Biology

Study of Life

Hierarchy of Life

Atoms→Macromolecules→Organelles→Cell→

Tissues→Organs→Organ Systems→Organism→

Population→Community→Ecosystem→Biome→Biosphere

Emergent Properties

- Emergent Property – each step up has unique properties that were not present at the simpler level of organization
- Cells are not just a bag of organelles
- Life has order
- Hierarchy - One level builds on the level below it
- (Macromolecule- large molecule)

Life

- Amazing
- Not just a sum of parts
- Can’t just throw stuff in a bucket and get life
- Things have properties not predicted by structure alone
- Ex. Chromosome – structure in nucleus which controls reproduction – can replicate like a Xerox with very few mistakes

Another Example of Life's Amazing Properties

- Cell membranes are made of phospholipids and proteins.
- Have properties beyond what you would expect from just throwing things together
- Respond by allowing some things through and keeping some things out to maintain homeostasis in the cell

Living things (GRREEHO)

- Grow
- Reproduce
- Respond
- Energy Use
- Evolutionary Adaptation
- Homeostasis
- Order

Life's Emergent Properties (Define Living Things)

- Order – predictable
- Reproduction – organisms perpetuate themselves and pass on traits
- Growth & Development – don't wind down like entropy predicts
- Use Energy – must feed or make food & rid itself of wastes
- Response to environment – behavior
- Homeostasis
- Evolutionary Adaptation – must have variation to get adaptation

Growth and Development

- Living things grow, develop into adults, age, and die


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Reproduction

- Organisms make similar (not exact) copies of themselves and pass on traits

Babies are very similar to their Parents

Response

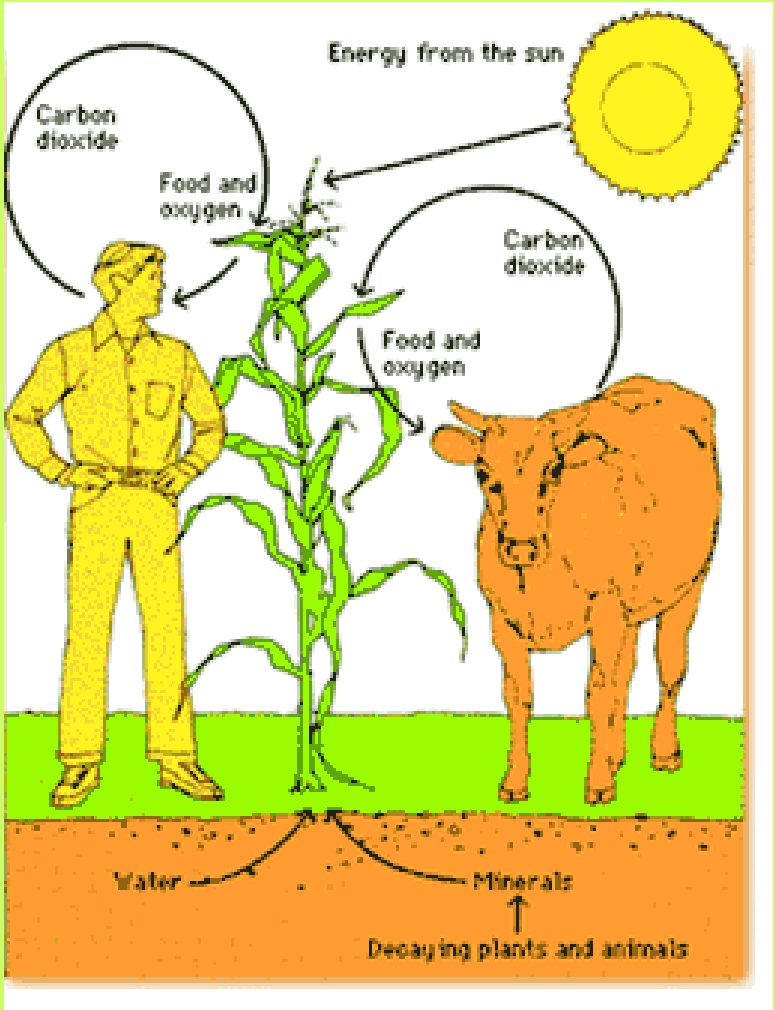
- Living things respond to their environment with certain behaviors
- Ex. Plants will grow toward the light.
- Ex. Animals will migrate with change in season.
- Ex. Animals like opossums will learn to live in cities.

Plants grow toward the Light

Energy Use

- Plants use energy from the sun to make their own food and food & oxygen for us.
- Animals eat plants or other animals, dispose of wastes, and make carbon dioxide for plants to use.

Energy ultimately comes from the Sun



Evolutionary Adaptation

- Genetic variation allows organisms to adapt through successive generations.
- Ex. If food was at 6', tall giraffes would eat.
- Short giraffes would die out so that through the generations, only the tall group would reproduce.

Homeostasis

- Biological balance with respect to the environment
- Your body responds to rapid temperature changes.
- Normal body temp = 98.6ºF. You die when internal temperature reaches 106ºF.
- Your body has mechanisms (shivering/sweating) to maintain 98.6º

Like when we turn the thermostat up in winter and down in summer

Order

- Living things are ordered. We have a heart protected in our ribcage to pump blood through an ordered system of blood vessels.
- We have family units of animals like monkeys, dolphins, people.
- Trees grow with the bark on the outside.

Viruses

- Exception to emergent properties
- Protein + nucleic acid
- Tobacco mosaic virus – can leave for 10 years, rub it on tobacco and cause the disease
- Living???
- Not known