure 1.17

The Culture of Science

- Science has two key features that distinguish it from other forms of inquiry. Science
  - depends on observations and measurements that others can verify and
  - requires that ideas (hypotheses) are testable by experiments that others can repeat.
  - What is Junk Science (Pseudoscience)?

Science, Technology, and Society

- Science and technology are interdependent.
  - New technologies advance science.
  - Scientific discoveries lead to new technologies.
  - For example, the discovery of the structure of DNA about 60 years ago led to a variety of DNA technologies.

Figure 1.18

Figure 1.UN02

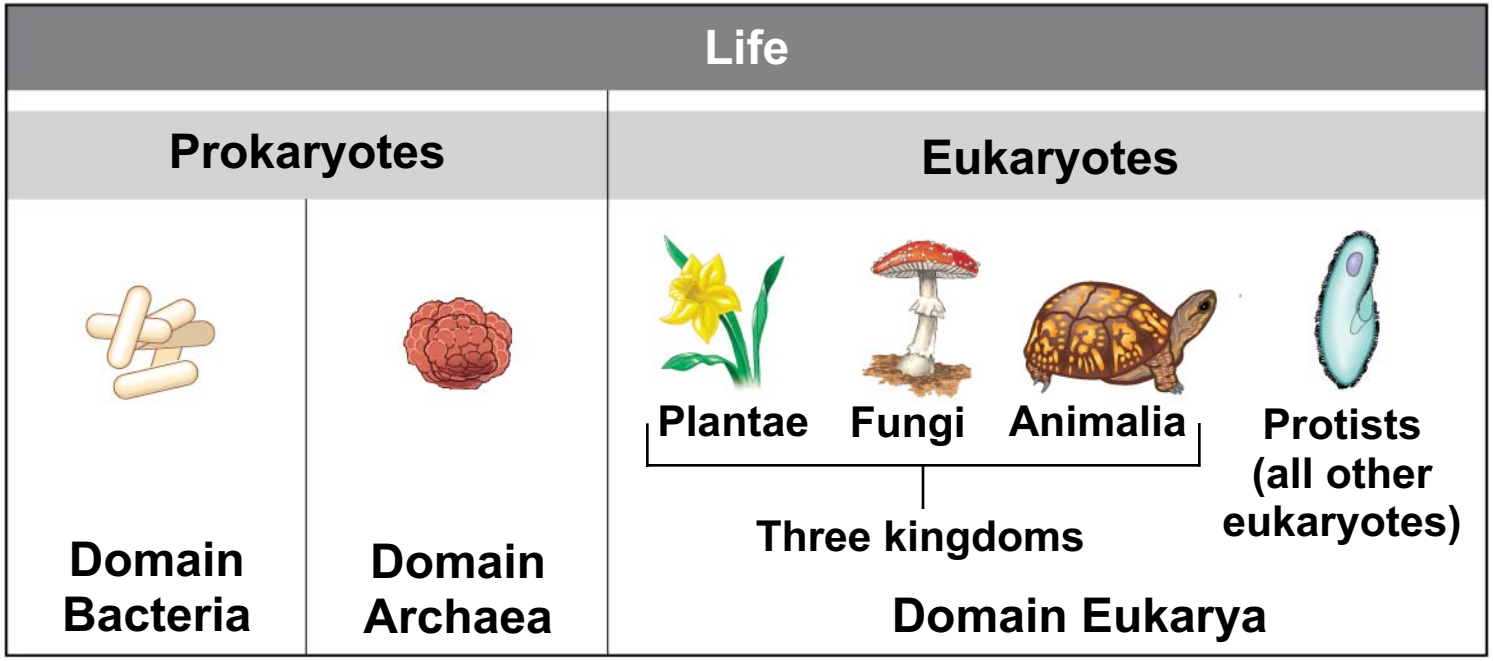


Figure 1.UN04