Chapter 1: *Biology & You*

- **Section 1: *Themes of Biology***
- **Section 2: *Biology in Your World***
- **Section 3: *Scientific Processes***

The Word "**Biology**"

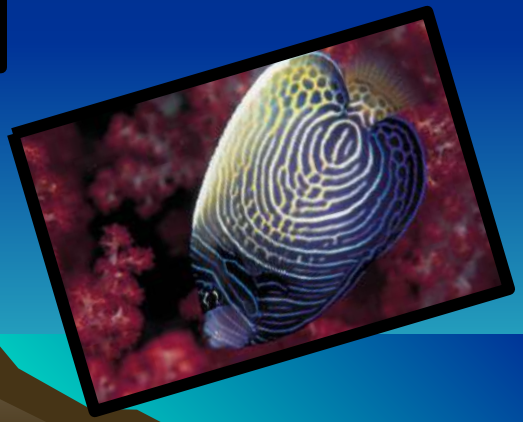
- Prefix "Bio" –
  - Means living or life
- Suffix "-ology"
  - Means *the study of*

Biology Definition:

The study of living organisms

So, what's an "organism?"

Any Living Thing

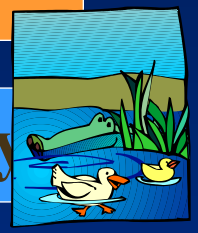


Biology Areas of Study

Botany

Zoology

Ecology



Herpetology

Ornithology

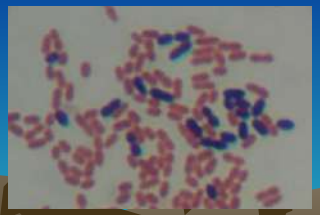
Ichthyology

Entomology

Anatomy

Physiology

Microbiology



How do you know you or any other organism is alive?

What does it mean to be alive?

Characteristics Video

Section 1:
Characteristics of Living Organisms

Cells-

- All organisms are made of one or more cells.

Homeostasis

- All organisms must maintain stable internal conditions
  - Examples: temp, water, blood sugar, salt

Section 1:
Characteristics of Living Organisms

- Reproduction
  - Is not necessary for the individual to survive, but it is necessary to keep the species from being extinct.
- Heredity
  - All organisms pass on traits to their offspring.

Section 1:
Characteristics of Living Organisms

Metabolism

- All organisms get and use energy to undergo ***metabolism*** - all the chemical processes necessary for life. Energy comes ultimately from the sun.

Section 1:
Characteristics of Living Organisms

Growth and Development

1. By Cell Division through the process of mitosis more cells are made
2. By Cell Enlargement: there is a limit on a cell's size. They cannot continue to get larger and larger.

How Is Growth Related to Development?

Development is the *change in an organism's form as it is maturing.*

Examples of development are:

1. Caterpillar to butterfly
2. Tadpole to frog

Two significant times of ***human development*** occur at:

1. Prenatal development
2. Puberty

Section 1:
Characteristics of Living Organisms

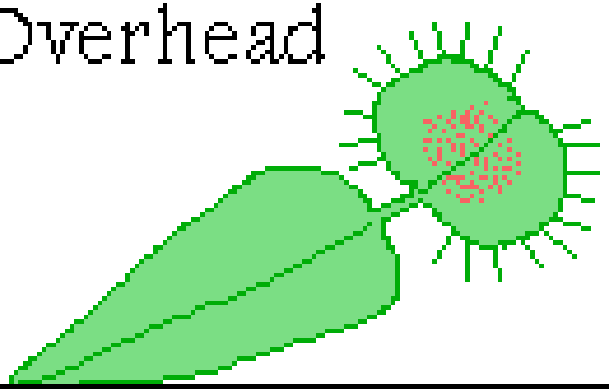
Responsiveness

Organisms respond to their environment and adapt (or adjust) to the conditions.

If not they die!

- Examples:
  - Skin tans in the sun
  - Sweat when they are hot

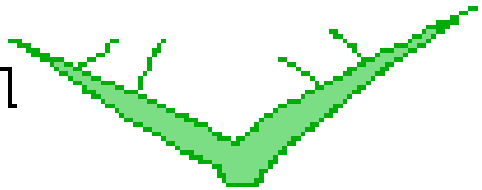
Overhead



Trap

Cross~

Section



Unifying Themes in Biology

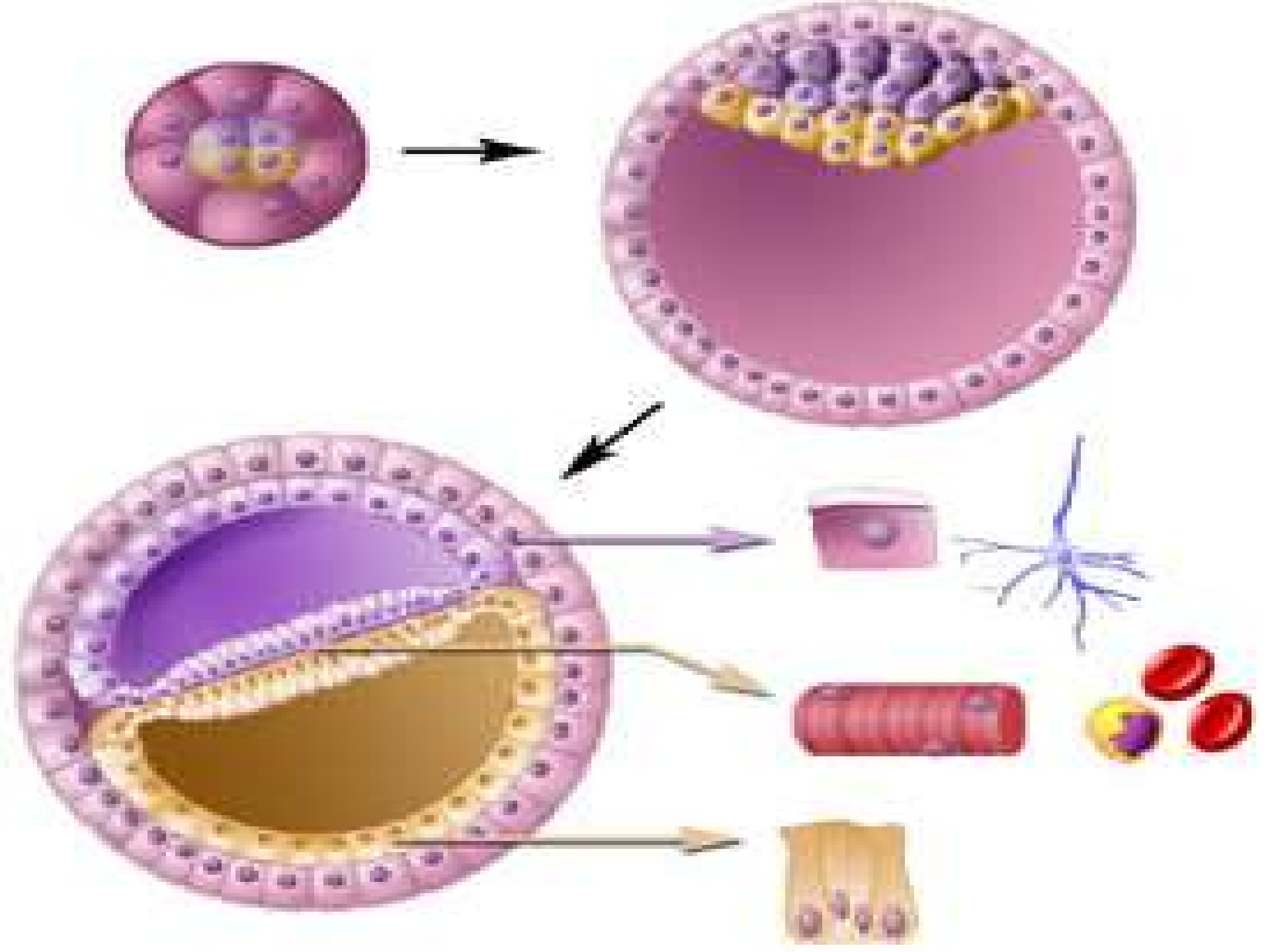
- **S**tructure & Function
- **H**omeostasis
- **E**volution
- **R**eproduction
- **H**eredity
- **I** nterdependence
- **M**etabolism

SHERHIM

S: Structure and Function

Structure & Function

- Cell is the basic unit of life
- Cells are organized and specialized
- Cells in multicellular organisms change from being all alike in the early embryo to being different with a special job to do through a process called ***differentiation***.



Structure & Function

Organisms may be

- **Unicellular (one celled), amoeba, euglena, paramecium, or algae**
- **Multicellular (more than one cell)**

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H: Homeostasis

Homeostasis

- Homeostasis is a type of biological balance
- Cells and organisms MUST maintain stable conditions

- water
- temperature
- sugar, salt, and chemical compositions

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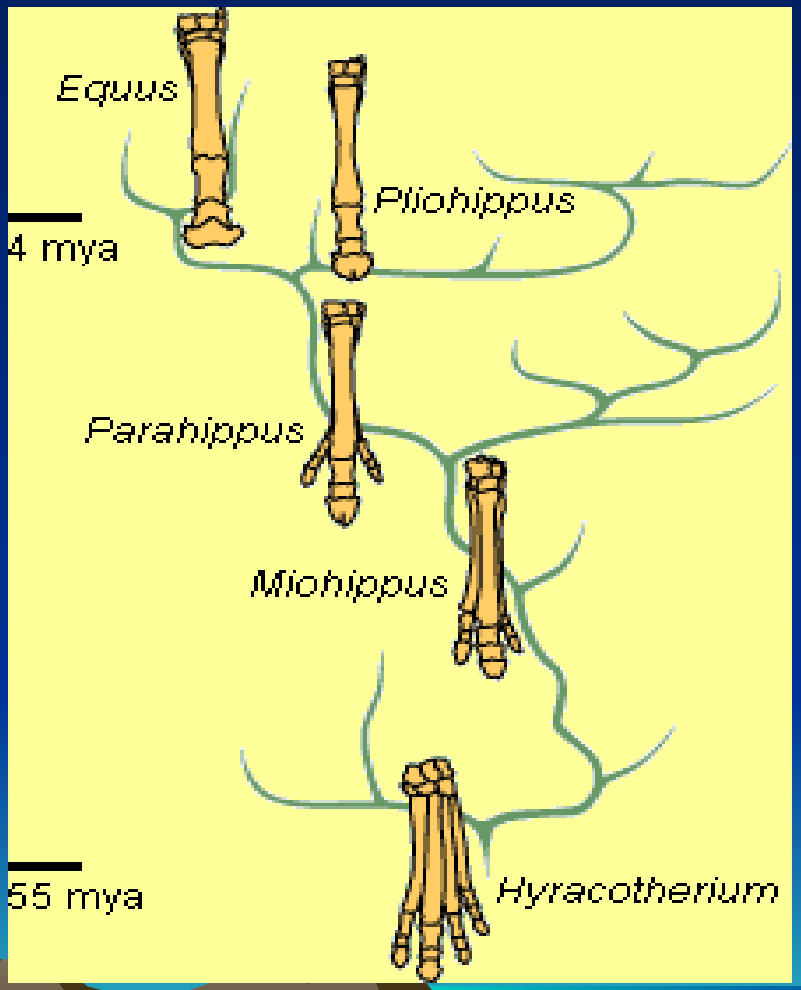
E: *Evolution*

Evolution

- Species change over many generations



Evolution

Evolution is caused by:

1. Mutations

- caused by radiation
- caused by chemicals
- caused by genetic errors

2. Natural selection

Evolution

- Mutations are changes in an organism's DNA sequence – some are good, some bad, but most have no impact!
- Mutations in egg or sperm cells can cause harm – other body cells can't.

Evolution

- A **species** is a group of genetically similar organisms that can produce fertile offspring.
- Members of species are similar but not identical – have variations.
- Some trait variations help organisms to survive better.

Evolution – Natural Selection

- **Favorable traits within organisms that helps them to survive.**
- **Survival resources are *limited* so there is *competition*.**

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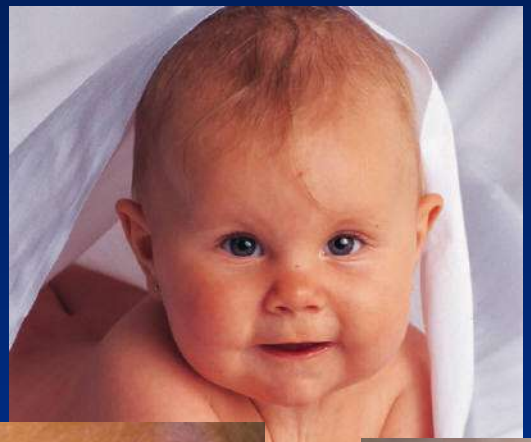
R: Reproduction

All Species Must Reproduce!



Reproduction

- The production of an offspring
- Two kinds of reproduction:

1. **Asexual** – from 1 parent cell and offspring's DNA is identical to parent

a. Cloning
b. Budding
c. Binary Fission

2. **Sexual** – from 2 parent cells and the DNA of offspring is a ***combination*** of the two parent cells.

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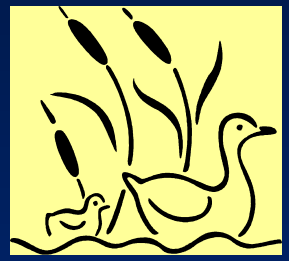
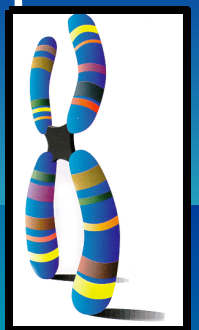
H: Heredity

Heredity



- During **reproduction** organisms transmit hereditary information to the offspring
- **DNA** is the molecule that carries the info about traits 
- A short segment of DNA that codes for a specific trait is a ***gene***.
- Mutations can be caused by a change in the gene region of DNA



SHERHIM

I: Organisms are **Interdependent**

- Cells interact with each other
- Organisms interact with each other
- We all live in ecosystems – environmental communities

Metabolism

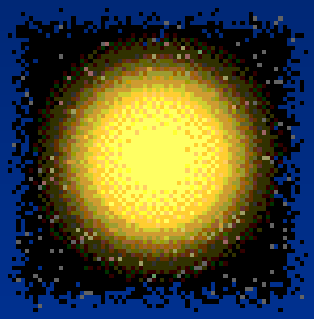
- What's going on inside you right now?
- Living things ***use*** energy to maintain life's processes.
- Metabolism is the sum of all the chemical reactions in an organism.

Metabolism

- Organisms can either get this energy from other organisms

or

- Can use the sun's energy through the process of photosynthesis



- **Heterotrophs** (consumers) get energy from other organisms: us, dogs, cats, cows, fungus, etc.

- **Autotrophs** (producers) get energy from the sun so they can produce food for themselves: trees, flowers, algae, etc.

- Word Search Puzzle

Section 2:

Biology in Your World

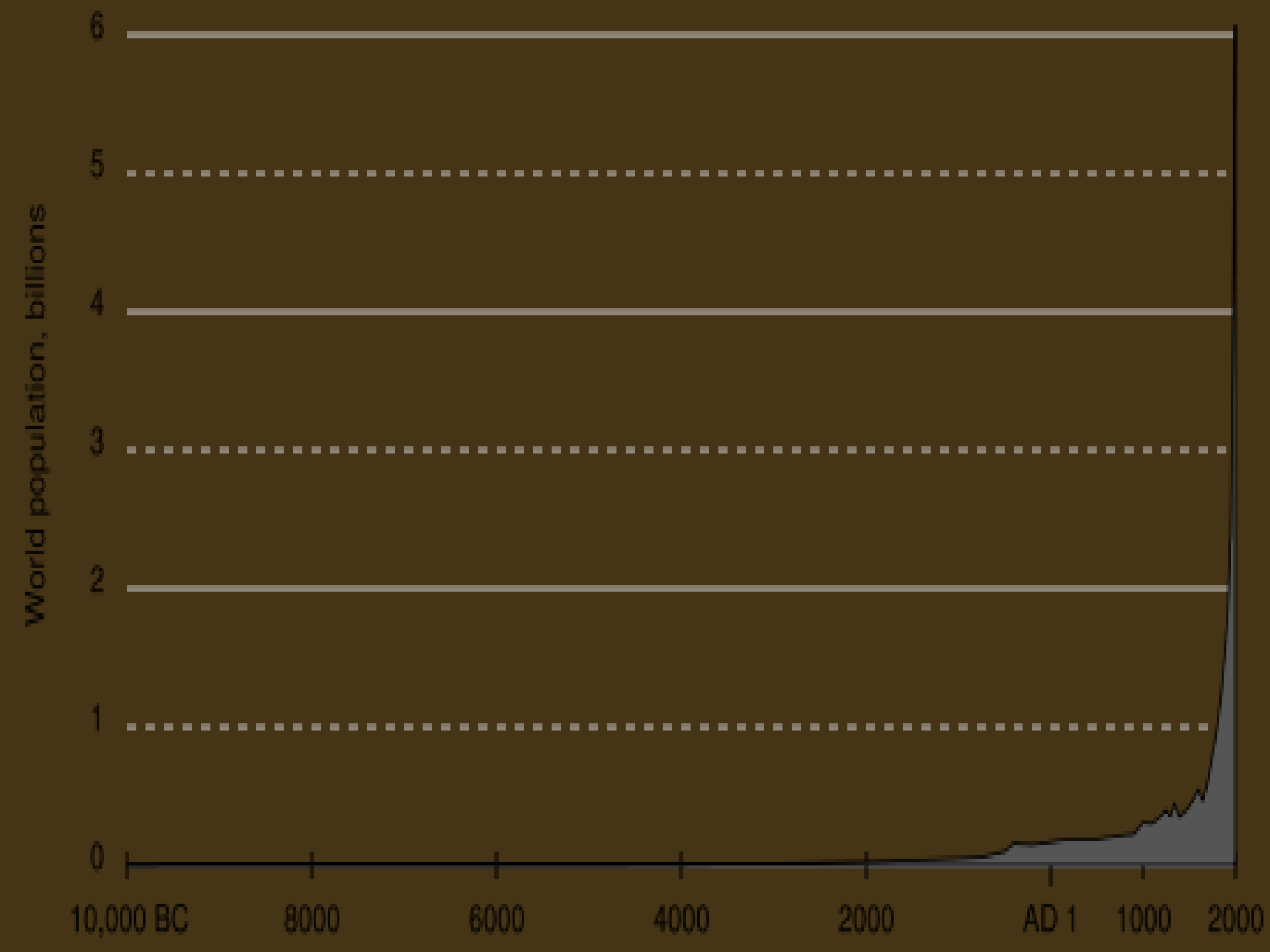
Biology Is Important for Solving Real World Problems

Preserving Our Environment

- World's population is over 6 billion!
- Destroying rain forests and oceans
- Global warming of the planet
- Species extinction – reduces biodiversity (a good thing)

When did we hit the billions?

- 1815 1
- 1927 2
- 1960 3
- 1974 4
- 1987 5
- 1999 6
- 2007 6576


World population, billions
6
5
4
3
2
1
0
10,000 BC
8000
6000
4000
2000
AD 1
1000
2000

Biology Is Important for Solving Real World Problems

- Improving the Food Supply
  - Use **genetic engineering** to improve crops and animals
  - Reduces use of **pesticides** (bug killers) and **herbicides** (weed killers)
  - Improves nutritional value of some foods

Biology Is Important for Solving Real World Problems

- **Understanding the Human Genome**
  - A **genome** is all the genetic material of an organism (all the DNA code contained in its chromosomes)
  - Human genome was completed in 2001
  - Has ***3 billion*** base pairs
  - Serves as a road map for our genes

Fighting Disease

- Biologists combat diseases with new technologies!
  - **AIDS**:
    - Caused by a virus (human immunodeficiency virus)
    - Have new vaccines & drugs to reduce deaths.
  - **Cancer**:
    - Caused when cells grow and multiply uncontrollably
    - Know causes of some kinds
    - Better detection
    - Better treatment methods

Fighting Disease

Emerging Diseases:

- New diseases occur which have not been known in the past
- Ex: West Nile Virus or Mad Cow Disease

Gene Therapy:

- Normal healthy genes are inserted (through genetic engineering) into the chromosomes of people who have genetic diseases
- Ex: Cystic fibrosis, muscular dystrophy, and hemophilia