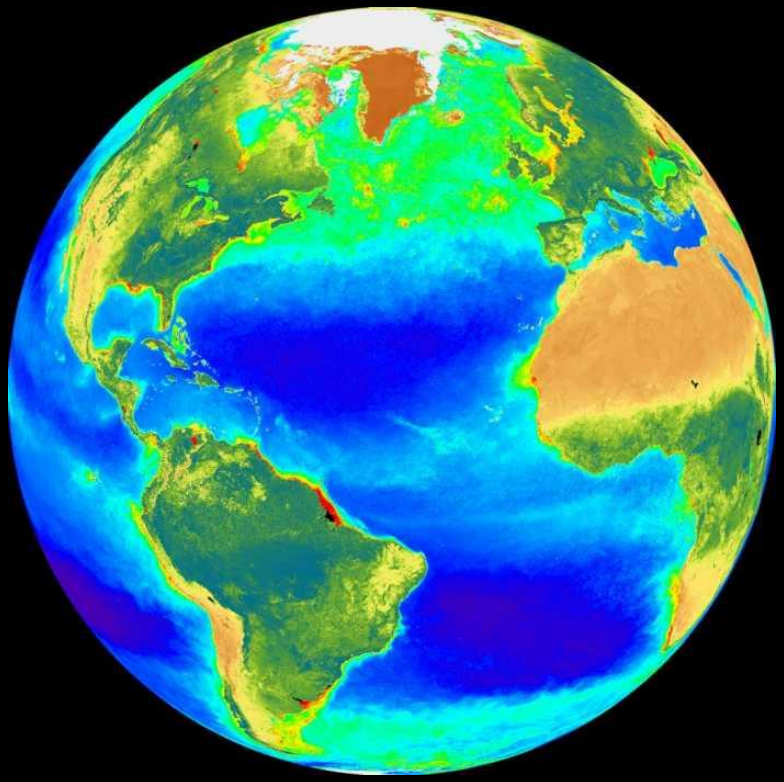
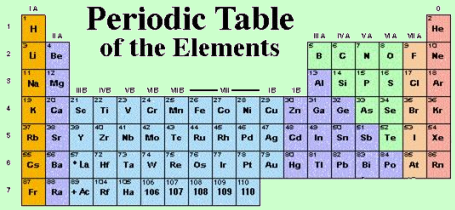
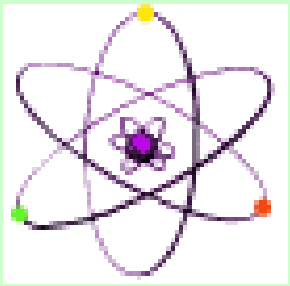
Energy Flow in the Biosphere,

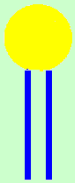


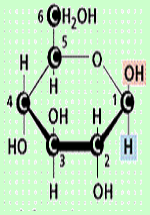
http://www.geog.uni-heidelberg.de/~ttavk/weltkarten/globen/1997-1998-biosphere-Nasa.jpg

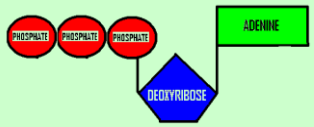
INTEREST GRABBER- THINK BACK TO CHAPTER 7

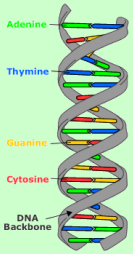


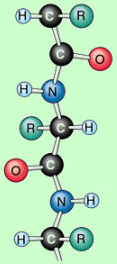


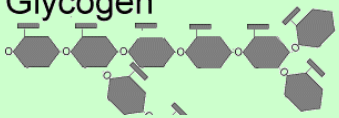


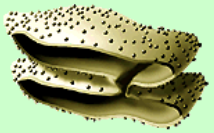


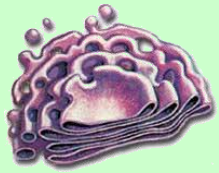


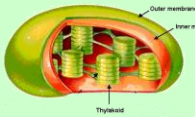


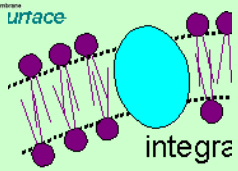


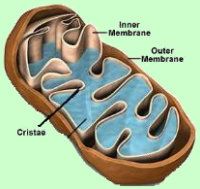






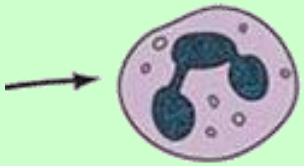


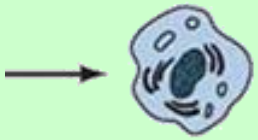


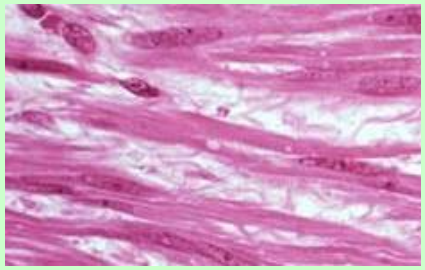


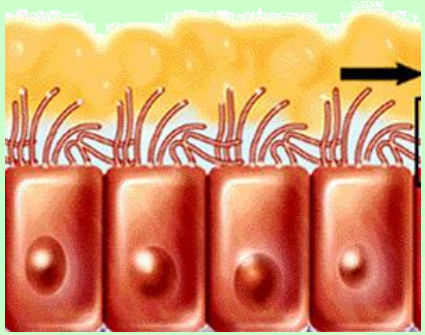
ATOMS → **MOLECULES** → **ORGANELLES** →

IMAGE SOURCES: see last slide





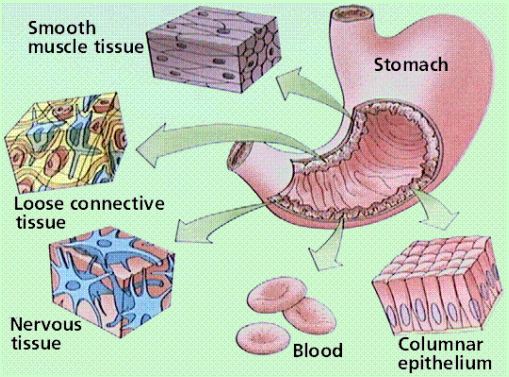


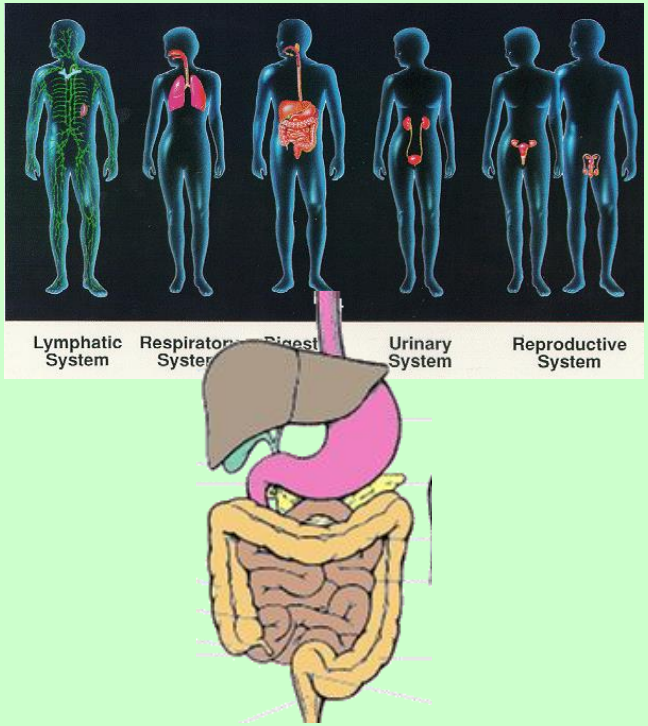


CELLS → **TISSUES** →

Similar cells
working together

IMAGE SOURCES: see last slide



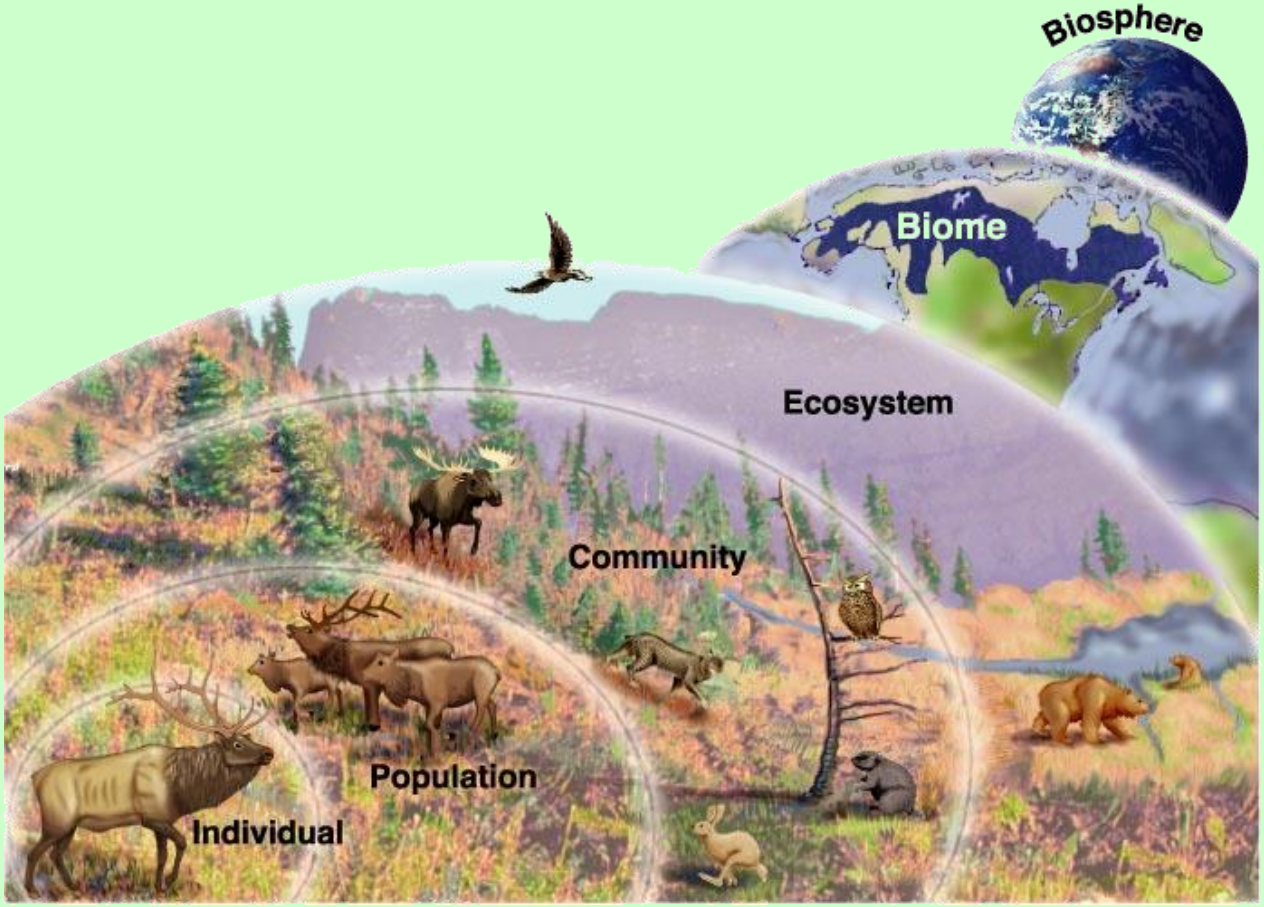


ORGANS → ORGAN SYSTEMS → ORGANISM

Different tissues working together

Different organs working together

IMAGE SOURCES: see last slide



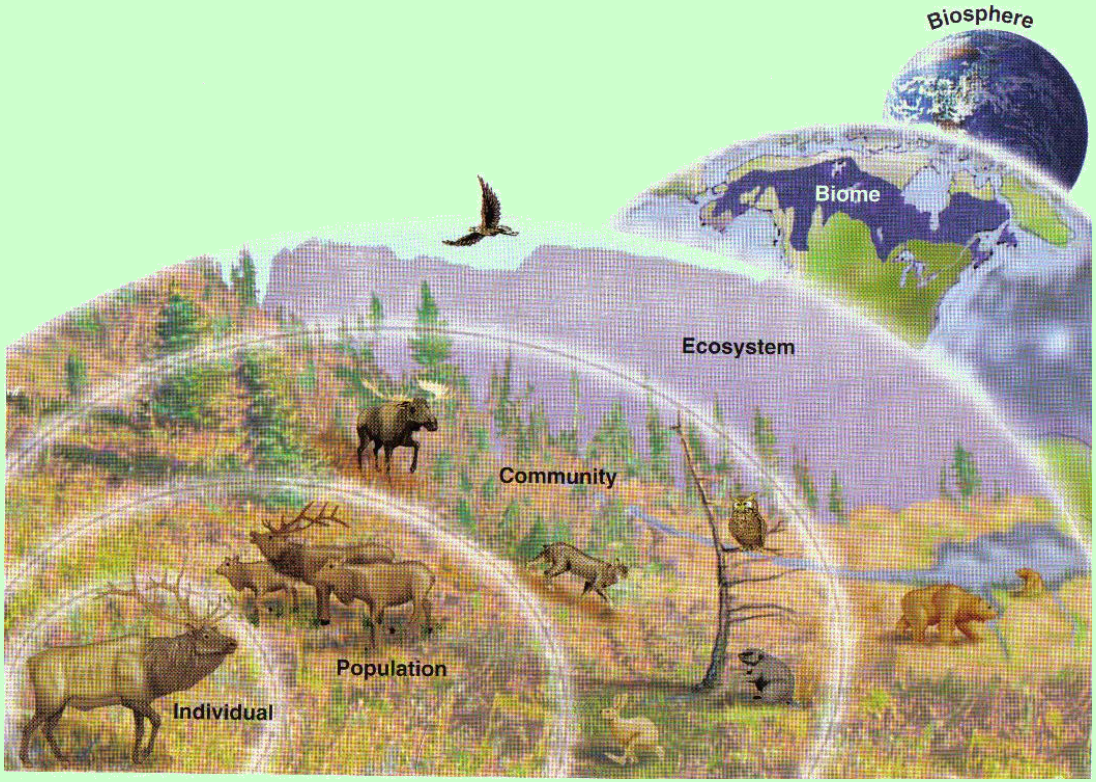
ORGANISMS → POPULATIONS → COMMUNITY

SAME SPECIES LIVING TOGETHER IN AN AREA

Ex: "herd"

DIFFERENT POPULATIONS LIVING TOGETHER IN AN AREA

BIOLOGY; Miller and Levine; Prentice Hall;2006



ECOSYSTEMS → BIOMES → BIOSPHERE

All the organisms that live in a place together with their NON-living environment

Group of ecosystems that have same climate and similar communities

The portion of the planet in which all life exists

IMAGE SOURCES: see last slide

Organisms so similar to one another that they can breed and produce fertile offspring = SPECIES

http://suedafrika.net/bluegifs/twooryx.jpg

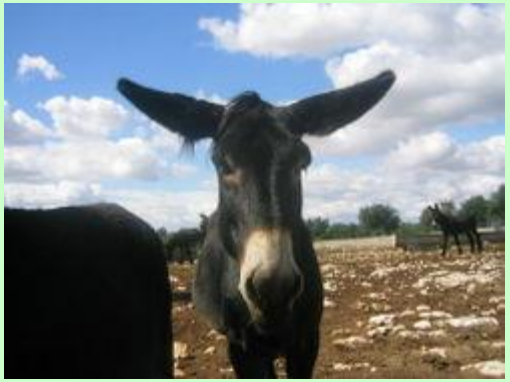
http://environnement.ecoles.free.fr/Site-chevaux/images/etalon_quarter_horse_genuine_redskin.jpg
http://www.caribbeanart.com/art/j-portrait-donkey.jpg
http://en.wikipedia.org/wiki/Mule

EX: Horse X donkey = mule

64 chromosomes

62 chromosomes

63 chromosomes



Horses and donkeys are different species.

If you breed them, the result is a mule which can NOT have offspring!

The scientific study of interactions of organisms with each other and with their environment = ECOLOGY

The portion of the planet in which all life exists = BIOSPHERE

(includes land, water, atmosphere)

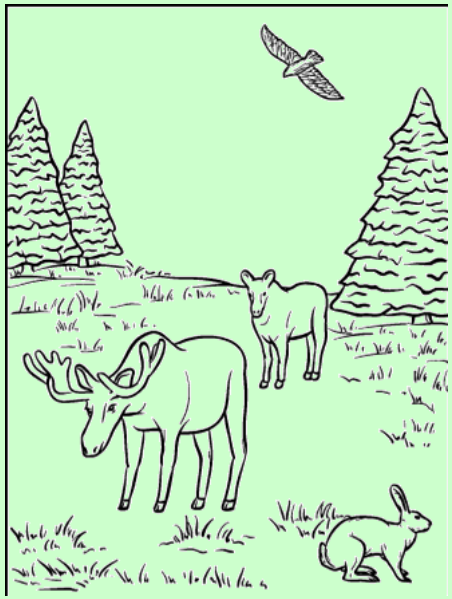
Extends from about
8 km above the Earth's surface
to 11 km below the ocean's surface

http://jaeger.earthsci.unimelb.edu.au/Images/Topographic/Whole_Earth/Earth_100.jpg

WHAT SHAPES AN ECOSYSTEM?

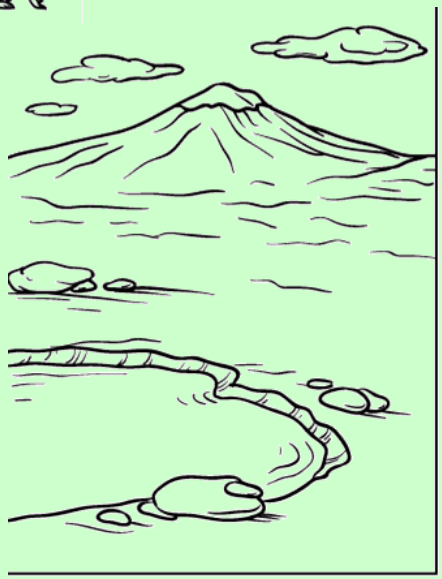
BIOTIC FACTORS

All the living things an organism interacts with



ABIOTIC FACTORS

All the non-living things that affect an organism



Ex: climate, temperature, sunlight soil, humidity, wind

HABITAT

= The area where an organism lives

A rattlesnake lives in a desert in the American Southwest

http://animals.timduru.org/dirlist/snake/animalwild089-RattleSnake-FaceCloseup.jpg

http://www.rvstogophx.com/images/arizona_desert_sm.jpg

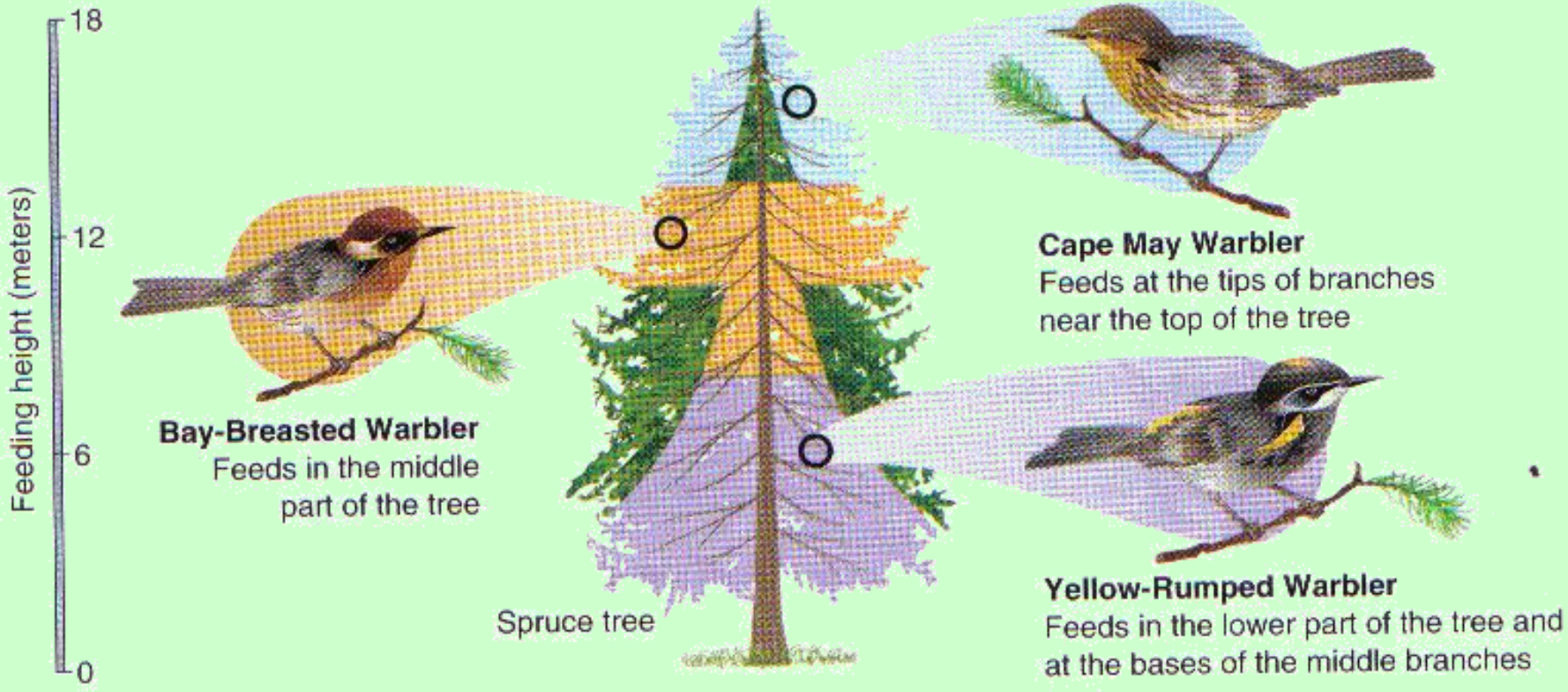
NICHE

= place it lives PLUS the biotic & abiotic interactions it has in that place

NICHE includes: Where it lives PLUS . . .

- What it eats? What eats it?
- Where in the habitat it lives?
  - In a tree, in a pond, underground
- Its actions… hibernating, migrating, etc
- When & how it reproduces?

NO TWO SPECIES CAN SHARE THE SAME NICHE !



= Competitive exclusion principle

BIOLOGY; Miller and Levine; Prentice Hall; 2006

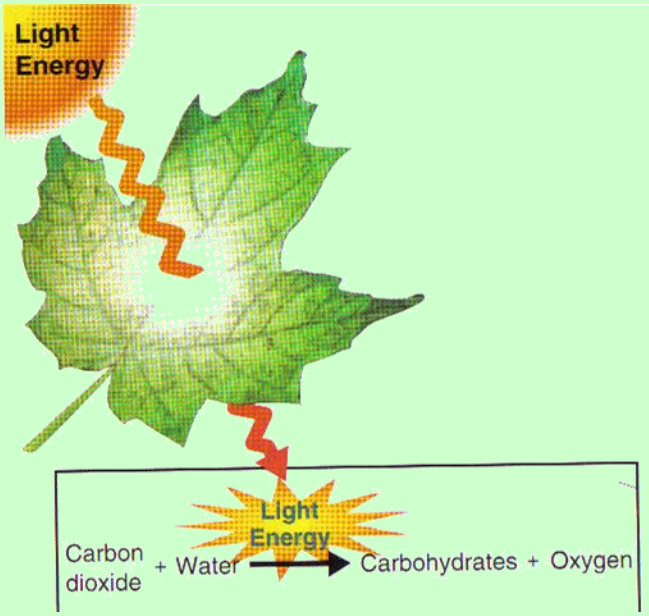
ALL LIVING THINGS USE ENERGY

AUTOTROPHS = PRODUCERS
Can make their own food

Most autotrophs use PHOTOSYNTHESIS to capture solar energy

Main producers on land = green plants

In water = algae



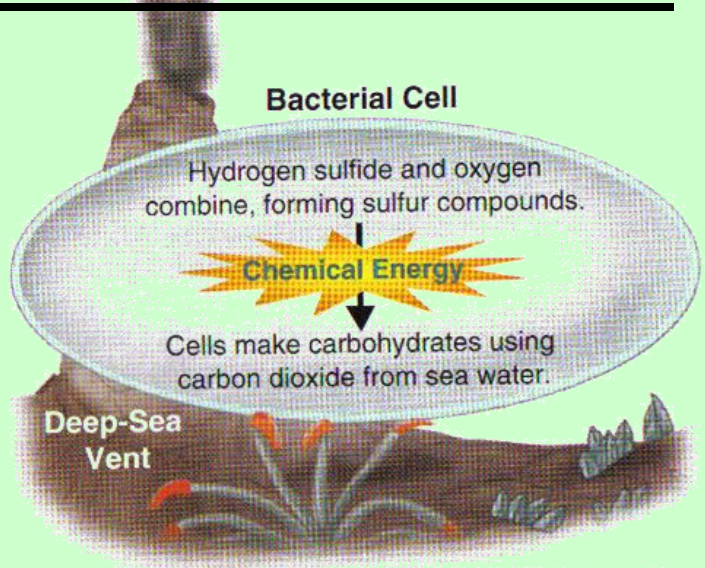
BIOLOGY; MIller and Levine; Prentice Hall; 2006

Some autotrophs can make own food in the absence of light

They use energy stored in chemical bonds of INORGANIC MOLECULES to produce carbohydrates = CHEMOSYNTHESIS

Ex: Bacteria that live in HOSTILE places

Like volcano vents, hot springs, marshes



CHEMOSYNTHESIS IN SULFUR BACTERIA

HETEROTROPHS = CONSUMERS

Get energy from consuming other organisms

http://www.epa.gov/region5/superfund/ecology/images/fishcartoon.gif

HETEROTROPHS = CONSUMERS

HERBIVORES =

eat only plants

CARNIVORES =

eat only animals

OMNIVORES =

eat both plants & animals

http://gallery.hd.org/_exhibits/natural-science/_more2003/_more09/elephant-eating-greenery-in-Addo-Park-Eastern-Cape-South-Africa-2-WL.jpg
http://personal.ecu.edu/wuenschk/rabbit-wolf.gif
http://www.rodsguide.com/bears/eating.jpg

HETEROTROPHS = CONSUMERS

DETRITIVORES =

feed on plant & animal remains

EX: mites, earthworms, snails, crabs

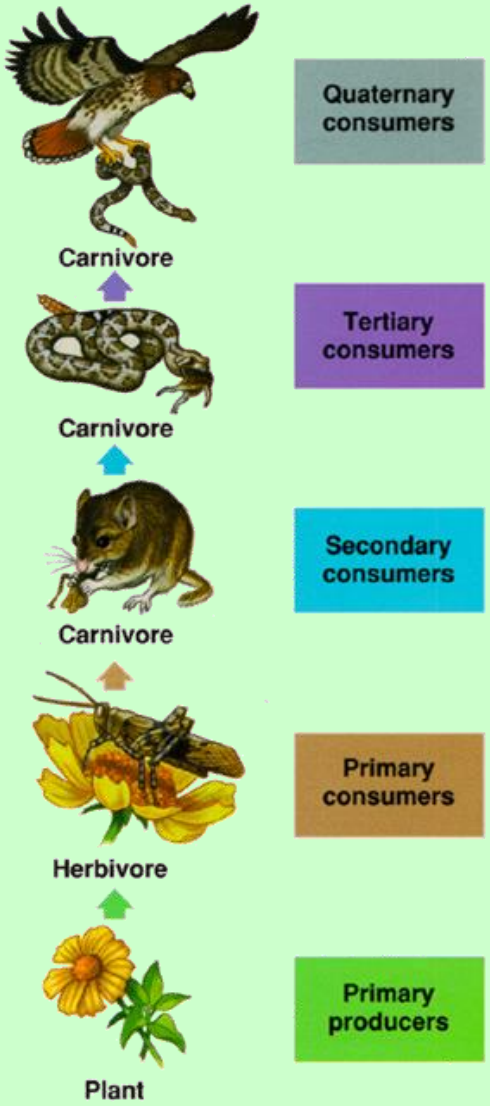
DECOMPOSERS =

break down and absorb organic matter

EX: bacteria & fungi

http://montereybayphotos.com/images/nature/2.jpg
http://www.fwnp.com/bracket-fungi.htm

Energy flows through an ecosystem in a series of steps in which organisms transfer energy by being eaten



CONSUMERS
(Heterotrophs)

↑

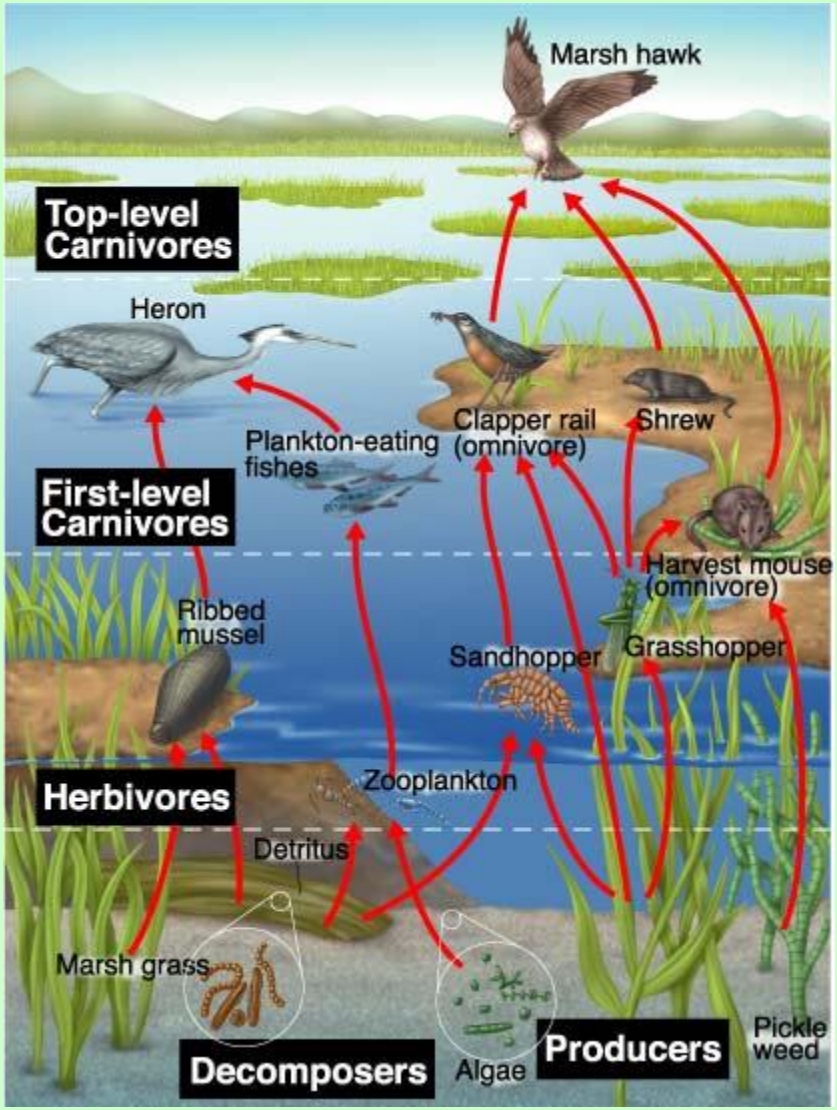
↑

PRODUCERS
(Autotrophs)

= FOOD CHAIN

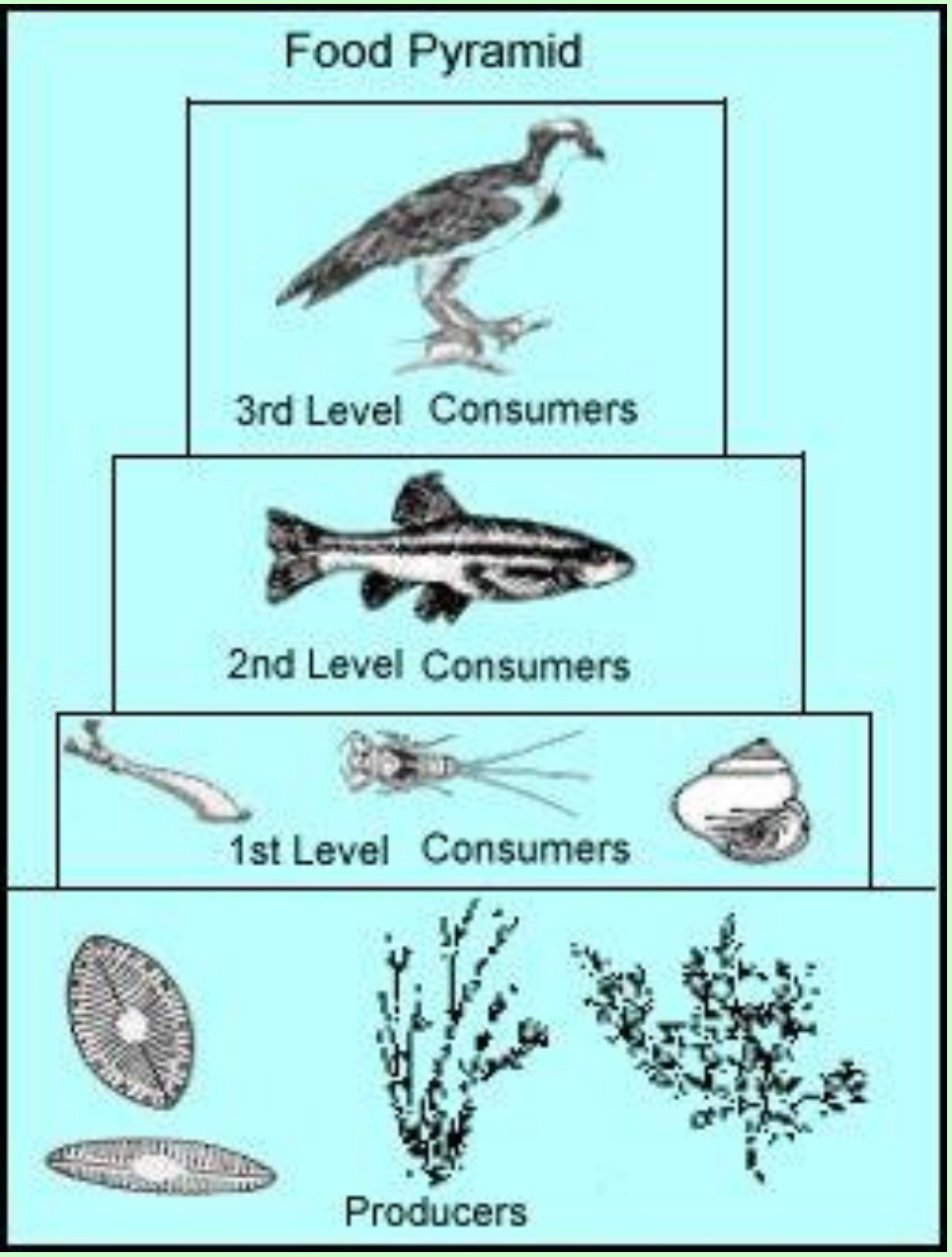
http://fig.cox.miami.edu/Faculty/Dana/foodchain.jpg

Pearson Education Inc, Publishing as Pearson Prentice Hall



In most ecosystems feeding relationships are more complex

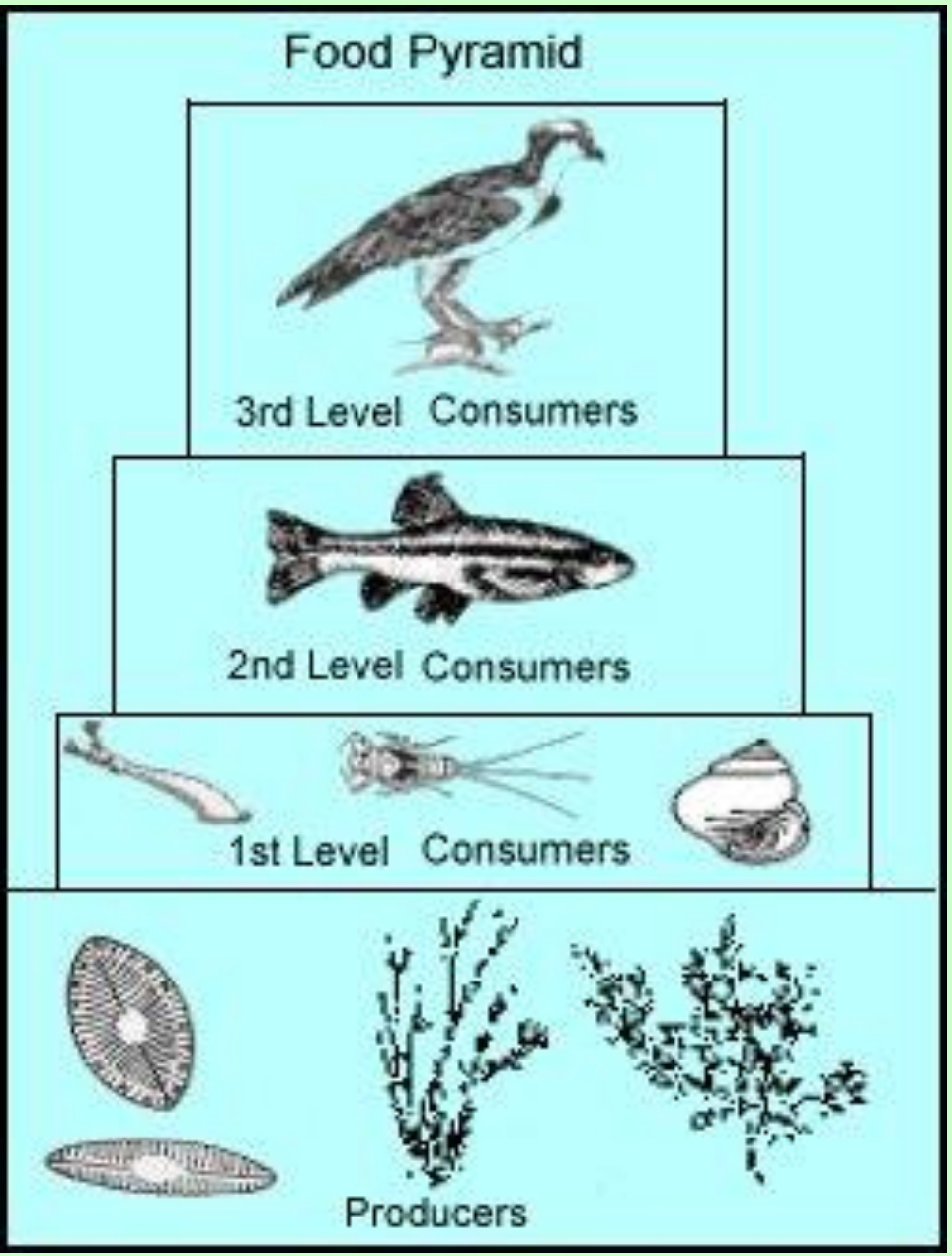
A FOOD WEB links ALL the food chains in an ecosystem together.



Each step in a food chain or web = TROPHIC LEVEL

PRODUCERS ALWAYS make up the FIRST trophic level.

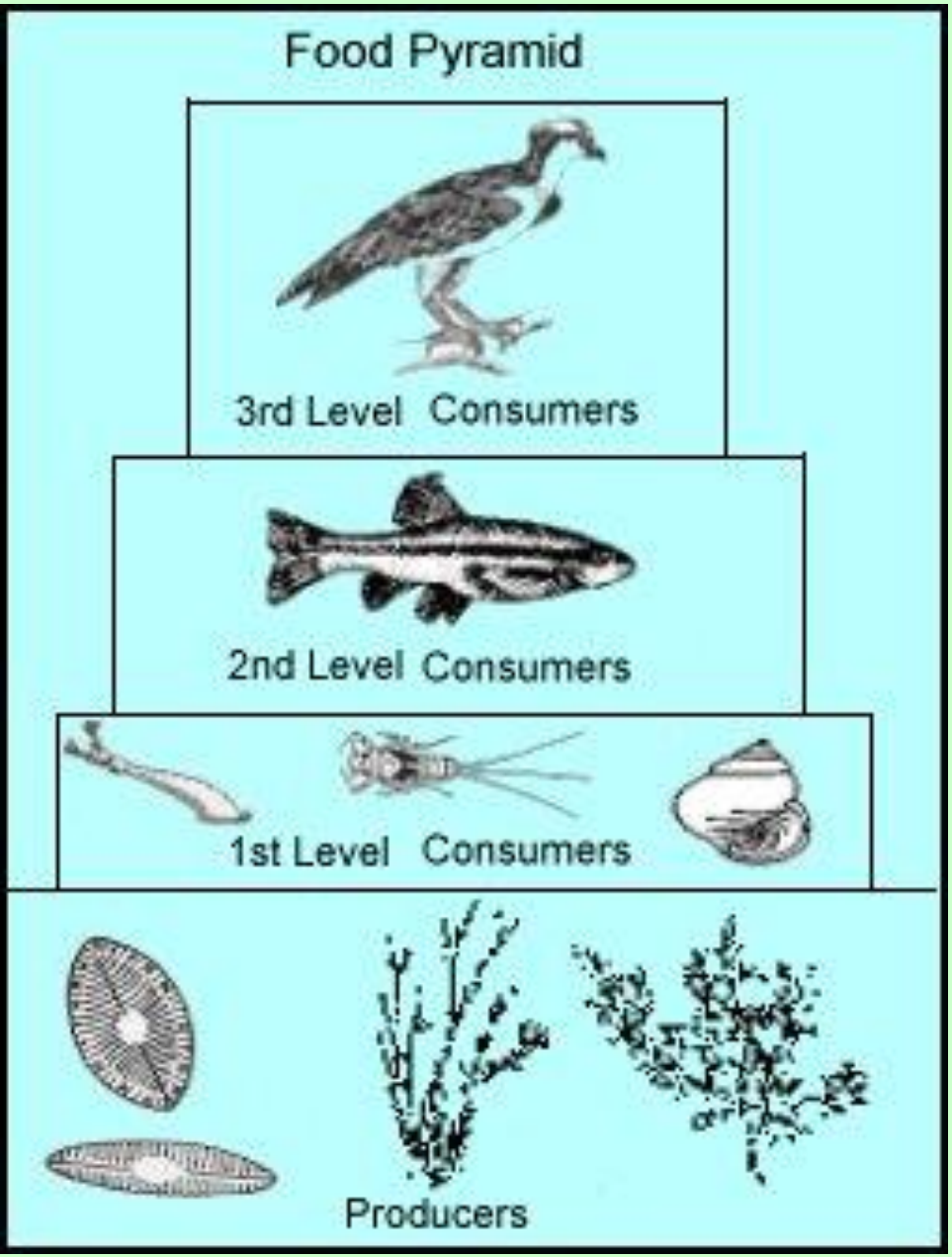
http://home.insightbb.com/~g.mager/Pond/Ecosystem.htll



Lower levels must be bigger to support the level above.

Only about 10% of the energy from each level is passed on.

http://home.insightbb.com/~g.mager/Pond/Ecosystem.htll



Some energy is used for life processes such as growth, development, movement, metabolism, transport, and reproduction.

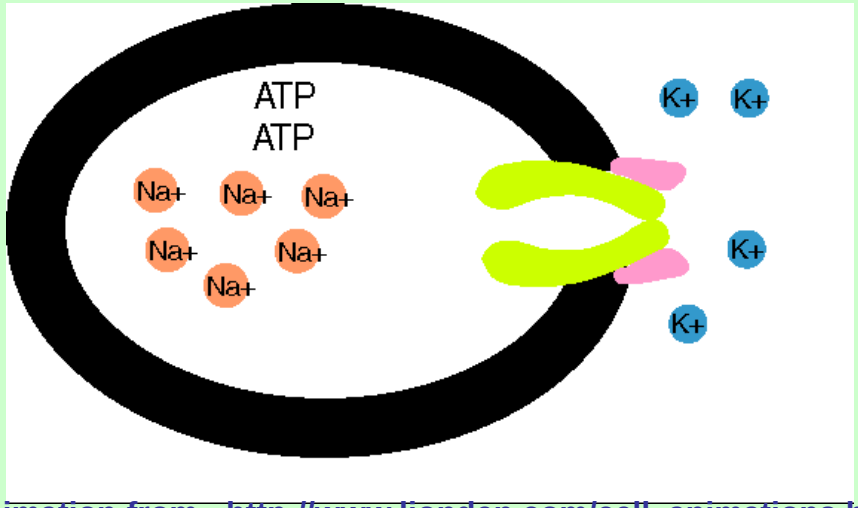
The rest is lost as HEAT

http://home.insightbb.com/~g.mager/Pond/Ecosystem.htll

WHAT DO CELLS USE ENERGY FOR ?

ACTIVE TRANSPORT

Na+ - K $^{+}$ PUMP
Endocytosis
Exocytosis



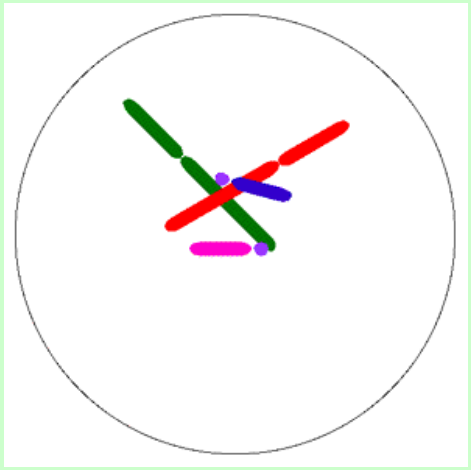
Animation from: http://www.lionden.com/cell_animations.htm

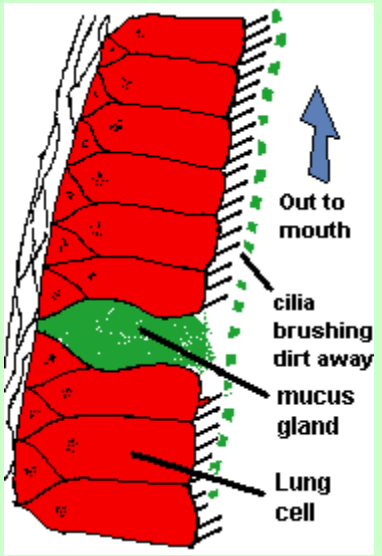
See a movie

Animation from: http://academic.brooklyn.cuny.edu/biology/bio4fv/page/cell-movement.html

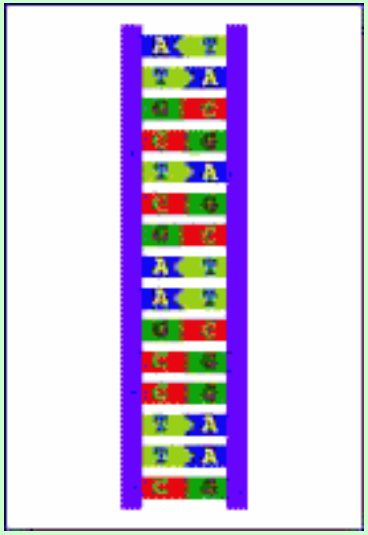
WHAT DO CELLS USE ENERGY FOR ?

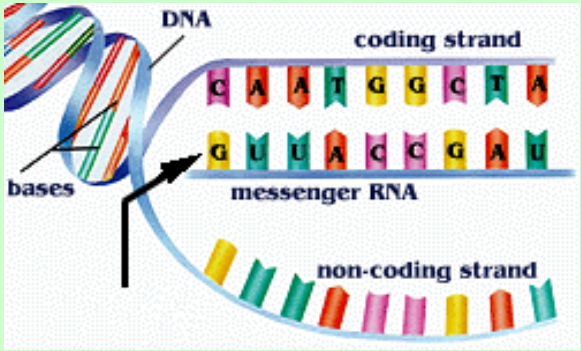
Movement

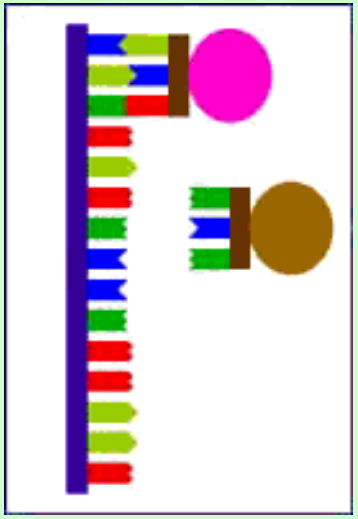




Synthesis of biomolecules







Meiosis: http://www.tokyo-med.ac.jp/genet/anm/
Cilia: http://www.sk.lung.ca/content.cfm?edit_realword=hwbreathe
Replication: http://www.beyondbooks.com/lif71/4c.asp
Transcription:http://www.wappingersschools.org/RCK/staff/teacherhp/johnson/visualvocab/mRNA.gif
Translation:

Growth and Development

REPRODUCTION

Family image from: http://babyhearing.org/Parenet2Parent/index.asp

http://www.mark-ju.net/wildlife/images/monkey03.jpg

http://www.dimijianimages.com/Aggression-defense-page4/vultures.jpg

WAYS ORGANISMS INTERACT 4-2

http://www.epa.gov/region5/superfund/ecology/images/fishcartoon.gif

http://www.uark.edu/depts/agripub/Publications/Agnews/mosquito.jpg

Ways organisms interact

COMPETITION

Between SAME and DIFFERENT kinds of organisms
Compete with each other for available resources

PREDATION

Between DIFFERENT kinds of organisms
Hunt and kill other organisms to supply their energy needs

COOPERATION

Between SAME kind of organisms
Live together and help each other

SYMBIOSIS

Between DIFFERENT kinds of organisms
live in close association with another kind of organism

WHAT IS A RESOURCE?

Anything needed by an organism for life

Examples:

Nutrients, water, light, space

COMPETITION

Organisms in an ecosystem have to compete with each other for available resources. FOOD

http://www.knology.net/~sgoswald/Eating.jpg

http://www.harcourtschool.com/glossary/science/images/gr3/community3.jpg

COMPETITION

Organisms in an ecosystem have to compete with each other for available resources: shelter

http://www.dpiw.tas.gov.au/inter.nsf/Images/LBUN-5K538R/$File/fox_adultandcub.jpg
http://www.gdccc.org/Records/EOY2004/NSEOY.htm

COMPETITION

Organisms in an ecosystem have to compete with each other for available resources

mates

http://www.wasatchcomputers.net/gallery/elk_fight.jpg

http://www.biocrawler.com/w/images/thumb/3/34/200px-Peacock_courting_peahen.jpg

COMPETITION

Organisms in an ecosystem have to compete with each other for available resources: space/territory

http://www.elise.com/weblog/photos/prairie-dogs.jpg

Prairie dogs - 5 to 35 per acre
Mountain lion- 1 male per 50-300 sq. mi

http://www.rilanationalpark.org/gr.phtml?dir=../../pictures/in_text&img=/65_1180.jpg

COMPETITION

Organisms in an ecosystem have to compete with each other for available resources: LIGHT

http://vilenski.org/science/safari/cellstructure/chloroplasts.html
http://www.csjbacau.ro/gallery/images/Beech%20Tree%20Forest%20in%20Slanic%20Moldova.jpg

INTERDEPENDENCE

All living and non-living things in an ecosystem are interconnected and changing even one thing impacts the whole ecosystem.

**When one tugs at a single thing in nature,
he finds it attached to the rest of the world.**

~John Muir, naturalist, Sierra Club founder

COMPETITION

If resources are scarce, some organisms will starve and populations will <u>decrease</u>.

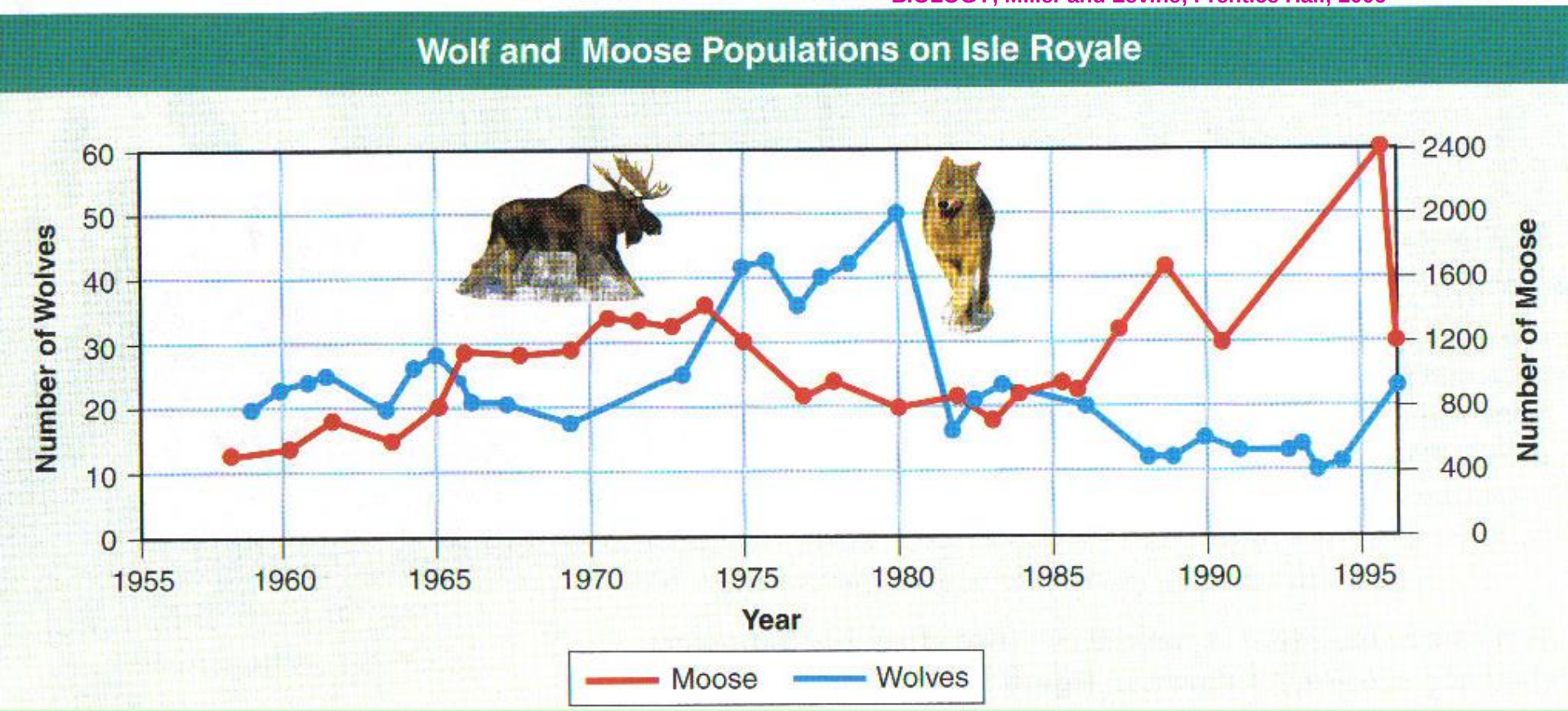
If resources become more plentiful, populations will <u>increase</u>.

Competition in nature often results in a winner and a loser

. . . with the loser failing to survive!

REMEMBER: EVERYTHING IS CONNECTED !

BIOLOGY; MIller and Levine; Prentice Hall; 2006



A decrease in the prey population means some predators will starve.
Fewer predators mean prey population will increase.

Increase in prey means more food for predators.
Predator population will increase until there is not enough food . . .
and the cycle repeats itself.

LIMITING NUTRIENT


http://www.greenfacts.org/images/glossary/algae-bloom.jpg

The short supply of a limiting nutrient keeps the population in check.

When an ecosystem receives a LARGE input of limiting nutrient (ie.,fertilizer runoff) the population increases dramatically = ALGAL BLOOM

Ways organisms interact

COOPERATION

Between SAME kind of organisms
Live together and help each other

http://www.mark-ju.net/wildlife/images/monkey03.jpg

COOPERATION

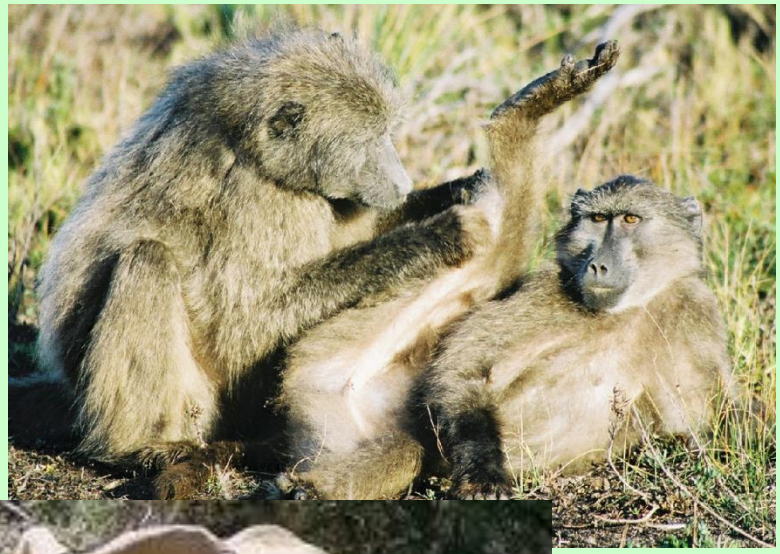
Same species live together in groups

EX: herds, packs, colonies, families, etc

Share food &
childcare responsibilities

Groom each other

Take care of sick



http://www.kenyatravelideas.com/african-elephants.html
http://www.sphoto.com/medium/meercats37.jpg
http://people.uleth.ca/~d.rendall/groom4.jpg

COOPERATION

Same species live together in groups
EX: herds, packs, colonies, families, etc

Hunt in packs

Provide protection

http://www.knology.net/~sgoswald/Eating.jpg
http://rosswarner.com/zebras1.jpg

Ways organisms interact

SYMBIOSIS

Between DIFFERENT kinds of organisms

Live in close association with another kind of organism

http://www.zahnersatz.com/english/library/symbiosis.jpg

3 KINDS of SYMBIOSIS

MUTUALISM

Both organisms benefit

COMMENSALISM

One organism benefits;
Other is neither harmed nor helped

PARASITISM

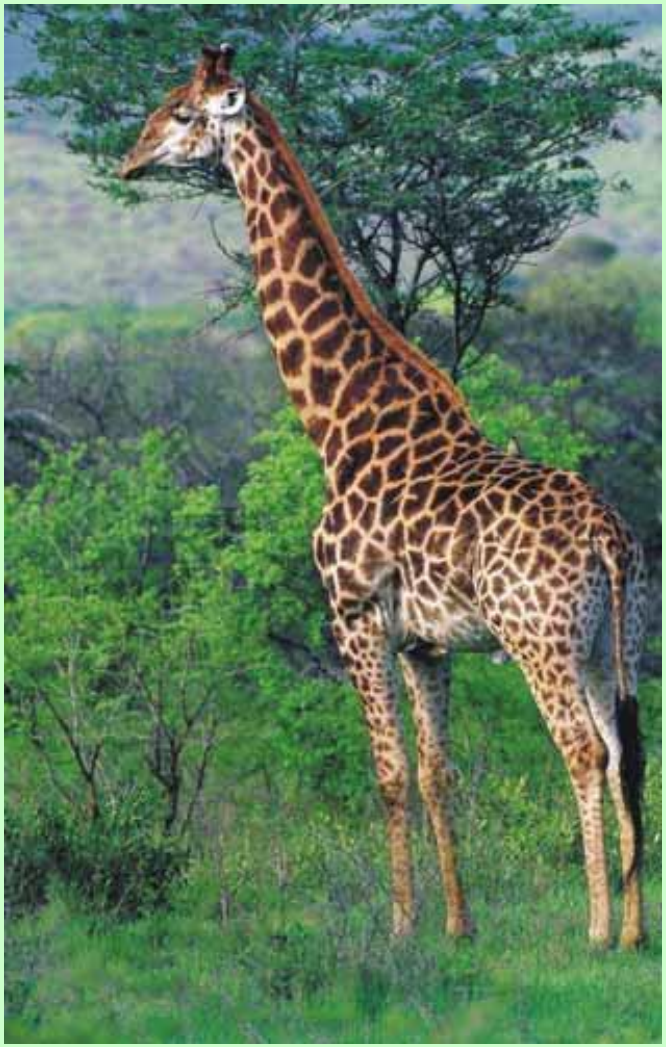
One organism benefits;
Other is harmed in some way

MUTUALISM

"Good for me - Good for you"

Birds eat parasites living on the hides of giraffes and rhinos while enjoying protection from predators. Groomed animals lose their pests.

http://www.hugheshome.net/jon/africa02/images/rhino_bird_JPG.jpg



http://www.imbt.org/science.htm

MUTUALISM

"Good for me - Good for you"

http://www.providence.edu/bio/faculty/adams/LECTUREProvCollegeMutualism.html

Insects transfer pollen between plants as they gather nectar for food.

http://www.yksd.com/DistanceEdCourses/YKSDbiology/lessons/SecondQuarterLessons/Chapter5/5-5/images/3-way-mutualism.jpg

COMMENSALISM

"Good for me - Doesn't bother you"

Pilot fish receive scraps of food dropped by shark,
Shark is neither harmed nor helped

COMMENSALISM

"Good for me - Doesn't bother you"

Hermit crabs make homes in shells abandoned by snails; Snail is not harmed by crab

PARASITISM

"Good for me - Hurts you"

Barnacles are crustaceans that attach to the surface of whales and feed on their skin and fluids; Whale is harmed

PARASITISM

"Good for me - Hurts you"

http://www.dogbreedinfo.com/guineafowltickphotos.htm

Tick feeds on dog's blood;
Dog has discomfort, can get diseases/infection from bite

PARASITISM

"Good for me - Hurts you"

Tapeworms absorb food by living inside host intestine; host is harmed

http://www.biology.ucok.edu/AnimalBiology/Platyhelminthes/tapeworms.jpg