BIOLOGY

- What is it?
- Why study it?
- Define it!

BIOLOGY- the study of life

Biologists study the interactions of life.

- living things do not exist in isolation; they are all functioning parts in the delicate balance of nature

- living things depend upon other living and nonliving tings in a variety of ways and for a variety of reasons.

Why Study Biology?

- learn about the world of living things

- human existence depends on the existence of other living things on Earth

  *future health of our planet depends on the web of nature!

- be able to make critical choices relevant to our future on Earth!

Characteristics of Living Things…

Is this a living thing - ?

Why?

Is this a living thing - ?

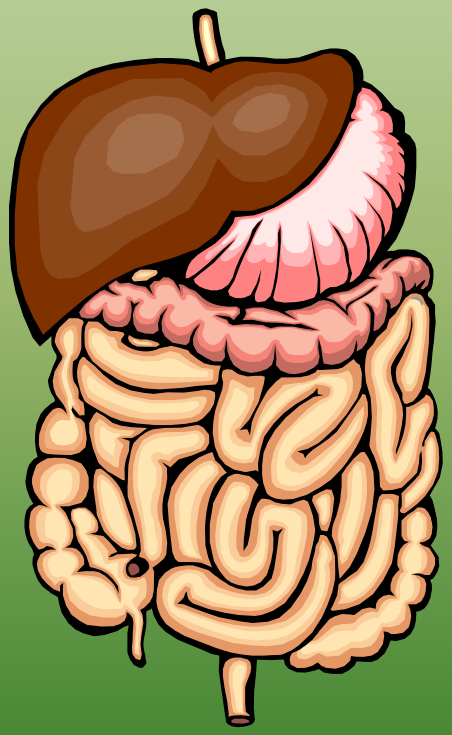
Why?

Organism – anything that possesses all of the characteristics of life

- Living things are organized
- Living things make more living things
- Living things change during their lives
- Living things adjust to their surroundings

Living Things are Organized

- Special parts that perform specific functions



- All structures and functions of an organism form an orderly living system

Living Things Make More Living Things

- Reproduction – making offspring

- Organisms don't live forever; therefore, must replace themselves in order for life to continue
  - Necessary for survival of species
    - Species – group of similar-looking organisms that can interbreed and produce fertile offspring

Living Things Change During Their Lives

- Growth – an increase in the amount of living material and the formation of new structures
- Different parts of an organism may grow at different rates

•Development – all of the changes that take place during the life of an organism

Living Things Adjust to Their Surroundings

- Live with a constant struggle with their environment
  - (including air, water, weather, temperature, other organisms)

- Must be able to adjust to environmental changes
  - Stimulus – condition that requires the organism to adjust
  - Response – reaction to a stimulus
  - Homeostasis – regulation of internal environment to maintain conditions suitable for life

Living Things Adjust to Their Surroundings Cont…

i.e. – what does “homeostasis” have to do with your body…?

What happens to your body when your body temperature rises…?

THEMES OF BIOLOGY

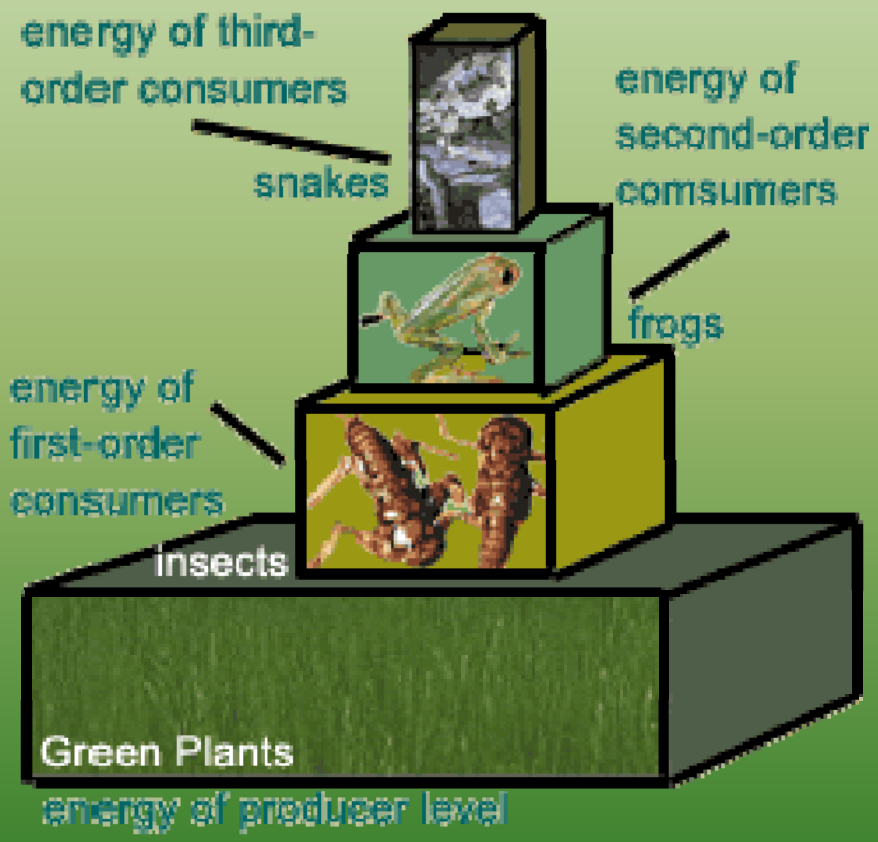
major themes link isolated facts and ideas

ENERGY

- energy – ability to do work; ability to make things move
- Powers life processes (ie – homeostasis, grow, reproduce)
- Obtain energy from food
- Flows through communities & ecosystems
- Determines how organisms interact w/each other & environment

ENERGY cont…

- The ultimate source of NRG is the sun.
  - It cycles through ecosystems
  - 10% of energy is transferred up each level of a food chain
    - The rest is lost as heat as the organism grows/develops



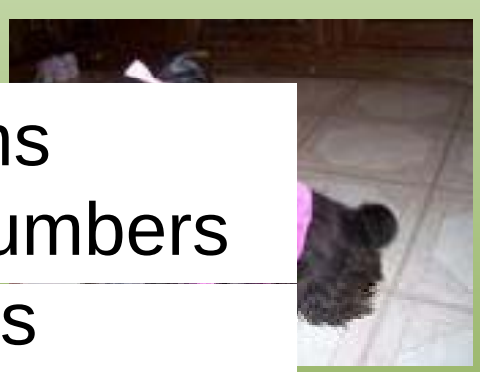
Systems and Interactions

- Systems don’t function independently

Interact to help perform the functions of life

UNITY WITHIN DIVERSITY

- Reproduce



Although ecosystems contain countless numbers of species… all life is unified by the general characteristics of living things.

- Maintain Homeostasis

HOMEOSTASIS

- Structural and behavioral adaptations help organisms maintain internal balance in order to live

Evolution

- gradual change in the characteristics of a species over time

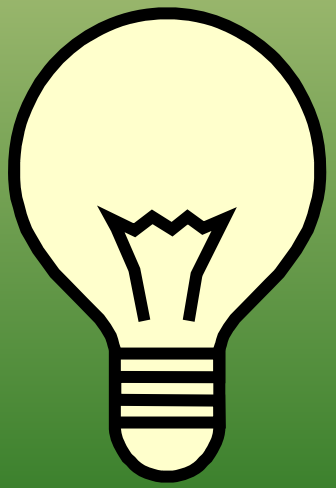
- Major unifying theme
- All structures, behaviors, interactions, and internal processes of all organisms on earth are the result of evolution

NATURE OF SCIENCE

- Biology is a continuous process
  - Seeking to discover facts about the world
- New info. is discovered; old ideas not “wrong”
- Facts are determined by making careful observations & building on previous knowledge
- Modify ideas rather than completely reject them

Nature of Science cont….

- In 1899 Charles Duell of the U.S. Patent Office issued this statement…
  - “Everything that can be invented has already been invented.”



DISCUSSION QUESTIONS

- 1. Describe a situation you have been in where knowledge of HUMAN biology was important.

- 2 (E only) Why is evolution considered to be a major unifying theme of biology? Explain.

SCIENTIFIC METHOD

-Steps scientists use to solve a problem

-Similar to using common sense

STEP 1 = State the Problem

- Recognize the problem or question to be answered
- Research background information on the subject

STEP 2 = Hypothesis

- Hypothesis – statement that can be tested
- Creating a logical statement predicting an answer to the question stated
  - Inductive reasoning = reasoning from a particular set of facts to a general rule
  - Deductive reasoning = suggesting that something may be true about a specific case from known general rules

STEP 3 = Testing the Hypothesis

- Experiment – using a series of steps with controlled conditions
- Variable – something that causes the changes observed in the experiment
  - Usually test the effect of varying(changing) a single condition(variable)
  - Independent variable – condition changed or manipulated
  - Dependent variable – observation shown from changing the independent variable

Step 3 cont…

- Control – standard for comparing results
  - Similar to the independent variable, except the variable is either held at a fixed level or completely omitted
- Data – recorded facts or measurements from an experiment
- Variables, control & data must be consistent for results to be accurate/acceptable
- Safety symbol – warns about a danger that may exist

STEP 4 = Drawing Conclusions

- Use observations & data to answer the initial question or solve the problem
- Publishing the steps to the experiment as well as the results is important/necessary
  - Reported in scientific journals where they become open to examination by other scientists
- Others must be able to reproduce your experiment AND achieve the same results for it to be valid

STEP 5 = Theory

- Theory – a hypothesis that has been tested many times by different scientists with similar results each time
- Scientific theory is NOT a guess → it's the best explanation science has to answer the problem (at that time)

RESEARCH

Quantitative (vs. Qualitative)

- Most biological experiments result in counts/measurements to create a graph or table
- Some aspects of biological experiments result in descriptions of the results and cannot usually be represented on a graph/table

INTERNATIONAL SYSTEM OF UNITS
(SI Units)

- Based on units of 10
- Used by scientists world-wide
  - Length = distance from one point to another
  - Volume = amount of space a substance occupies
  - Weight = measure of the force of gravity on an object
  - Mass = how much matter is in something
  - Time = period between two events
  - Temperature = amount of heat in something

LENGTH

- Meter is the SI Unit of length
  - Going smaller…
    - 1 meter = 10 decimeters (dm)
    - 1 decimeter = 10 centimeters (cm)
    - 1 centimeter = 10 millimeters (mm)
  - Going BIGGER…
    - 1 decameter (dam) = 10 meters
    - 1 hectometer (hm) = 10 decameters
    - 1 kilometer (km) = 10 hectometers

VOLUME

- Cubic Meter (cm^3) is the SI Unit of volume
  - Too large for everyday use, use Liter (L) instead
  - 1 cubic meter = 1000 liters
  - Volume units are based on units of length
  - Volume = lengthXwidthXheight

WEIGHT & MASS

- Kilogram (kg) is the SI Unit for mass
  - 1kg = 1000 grams
- Mass does not change with location; weight changes with location

TIME & TEMPERATURE

- Second (s) is the SI Unit for Time
- Kelvin (K) is the SI Scale Unit for Temperature
- Celsius is used because it's easier
  - Freezing Point = **0C or 32F**
  - Boiling Point = **100C or 212F**
  - Convert from one scale to another…
    - From Farenheit to Celsius
      - (.56) X (deg F – 32) = C
    - From Celsius to Farenheit
      - (1.8 X deg C) + 32 = F