BIOLOGY – The Study of Living Things

OTHERWISE KNOWN AS REGENTS LIVING ENVIRONMENT

Some Random Questions:

What is Spontaneous Generation?

- **The idea that living things come from non-living things.**

What is the initial source of energy for most living things?

- **The sun.**

- **WHAT IS THE DIFFERENCE BETWEEN LIVING & NON-LIVING?**
  - **SCIENTISTS HAVE NOT BEEN ABLE TO AGREE ON A SINGLE DEFINITION THAT CHARACTERIZES LIFE!!!**

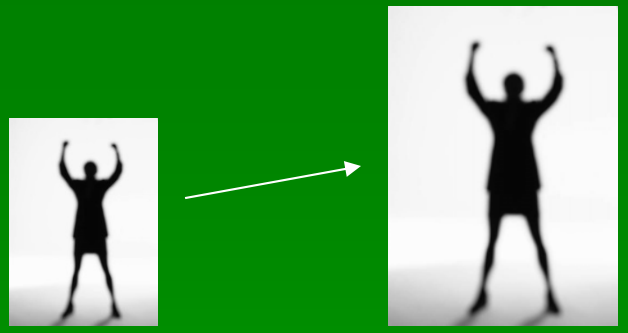
So what is LIVING then?...

LIVING VS. NON-LIVING: (ORGANIC VS. INORGANIC)

- **Living things carry out almost all of the LIFE FUNCTIONS**
  - **Growth, Nutrition, Homeostasis Regulation, Respiration, Reproduction, Excretion, Synthesis, Transport.**
    - **Good NigHt's RREST**

    Metabolism, Movement, Immunity
- **Non-living things cannot carry out at least one or more of these functions**

GROWTH:



- **Simply the increase in the size of cells (at an embryonic stage) or an increase in the number of cells (throughout life)**
- **Growth stops when an organism experiences death**
- **Development = Maturation of an organism**

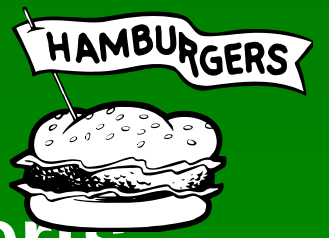
Interesting Info....

In a 2011 study, researchers at the University of North Carolina found that the human pelvis continues to widen from the ages of 20 to 79. This means that even if you watch your weight and maintain the same level of body fat, your waist size naturally increases over time because of changes in the underlying bone structure. On average, the pelvis widens 1 inch (2.54 centimeters) between ages 20 and 79, resulting in a 3-inch (7.62 cm) average increase in waist size [source: University of North Carolina].

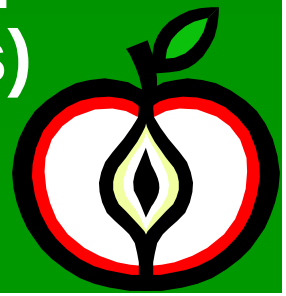
In 2008, researchers at Duke University revealed that just like the pelvis, the skull continues to grow and change throughout a person's lifetime. Not only does the skull grow larger, but the forehead shifts forward, bringing the cheekbones further back. This study has important implications for the field of plastic surgery, and suggests that adjustments to the underlying skeletal structure could have a much more dramatic impact on appearance than the traditional facelift [source: Duke University].

But what about the oft-cited statistic that the ears and nose never stop growing? You can relax; just like most of the body, the ears and nose stop growing after puberty. Though they may seem to grow larger as you age, this is simply a gravity-inspired illusion. As the cartilage in the ears and nose breaks down, these parts may droop or sag, making them appear as if they're grown when they've really just shifted position somewhat [source: Leyner and Goldberg]. We also can thank gravity for another sign of aging -- varicose veins.

NUTRITION:



- **Process by which an organism converts inorganic and organic "foods" into a more usable form of energy**
- **Autotrophic organisms MAKE their own food – example: PLANTS**
- **Heterotrophs cannot make their own food – example: PEOPLE**
  - **Nutrition involves both ingestion (taking in food) and digestion (breaking larger complex food molecules into smaller simpler ones)**
  - **EGESTION – removal of UNDIGESTED material (regurgitation)**



- **Peristalsis -** the involuntary constriction and relaxation of the muscles of the intestine or another canal, creating wavelike movements that push the contents of the canal forward.

METABOLISM:

- **The energy level that an individual organism must maintain to stay alive**
- **Every organism, even those within a species, has its' own personal metabolic rate**
  - **EX: Some people eat TONS of food but never seem to gain weight – they have very fast metabolisms that utilize the energy from food faster**

HOMEOSTASIS is…

- **… the ability of living organisms to maintain a DYNAMIC EQUILIBRIUM with its surroundings by carrying out the LIFE FUNCTIONS**
- **Internal stable state of an organism**
- **… a state of BALANCE between a living thing and its environment**
- **… constantly threatened!**

HOMEOSTASIS…

- **Ex: environmental temp increases ----> more sweating ---> more evaporation --< cools down body**
- **Ex: Blood sugar regulation**

  Insulin -- a hormone (chemical messenger) produced by the pancreas and carried through the blood

  -- lowers blood sugar 2 major ways:

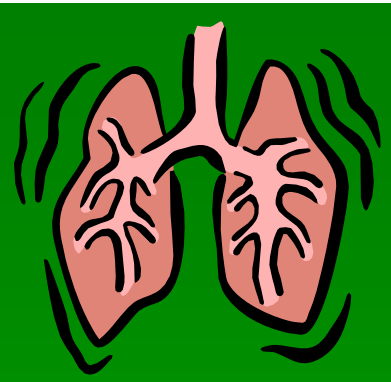
  a.) Takes glucose ($C_6H_{12}O_6$) into our cells to be used as fuel in cellular respiration from our blood

  b.) Converts excess glucose to the glycogen (animal starch) and stores it in our liver and muscles

REGULATION:

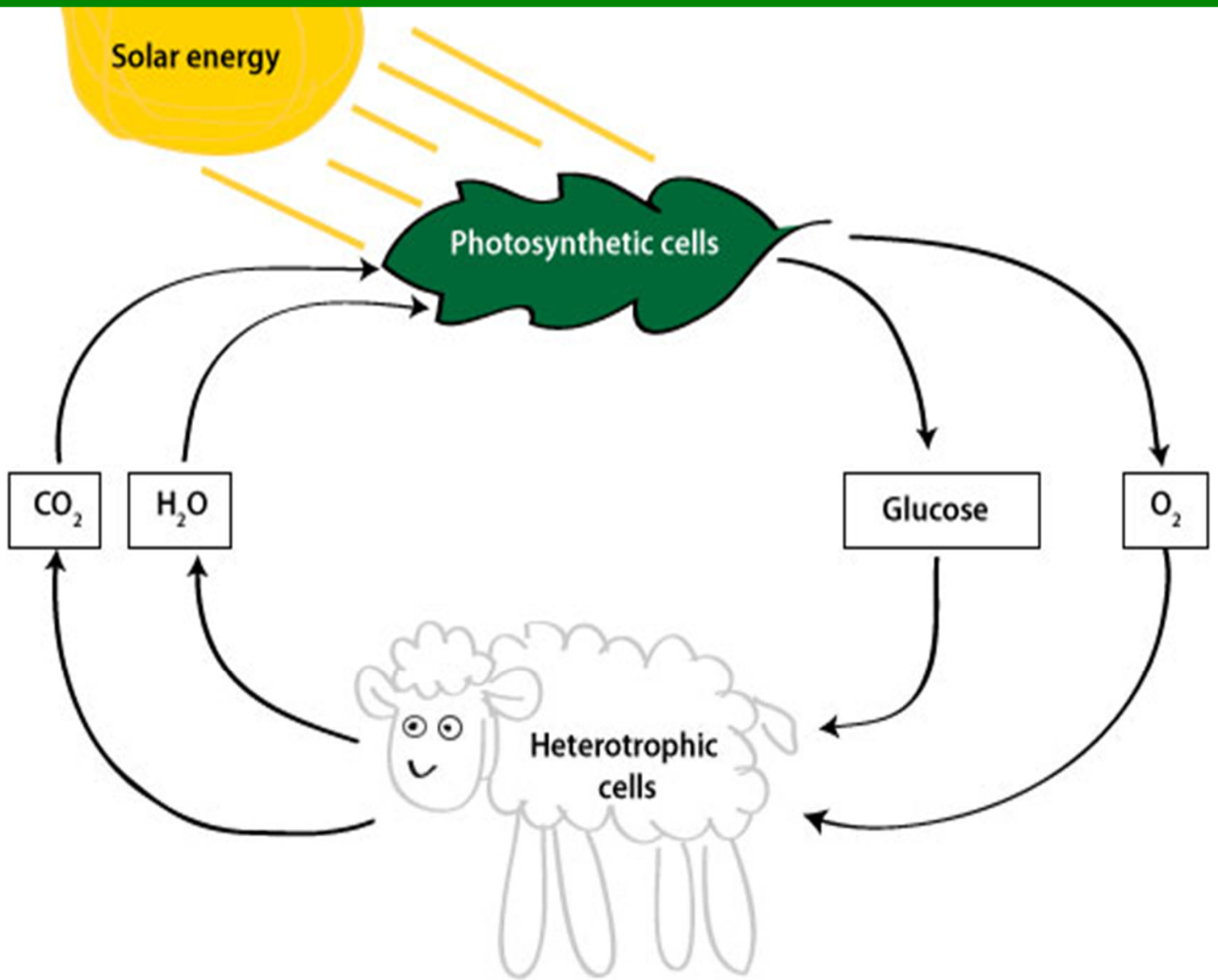
- **Control and Coordination of life functions**
- **Any activity which an organism does to try and maintain its' internal environment. This includes: brain activity, nervous function, release of hormones, etc…**
- **A change in the environment is called a STIMULUS(provokes a reaction) which causes a PHYSICAL RESPONSE (action that occurs as a result of being stimulated) from an organism**
  - **NERVOUS & ENDOCRINE SYSTEM – deals with COORDINATION – controls various activities of the organism**

RESPIRATION:



- **THIS IS NOT BREATHING!!!!!!!!**
- **THE PROCESS THAT CONVERTS THE ENERGY FROM FOOD INTO ATP (THE FORM OF ENERGY THAT CAN BE USED BY CELLS)**
- **IT IS A RELEASE OF ENERGY by an EXCHANGE of gases!**
  - **Organisms that need OXYGEN for respiration are called AEROBIC**
  - **Organisms that do not need Oxygen are called ANAEROBIC**

Photosynthesis and Respiration



REPRODUCTION:

- **The making of more organisms of one's own kind – NOT NEEDED by an individual living thing to survive, but is needed to continue a species**
- **You are reproducing right now!**
- **This is not always a SEXUAL (2 parents) event**
  - **Your cells are being replaced at all times(repair and maintenance)**
- **More often, it is ASEXUAL (1 parent)**
  - **Some organisms are completely asexual**
    - **(ex. amoeba, hydra, bacteria, fungi, plants, starfish, coral)**

EXCRETION:

- **Not what you think…. THIS IS NOT simply urination.**
- **It's the release of cellular waste products into the transport system for removal from the organism**
- **(Ex. CO_2, water, urea, urine, sweat…)**

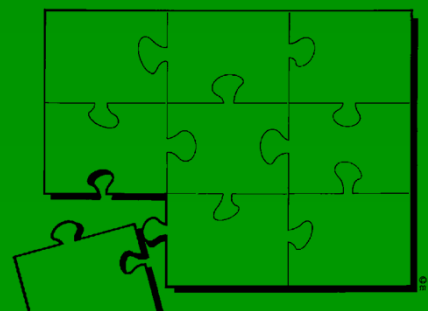
  - **EGESTION – removal of UNDIGESTED material (defecation or regurgitation)**

    Defecation is not excretion!

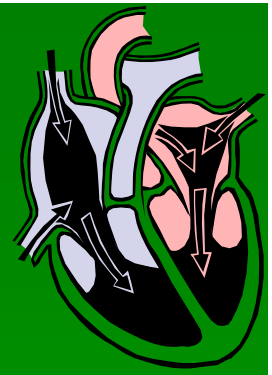
SYNTHESIS:

- **The building of large complex molecules from smaller simpler ones.**
  - **EX: 2 Hydrogen + 1 Oxygen = 1 Water**

This is the opposite of digestion



TRANSPORT:



- **Movement of materials (nutrients, essential gases, wastes, hormones, etc.) throughout the organism**
- **WITHIN A CELL THIS IS KNOWN AS CIRCULATION**
  - **Absorption takes nutrients into the cell – transport gets the nutrients to where they need to be!**

MOVEMENT:

- **ACTUAL PHYSICAL MOTION**
- **Also called LOCOMOTION**

- **Usually associated with some sort of survival need and quite often dependent on the physical size of the organism**
  - **(a blue whale will move much farther in its' lifetime than an ant will, for example)**

IMMUNITY:

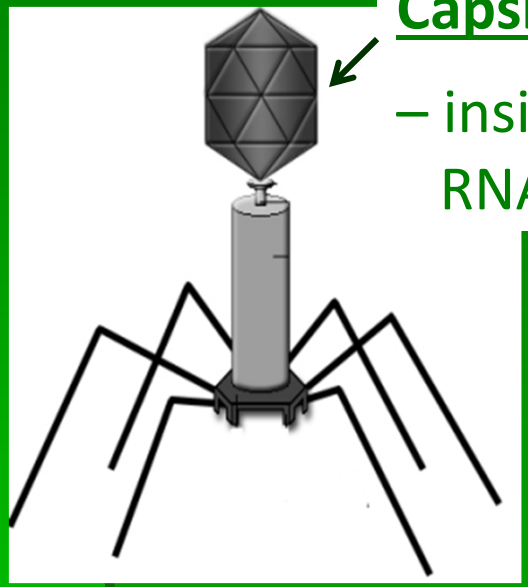
- **The ability to defend yourself against disease or allergies**
- **Organisms have a complex system of defending against both pathogens (disease causing organisms) and allergens (chemicals that cause allergic reaction)**

Virus

A virus is an infectious agent made up of nucleic acid (DNA or RNA) wrapped in a protein coat called a capsid.

Viruses are parasites—an organism that depends entirely upon another living organism (a host) for its existence in such a way that it harms that organism.

1. Bacteriophage—viruses that infect bacteria



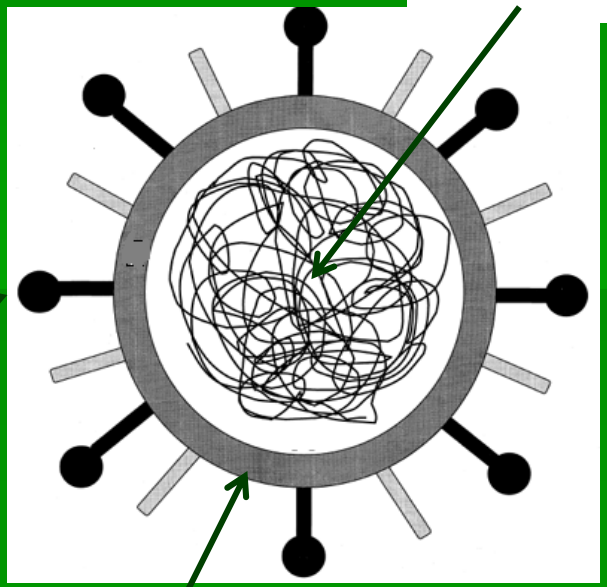
Capsid (**protein** coat)

– inside contains either RNA or DNA

2. Flu (influenza), HIV

DNA or **RNA**

Surface Marker



Capsid (protein coat)

Replication is how a virus spreads.

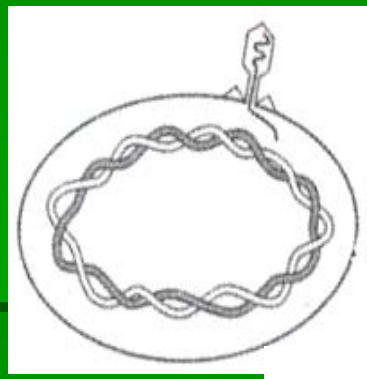
A virus CANNOT reproduce by itself—it must invade a host cell and take over the cell activities, eventually causing destruction of the cell and killing it. (The virus enters a cell, makes copies of itself and causes the cell to burst releasing more viruses.)

Step 1

Virus **attaches** to cell.

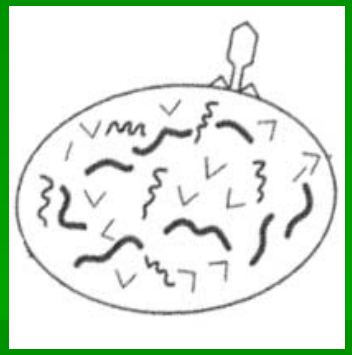
Step 2

DNA/RNA injected into cell.



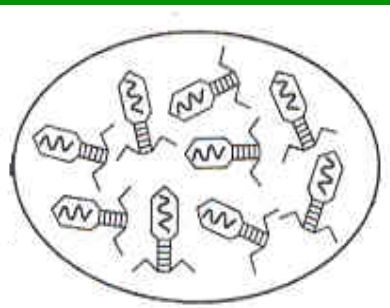
Step 3

DNA/RNA is **copied**.



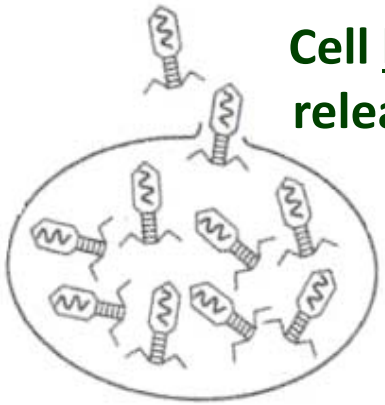
Step 4

Virus copies itself.



Step 5

Cell bursts (lyses) and releases new viruses.



Virus

- **Is it living?**
  - * Viruses do not breathe.
  - * Viruses do not metabolize.
  - * Viruses do not grow.
  - * However, they do replicate ("reproduce").

Viruses are exceptions to the cell theory, but they have some characteristics of living things. One major characteristic is that it contains Genetic Material (DNA or RNA).

	Virus	Living Cell
Structure	RNA or DNA core (center), protein coat (capsid)	Cell membrane, cytoplasm, genetic material, organelles
Reproduction	Copies itself only inside host cell--REPLICATION	Asexual or Sexual
Genetic Material	DNA or RNA	DNA and RNA
Growth and Development	NO	YES—Multicellular Organisms
Obtain and Use Energy	NO	YES
Response to Environment	NO	YES
Change over time	NO	YES