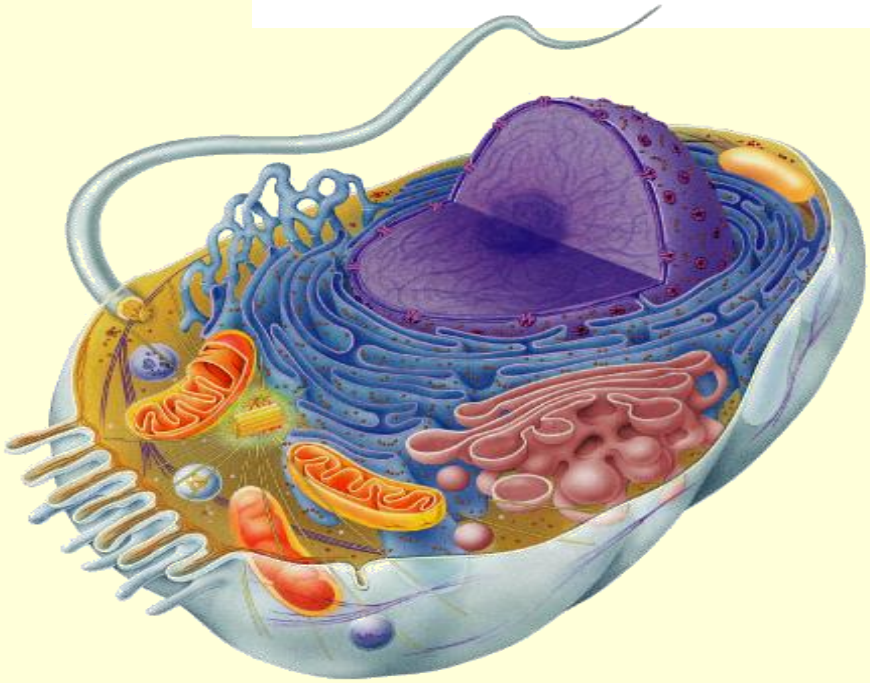
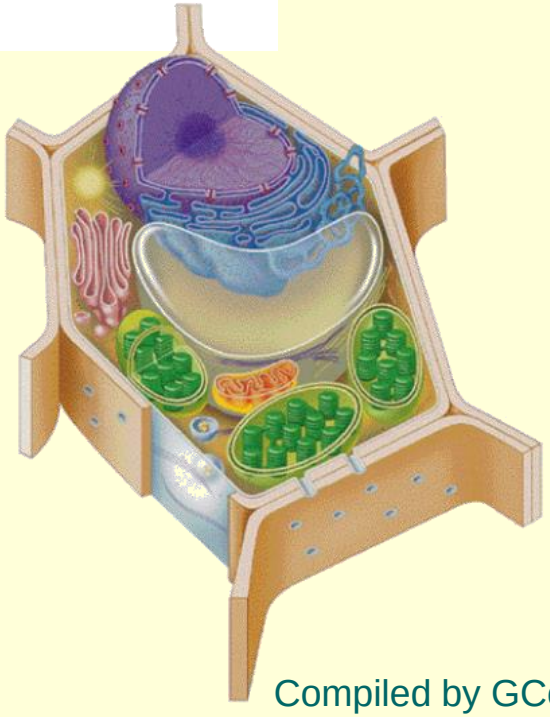
Living Environment Review

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

LIVING ENVIRONMENT





Compiled by GCochrane
Half Hollow Hills HS East

Regents Exam Format

A: 30 Multiple Choice

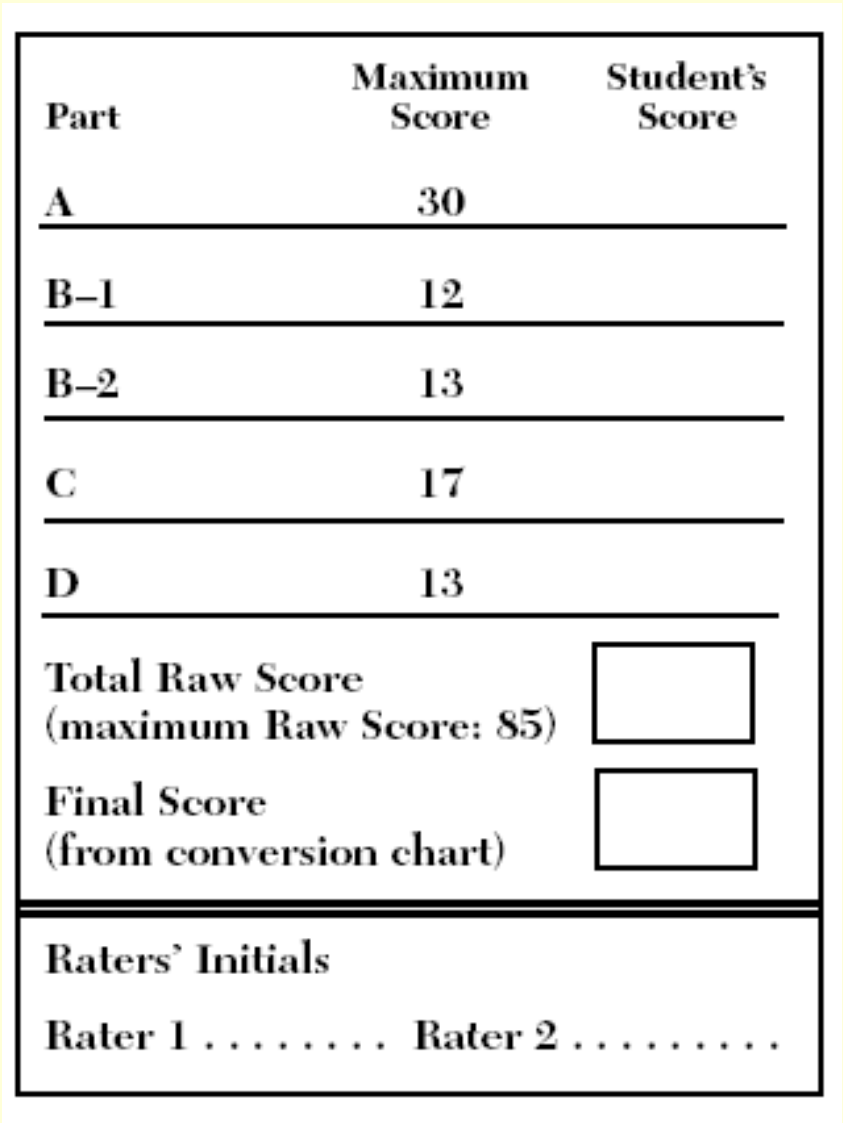
B-1: Multiple Choice

B-2: MC and Short constructed response
Reading passages, graphing, lab skills

C: Constructed Responses

D: Labs and Lab Skills

- Making Connections
- Beaks of the Finches
- Relationships and Biodiversity
- Diffusion Through a Membrane



Part	Maximum Score	Student's Score
A	30	
B–1	12	
B–2	13	
C	17	
D	13	
Total Raw Score (maximum Raw Score: 85)		
Final Score (from conversion chart)		

Raters' Initials

Rater 1 . . . . . Rater 2 . . . . . .

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Living Environment Core Content and Material

STANDARD 4

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Unit 1 Web of Life: Interactions and Interdependence

Ecology: The branch of biology that deals with the interactions between organisms and the relationship between organisms and the environment.

Ecology is the study of the interactions of organisms and the environment

Ecology can be studied at different levels:

<u>Define the terms</u>

Organisms:

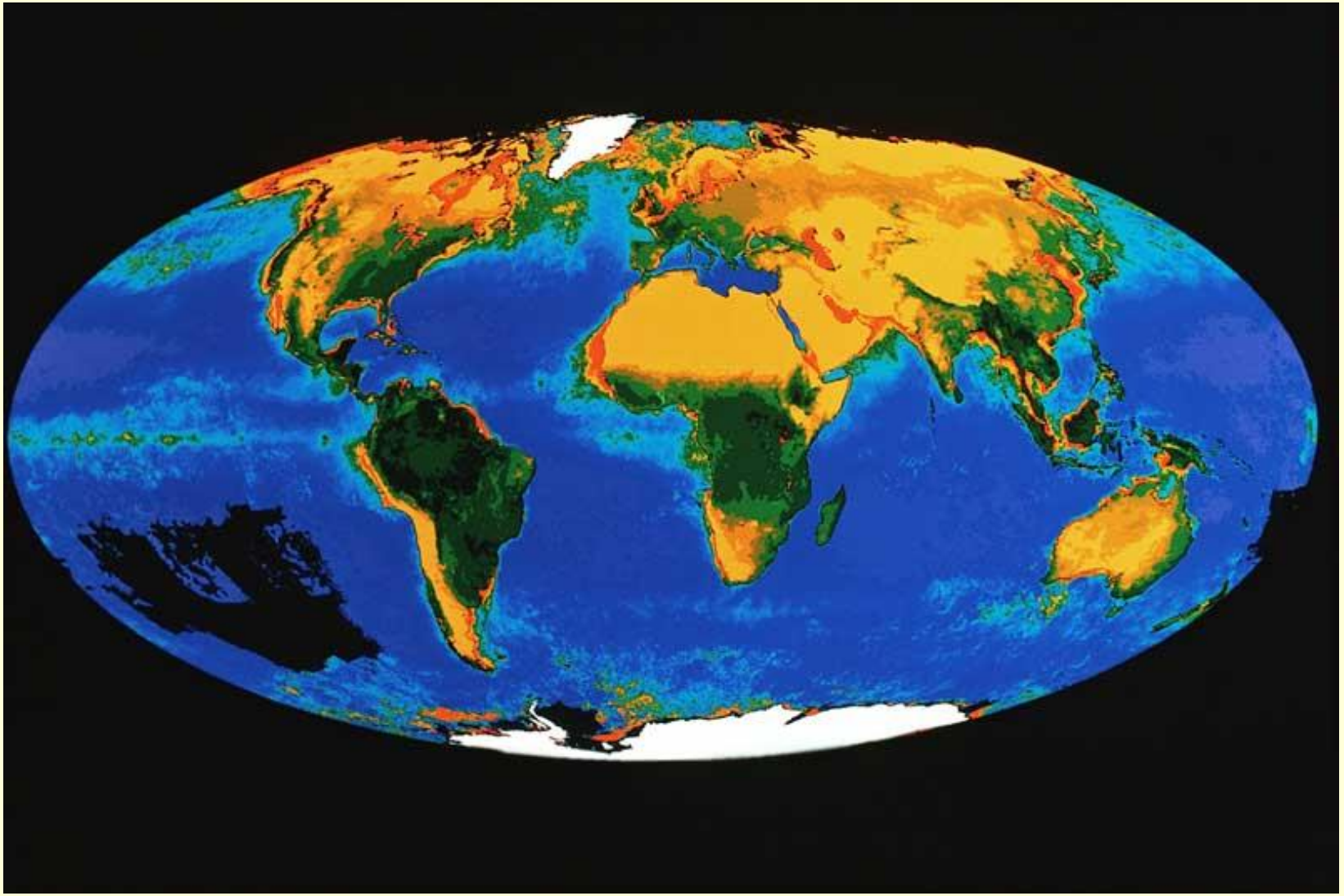
Populations:

Communities:

Ecosystems:

Biosphere:

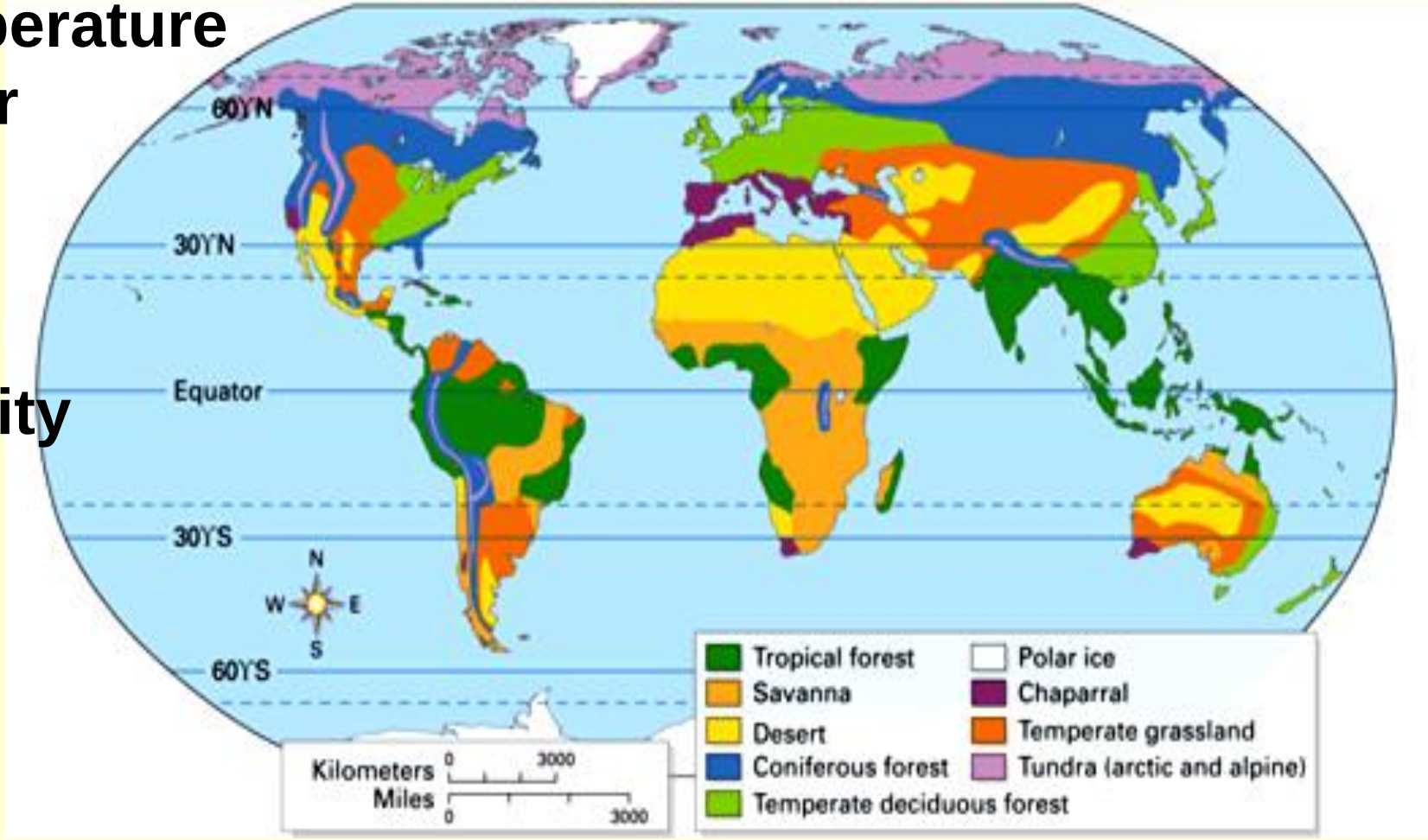
Factors Affect the Distribution of Organisms



The Biosphere

Abiotic Factors are the non-living, physical conditions that define the characteristics of the region.

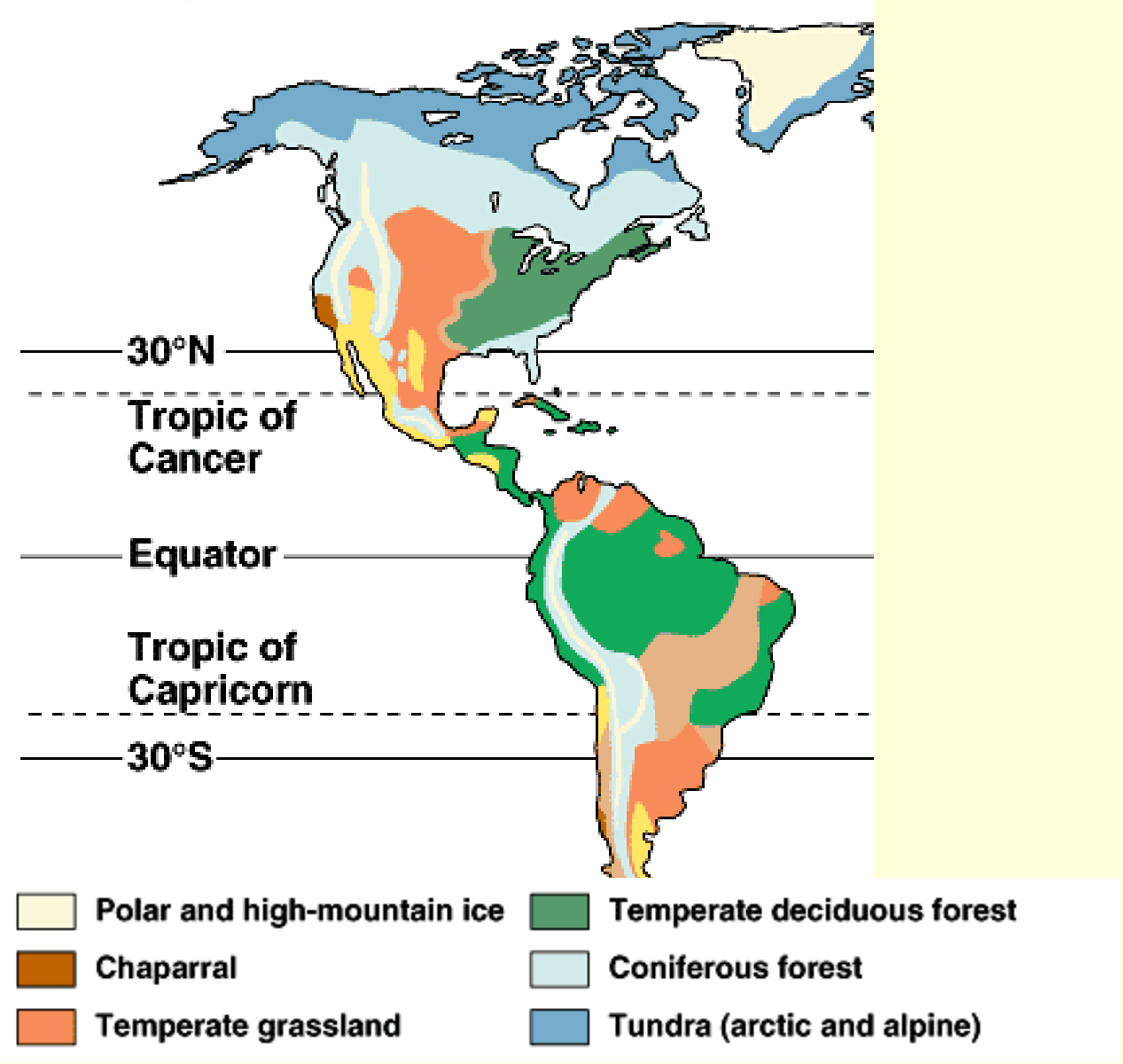
Climate
Temperature
Water
Light
Wind
Soil
Salinity
pH



Abiotic Factors can be Limiting Factors:

Determines the types of organisms which may exist in that environment.

The amount of rain fall and temperature range determines the types of plant communities



Biotic Factors involve interactions among living things.

Nutritional Interactions

Predator/Prey

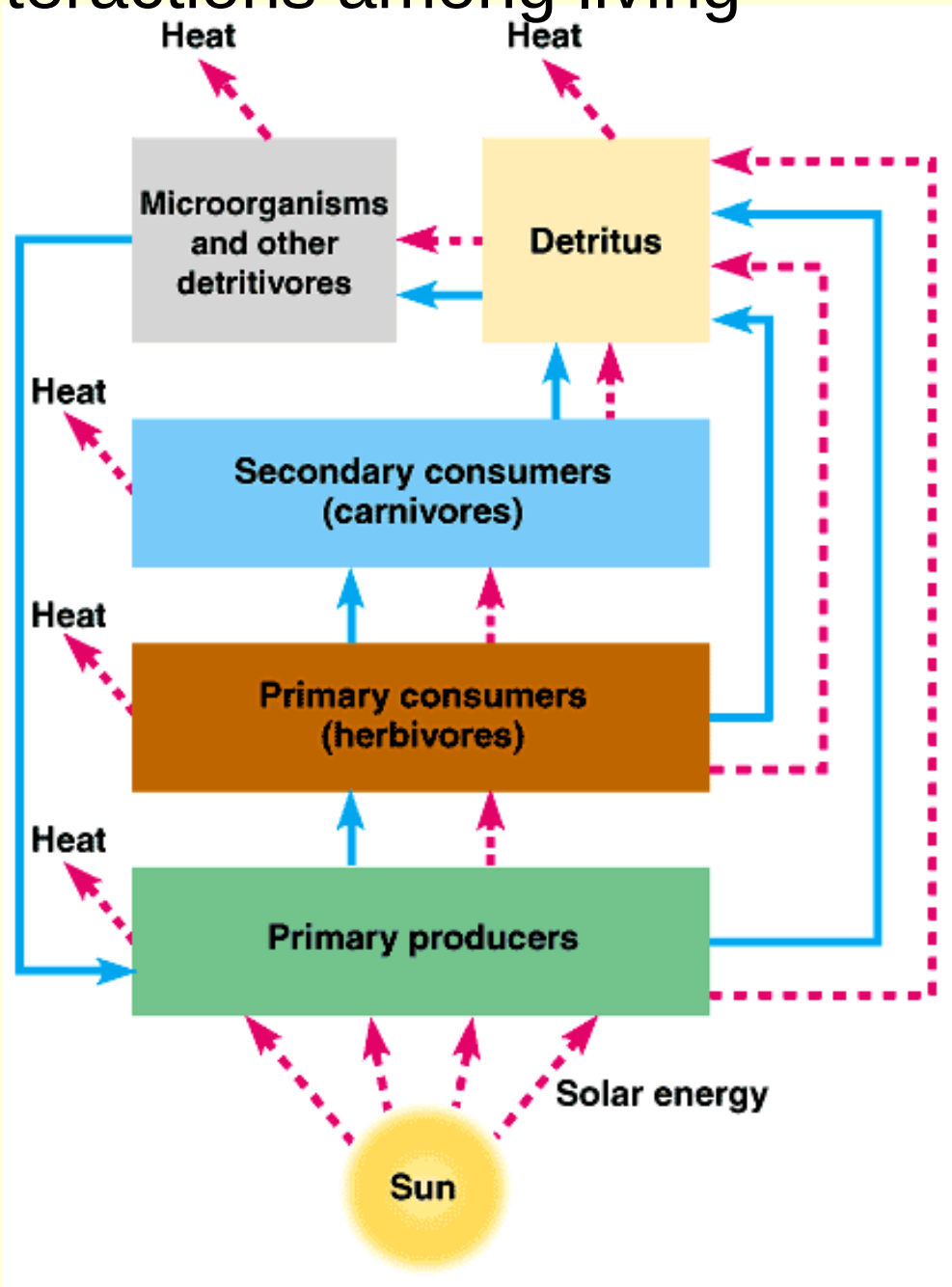
Parasite/Host

Producer/Consumer

Decomposition

Competition

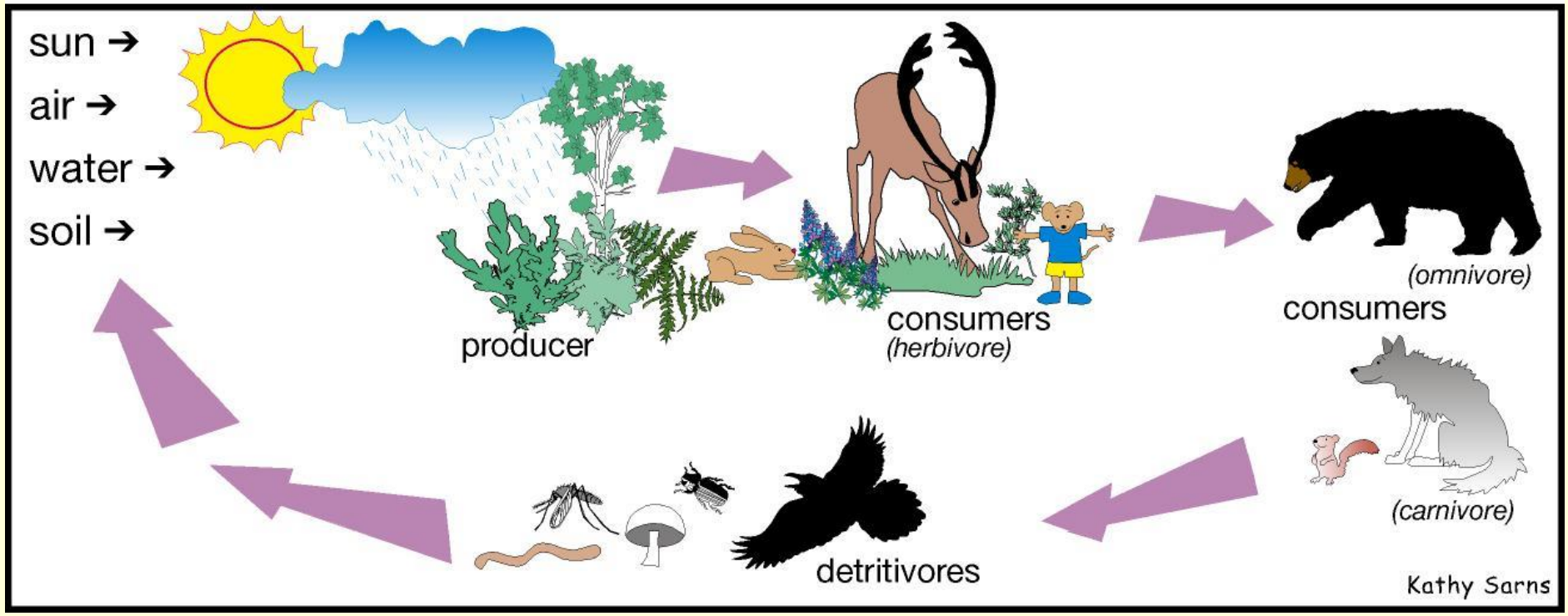
Food Webs



Nutritional Interactions

Involves the <u>transfer</u> of nutrients from one organism to another within an ecosystem.

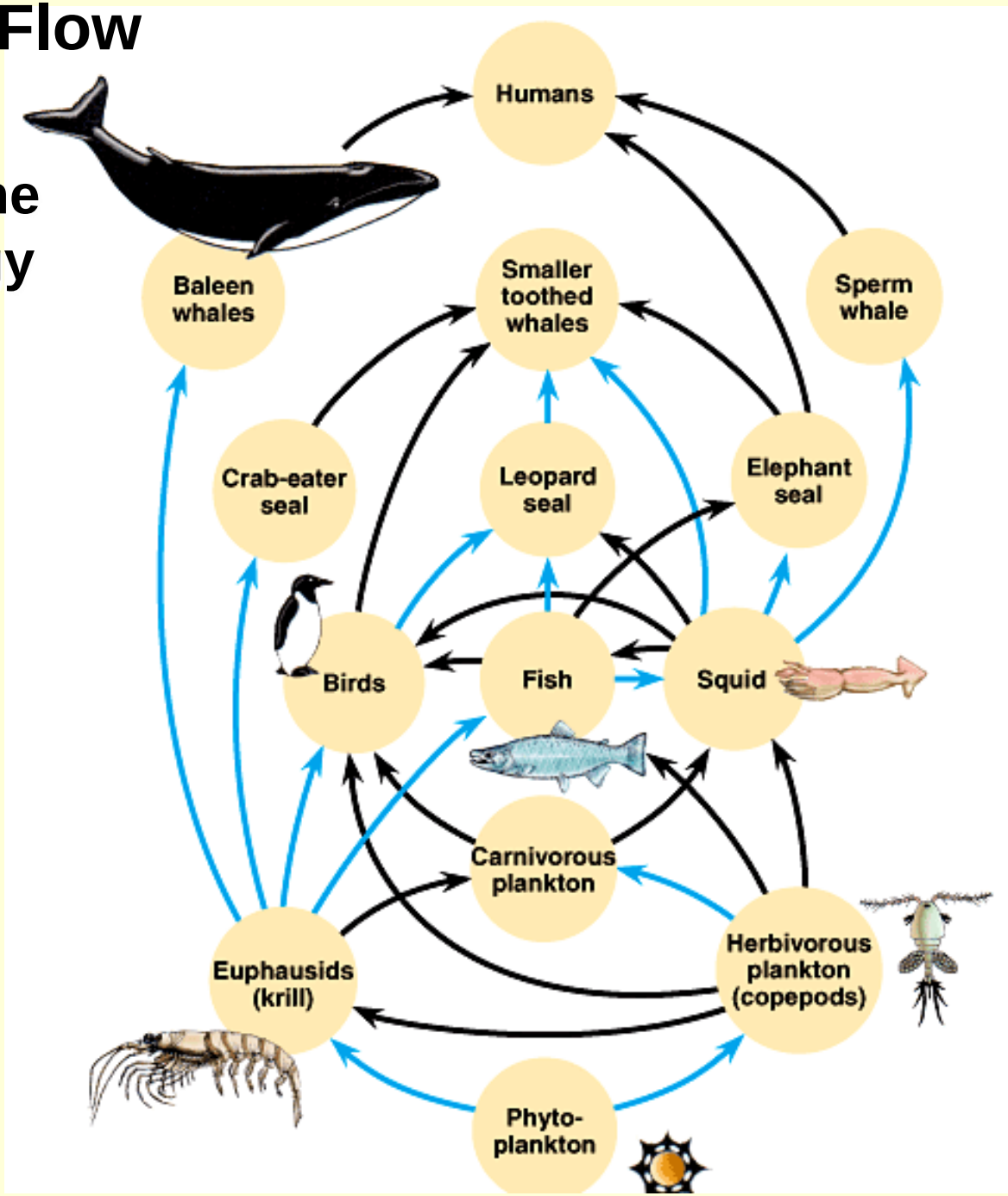
In terms of nutrition, organisms are either <u>autotrophs</u> or <u>heterotrophs</u>.

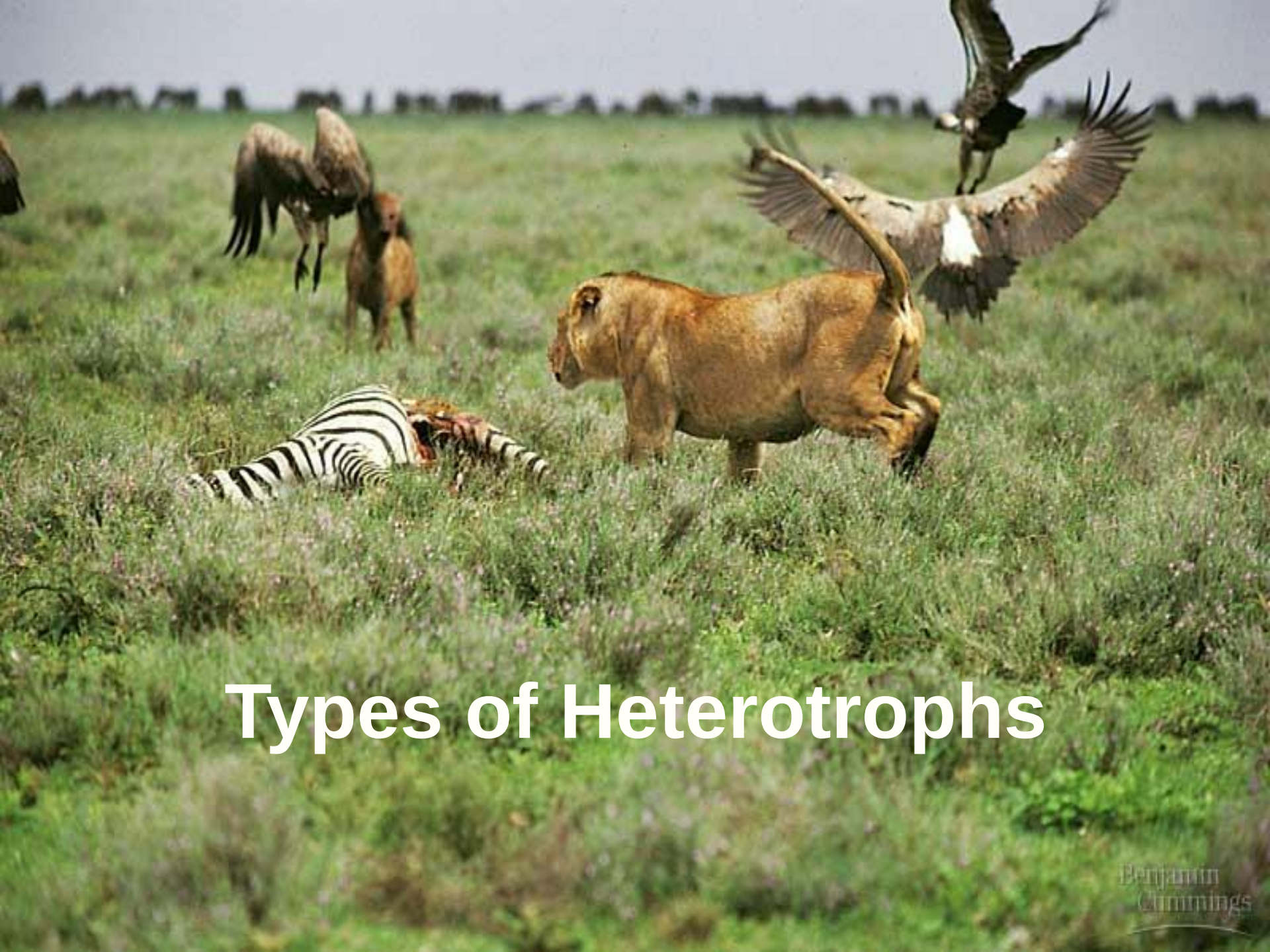


Pathway of Energy Flow

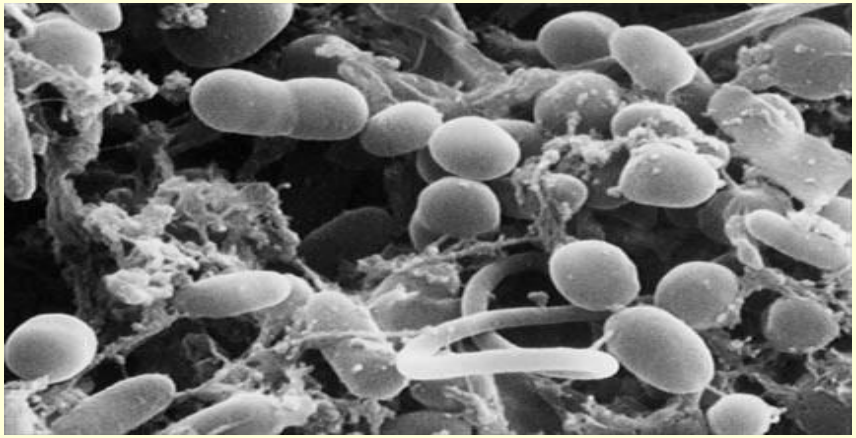
<u>Food Chain</u> involves the linear transfer of energy and material through a series of organisms.

<u>Food Web</u> shows the interrelationship between food chains.

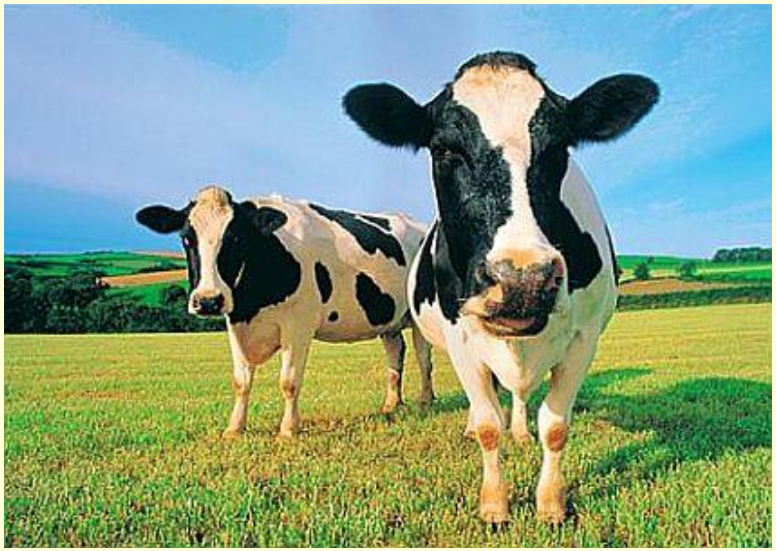



Types of Heterotrophs
Benjamin Cummings

Saprophytes- fungi, and bacteria which feed on dead organisms. (also called decomposers)



Herbivores- animals that feed on plants



Carnivores- animals that consume other animals**.**

a) predator – kills and consume their prey.

b) scavenger- feed on the remains of animals they did not kill.

Omnivores- animals that consume both plants & animals (humans)

Name some common organisms to match the nutritional terms

Producer

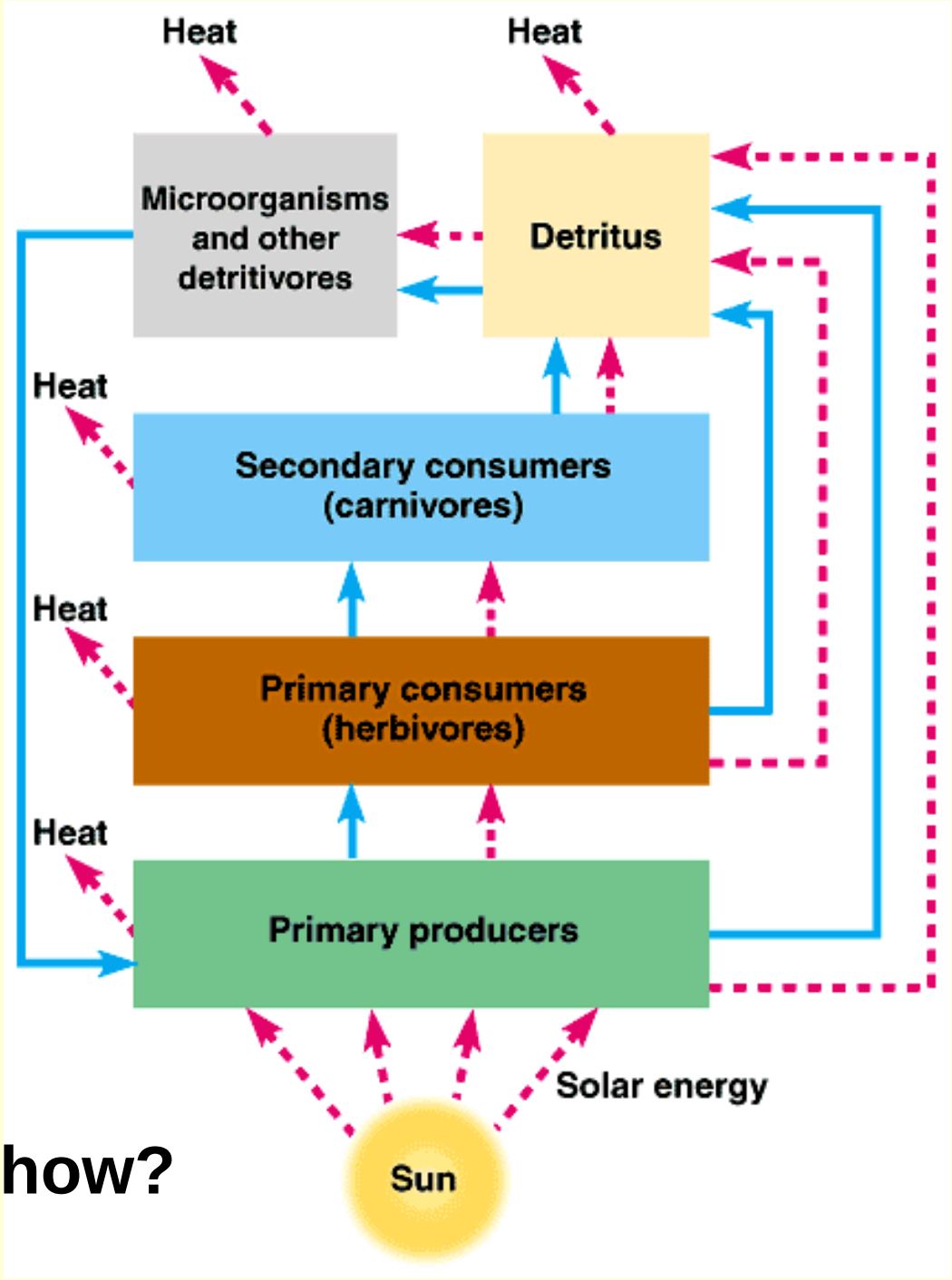
Herbivore

Carnivore

Heterotroph

Autotroph

Decomposer



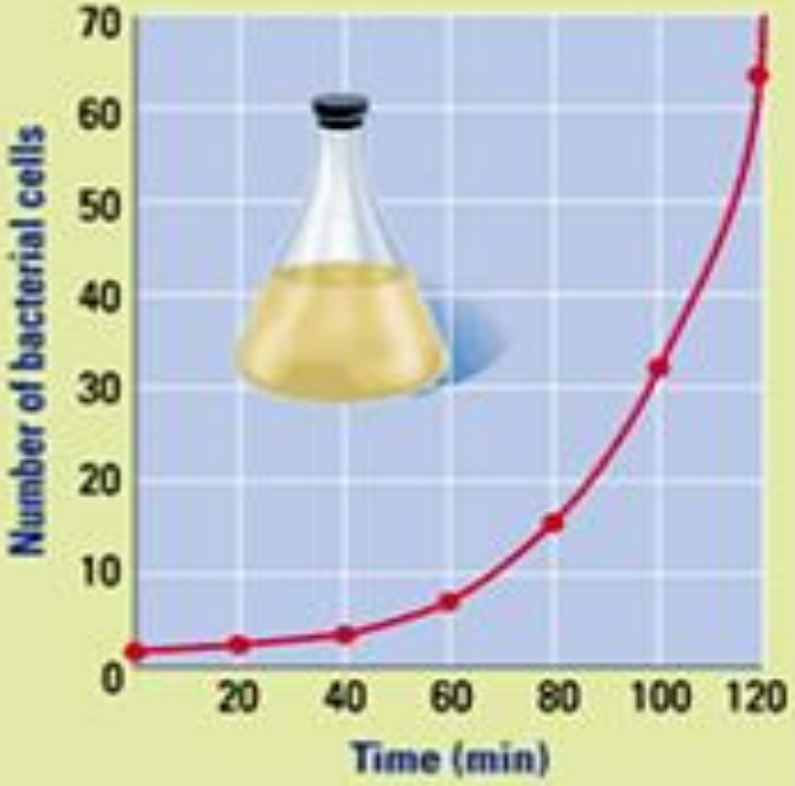
What do the arrows show?

Population Growth: Members of a species

This table shows how many bacteria are in a population that doubles every 20 minutes. The graph is another way to show the same data.

Exponential Growth of Bacteria

Time	Number of Cells	
0 min	1	$= 2^0$
20 min	2	$= 2^1$
40 min	4	$= 2^2$
60 min	8	$= 2^3$
80 min	16	$= 2^4$
100 min	32	$= 2^5$
120 (2 hr)	64	$= 2^6$
⋮	⋮	⋮
4 hr	4,096	$= 2^{12}$
⋮	⋮	⋮
12 hr	68,719,476,736	$= 2^{36}$

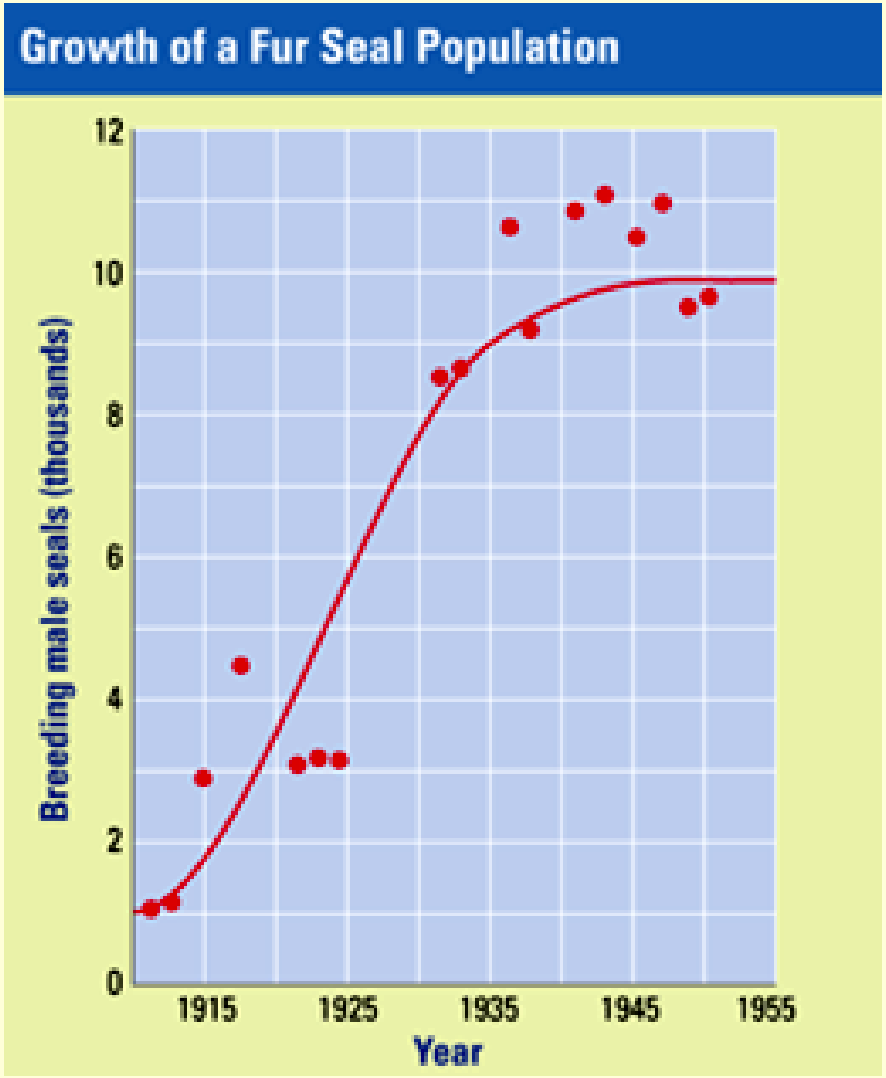


Population Growth: limiting factors determine the size of a population.

Carrying Capacity: is the maximum population size that a particular environment can support without degradation to the habitat.

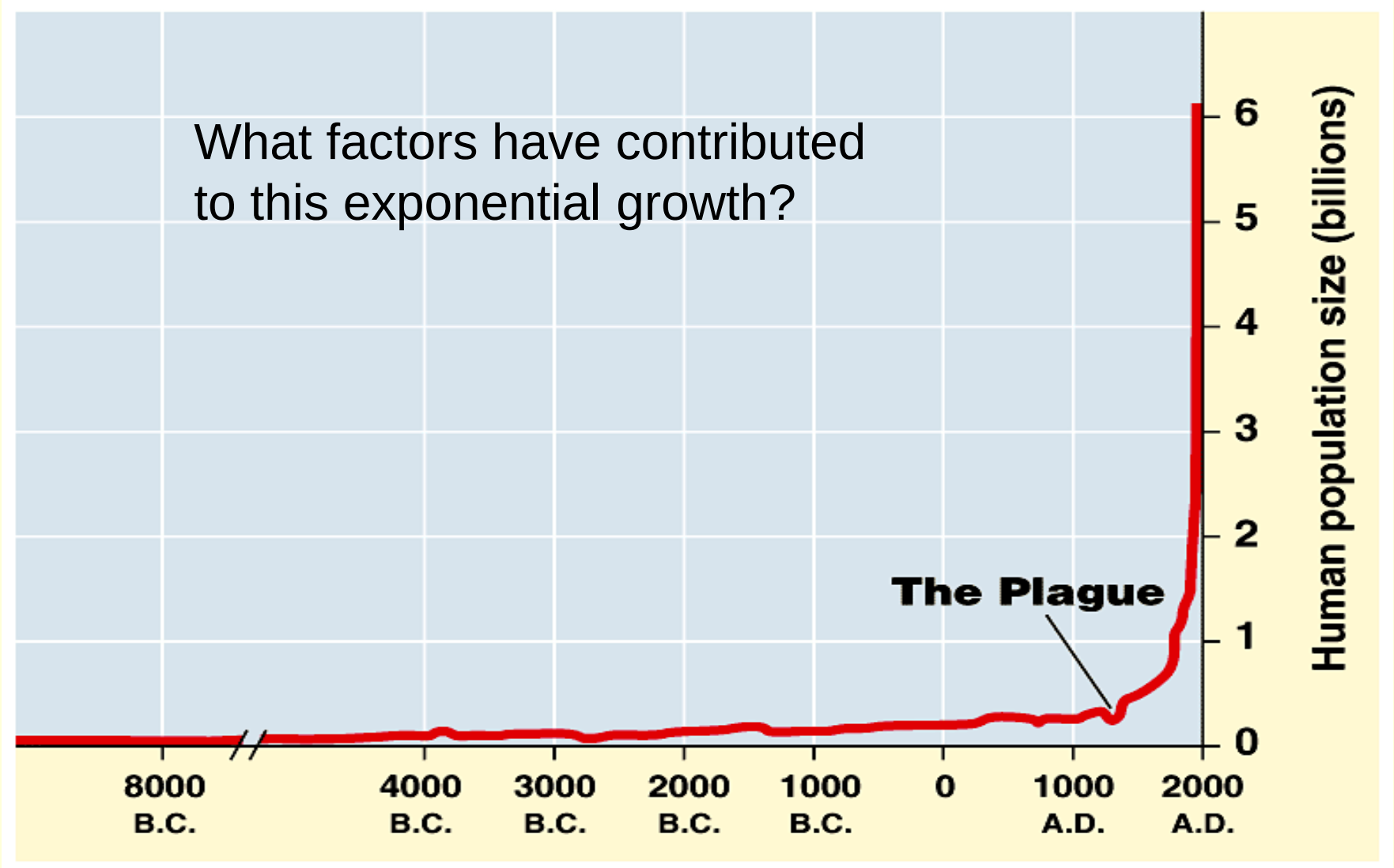
What factors contribute to determining the carrying capacity of an area?

Food, territory, water, predators, limiting resources…



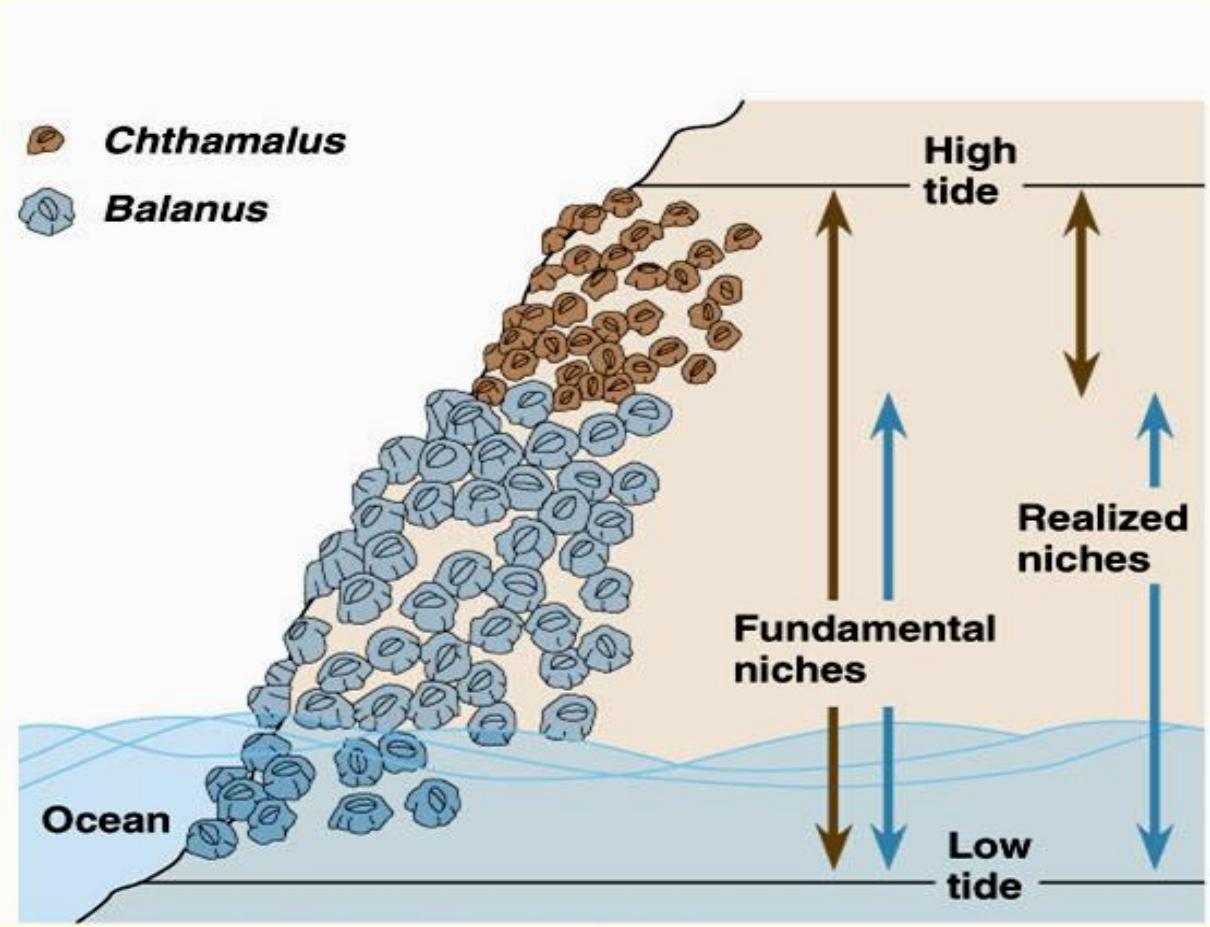
Human Population Growth

The size of the human population is the cause of many of issues detrimental to our ecosystems.



Ecological Niche: sum of all activities and relationships a species has while obtaining and using the resources needed to survive and reproduce

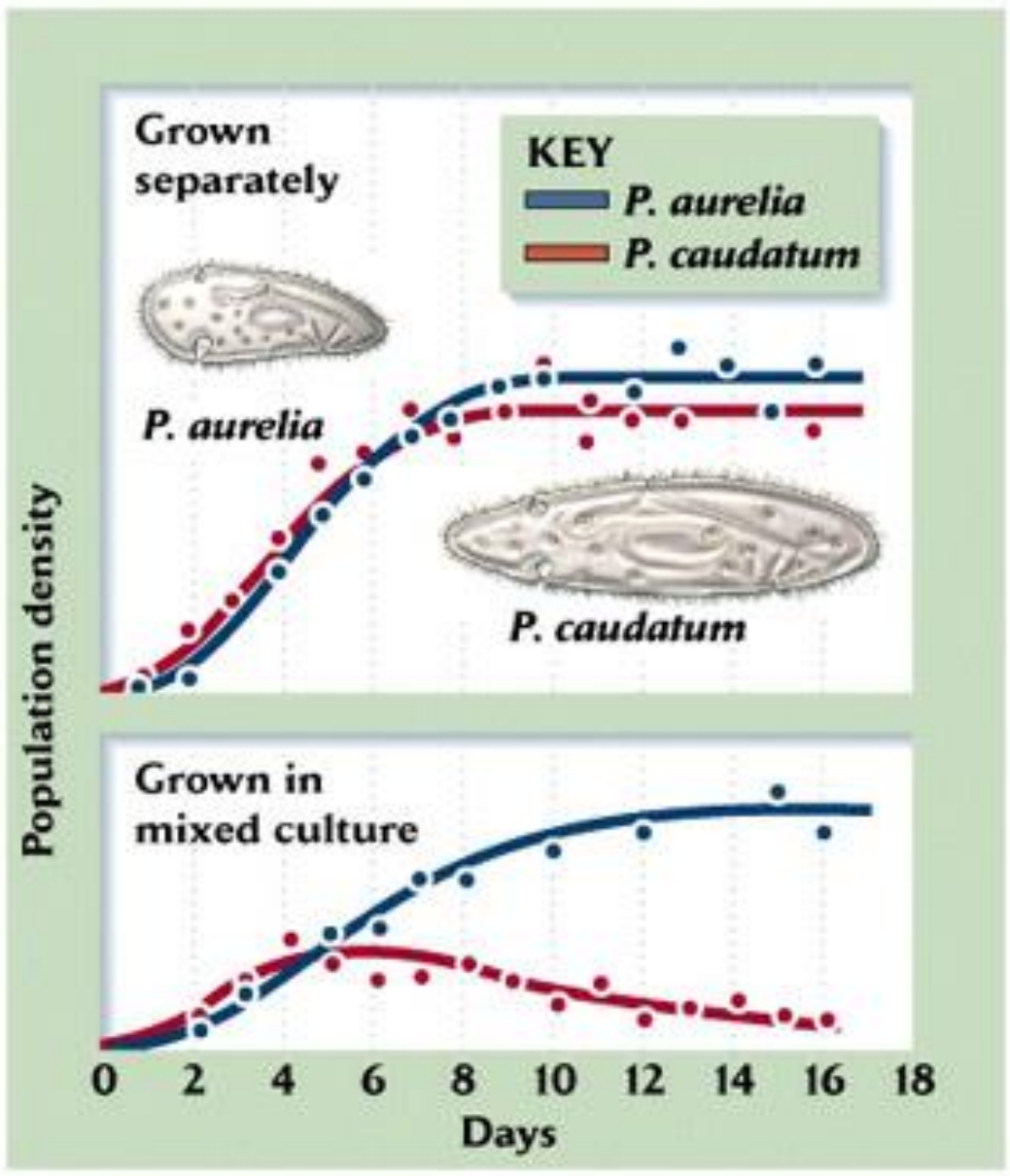
Ecological Habitat: the location or environment of a species



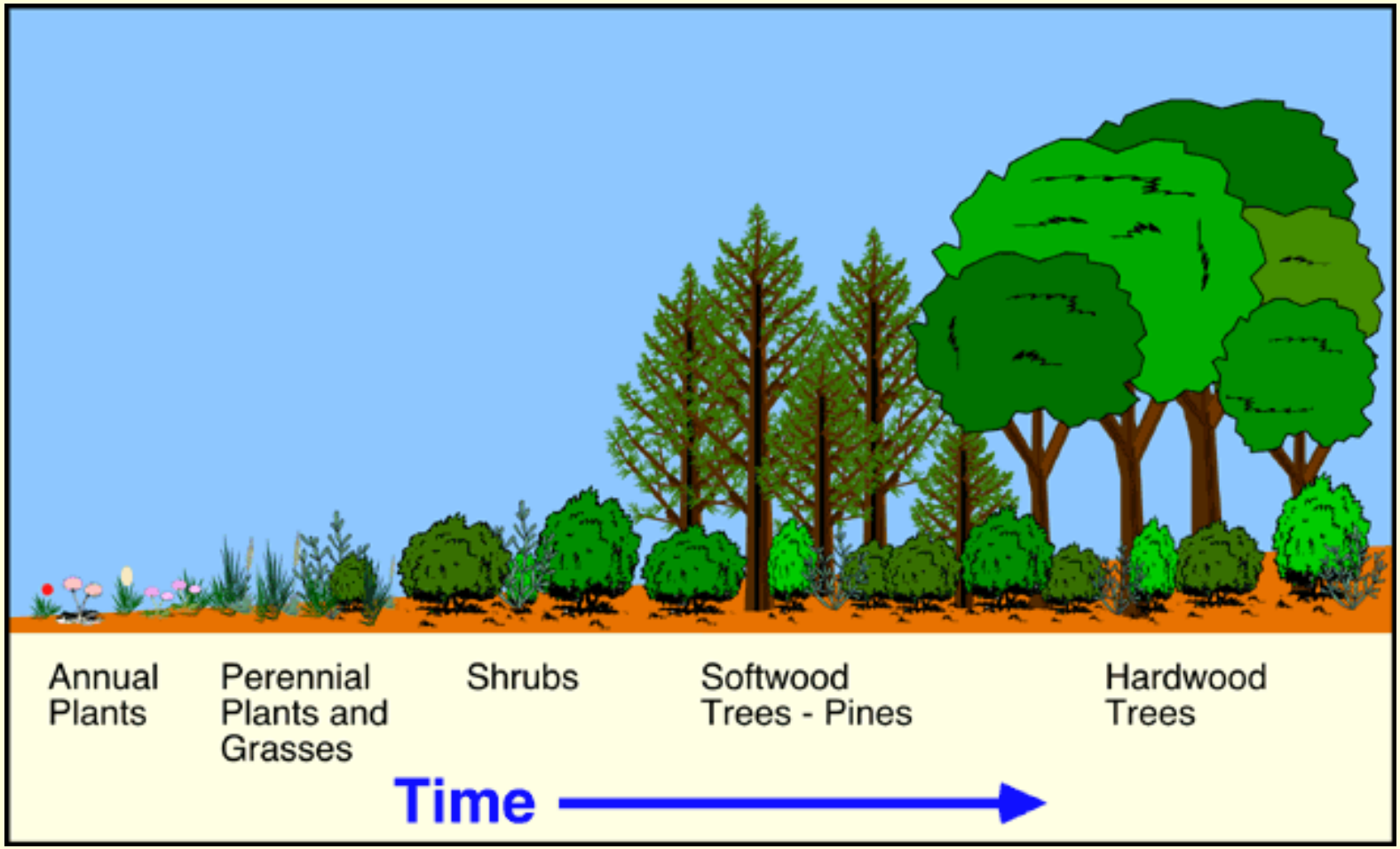
What happens if two species occupy the same niche?

Competition

No two similar species occupy the same niche at the same time.



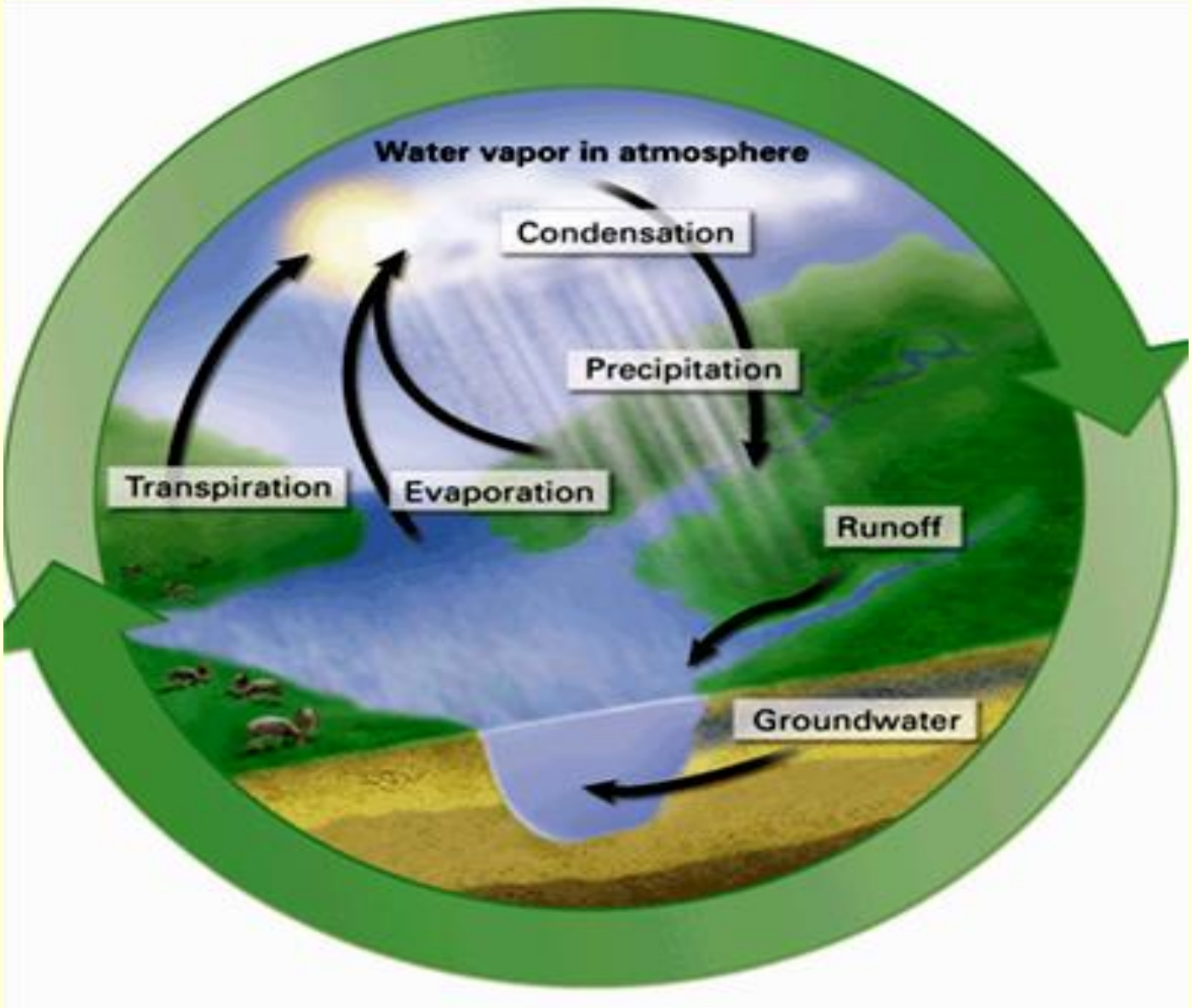
Ecological Succession is the sequence of changes in the composition or structure of an ecological community



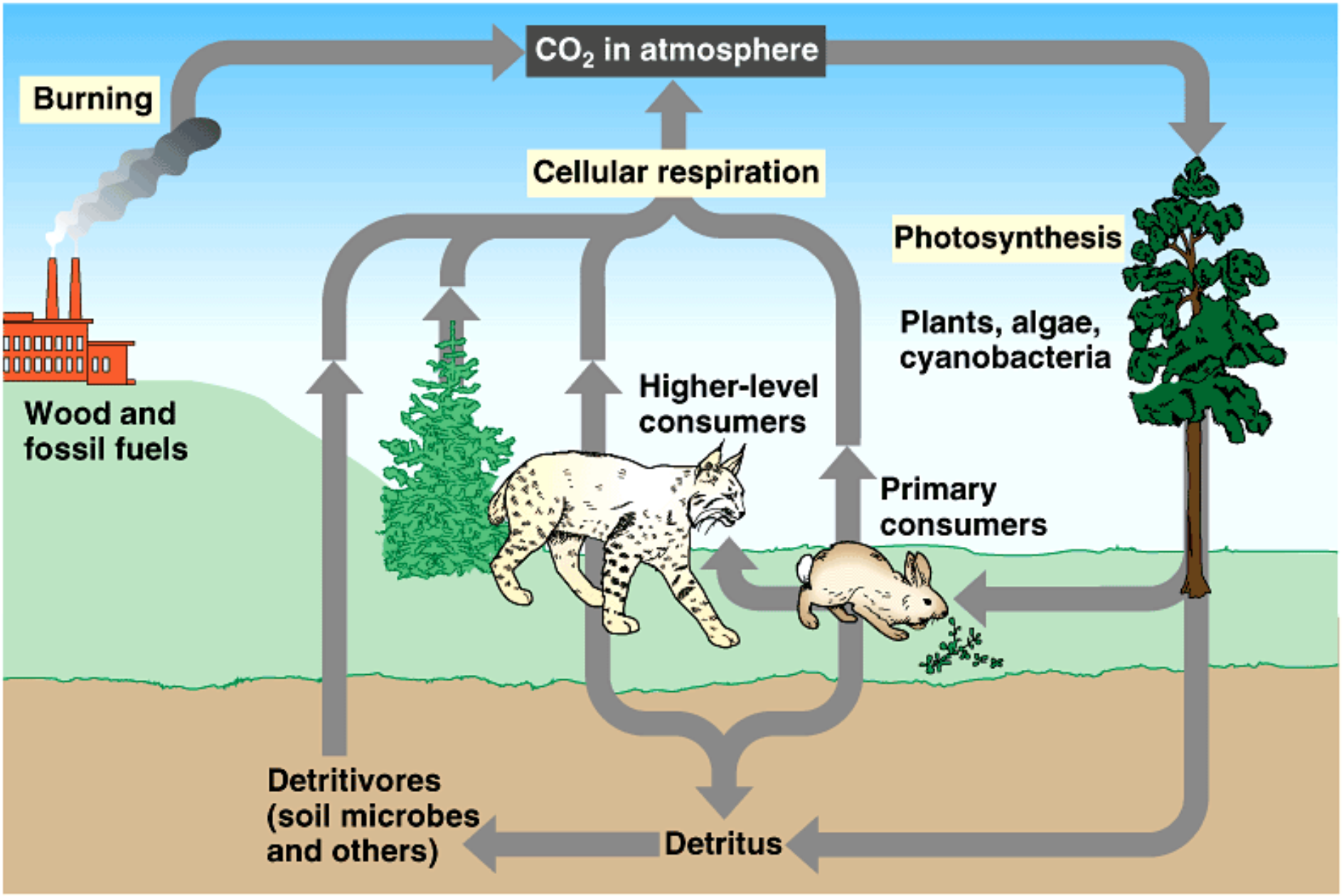
Why does this change occur?

Cycling of Chemical Elements: pathway by which an element or molecule moves through both biotic and abiotic components of an ecosystem.

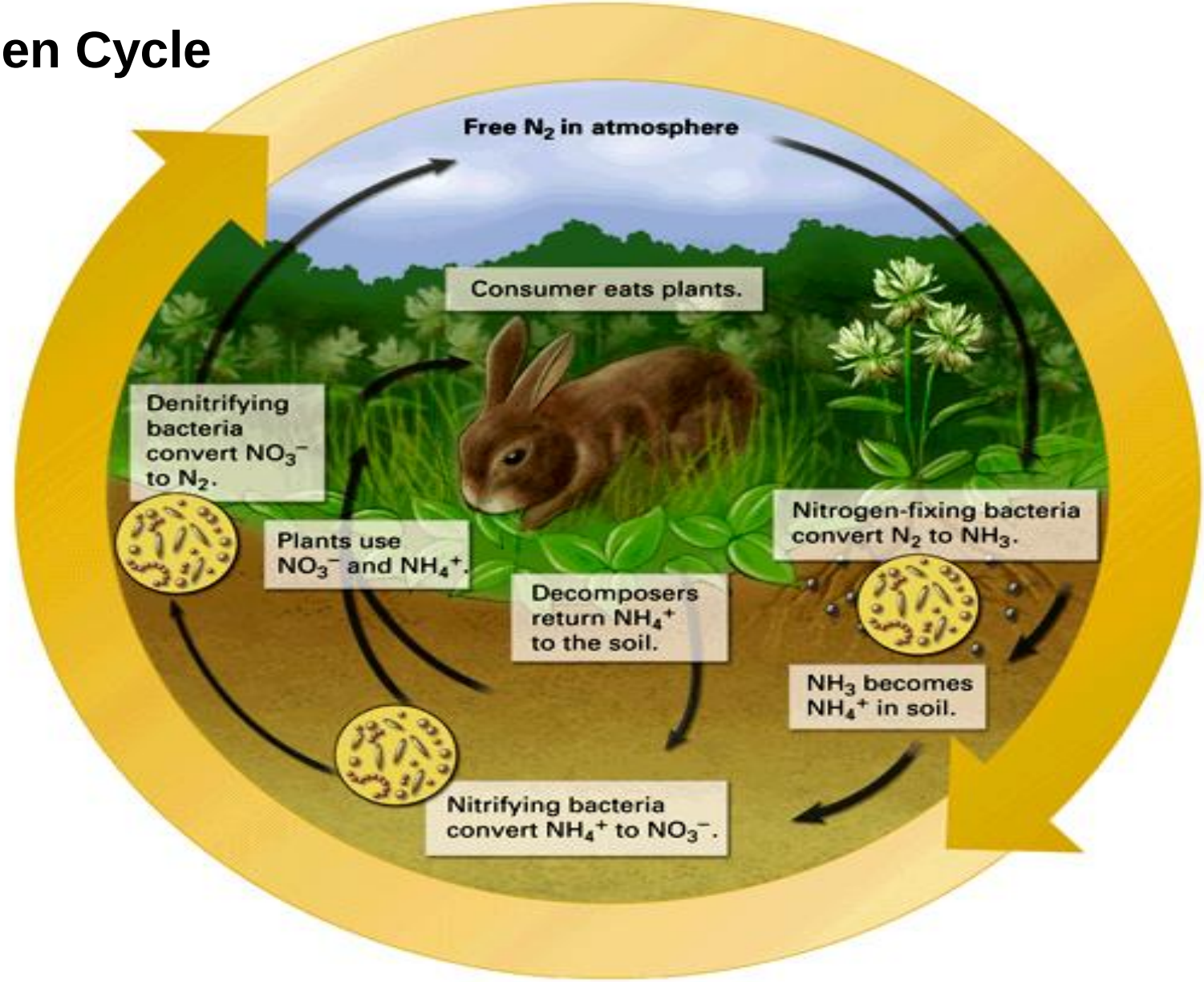
Water Cycle



Carbon Cycle



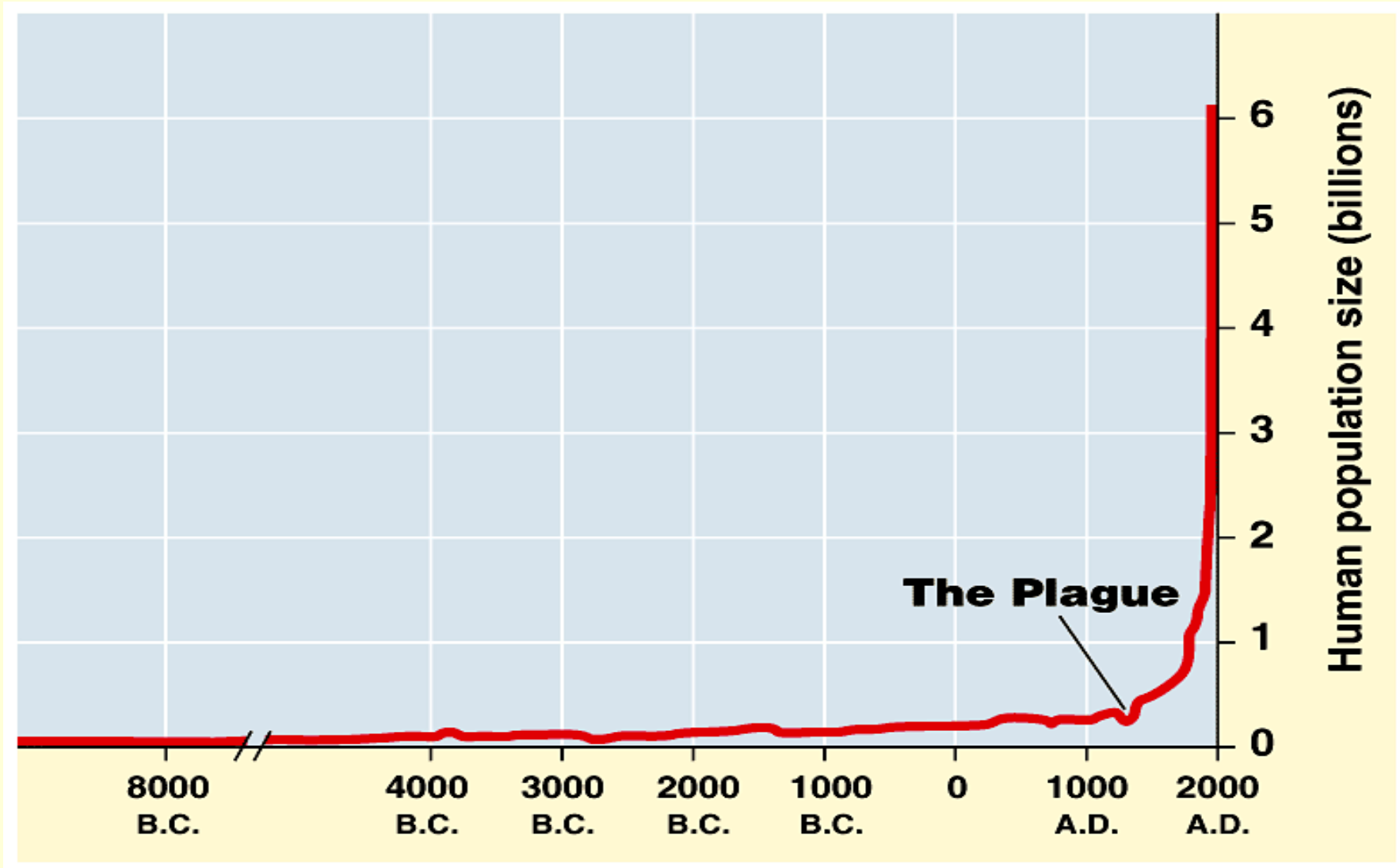
Nitrogen Cycle



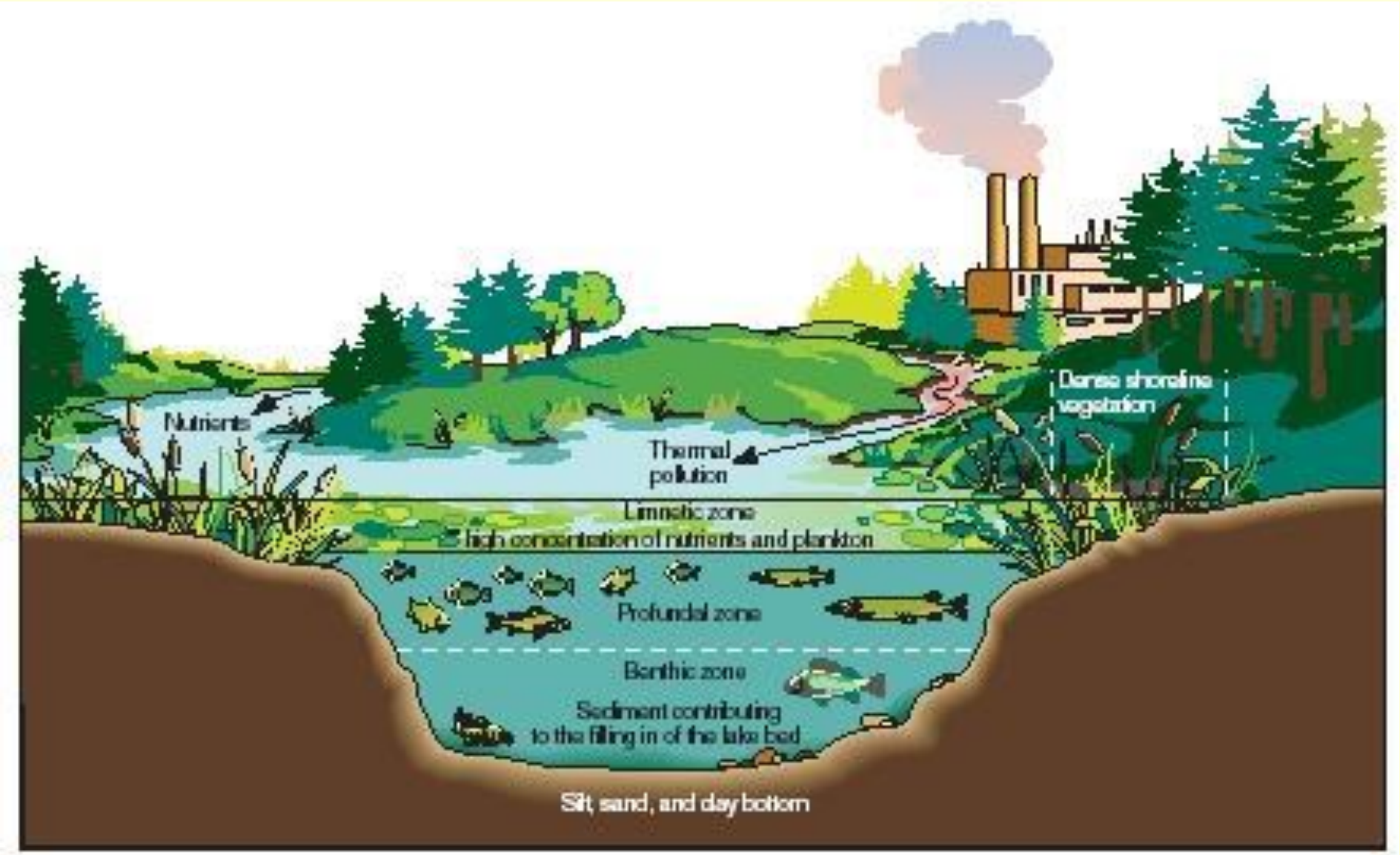
Nitrogen gas is converted by bacteria to forms that plants and animals can use to build amino acids, proteins, and nucleic acids.

Human Impact on Ecosystems and the Biosphere

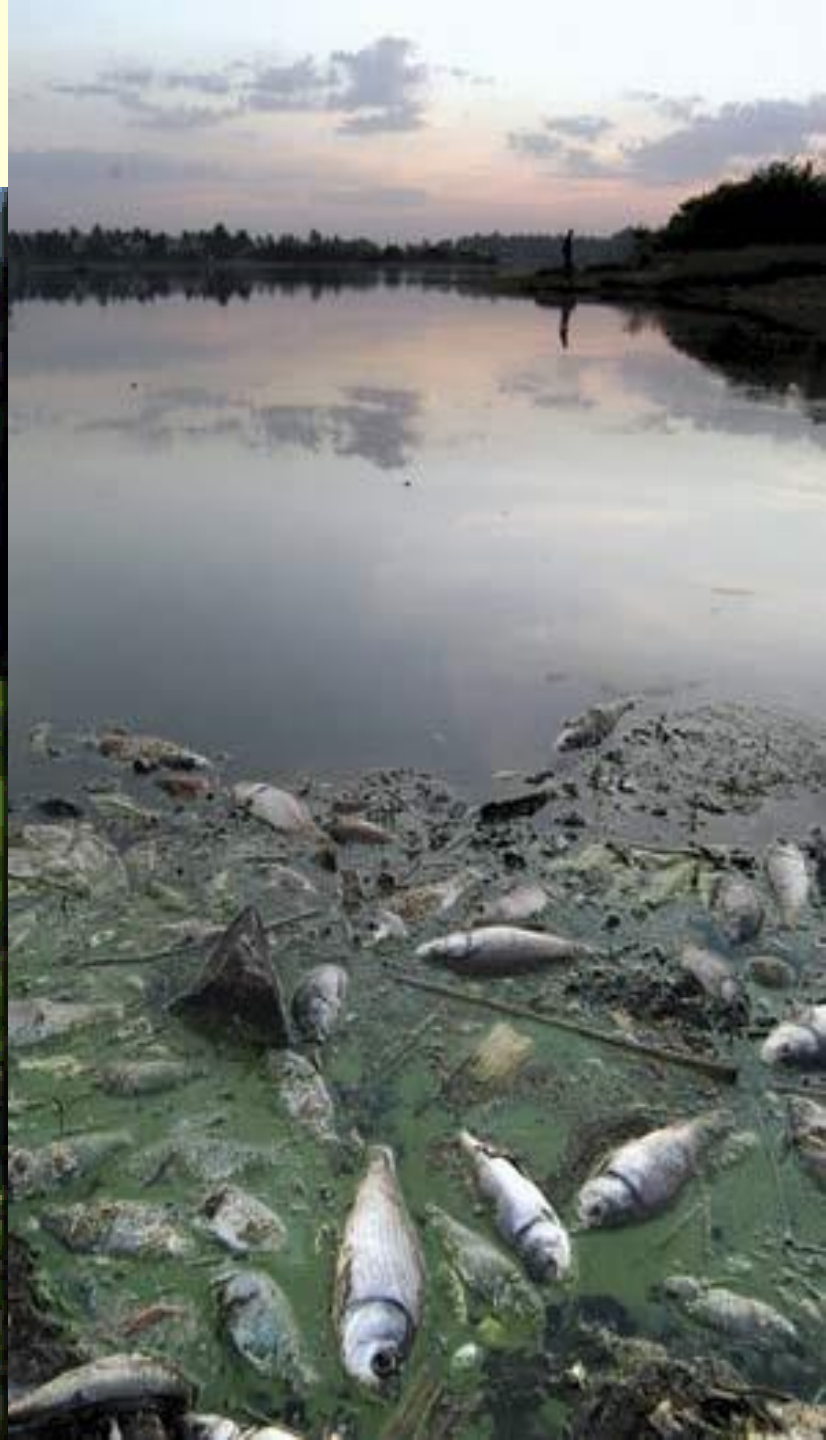
Human population growth is the root of many environmental issues.



Eutrophication is caused by enrichment of the aquatic biomes from fertilizers and wastes. (too much of a good thing)



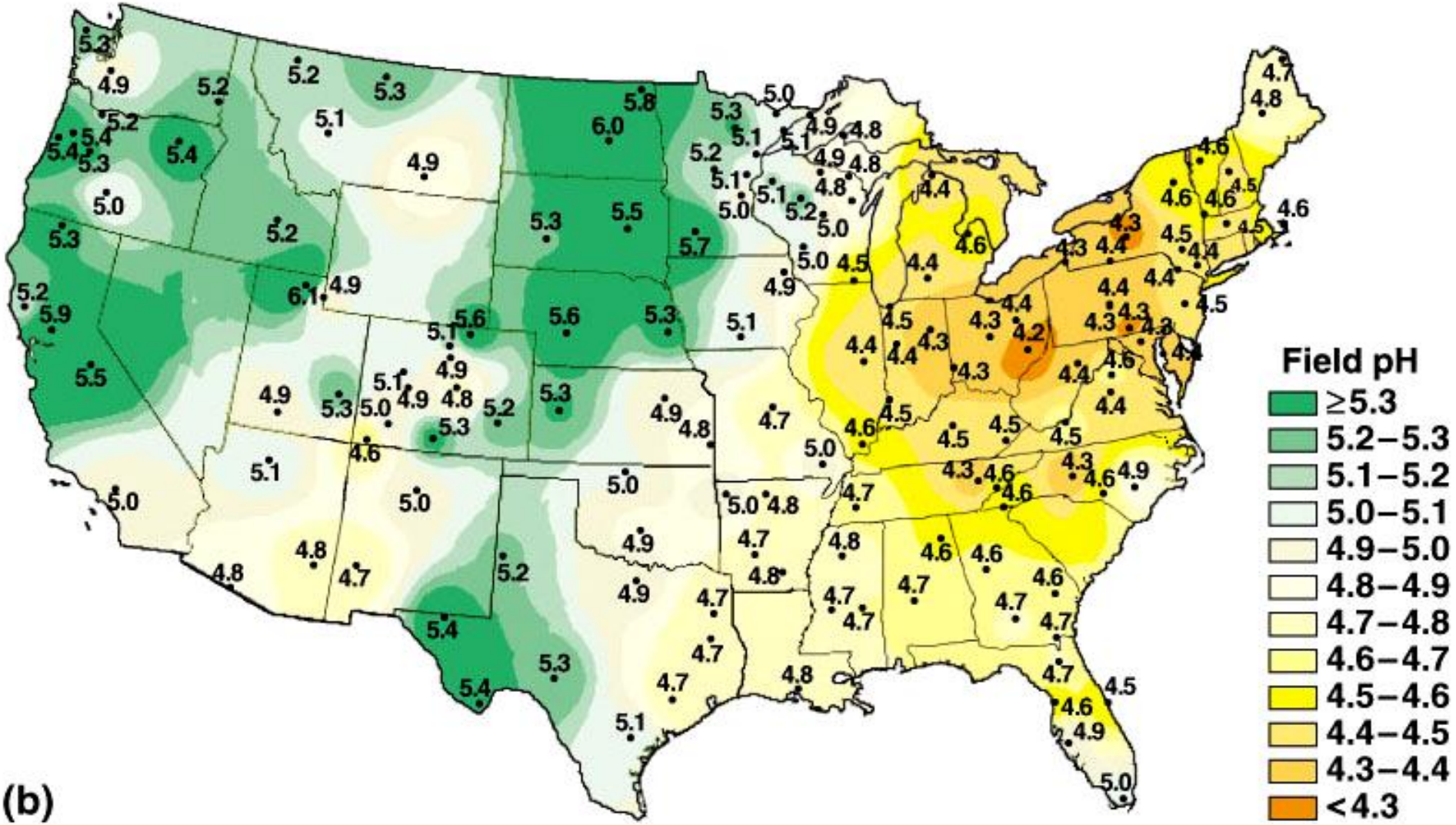
Eutrophic Lake



Acid Precipitation is caused mainly by combustion of fossil fuels.

Acid rain cause the rapid erosion of statues and destruction of lakes

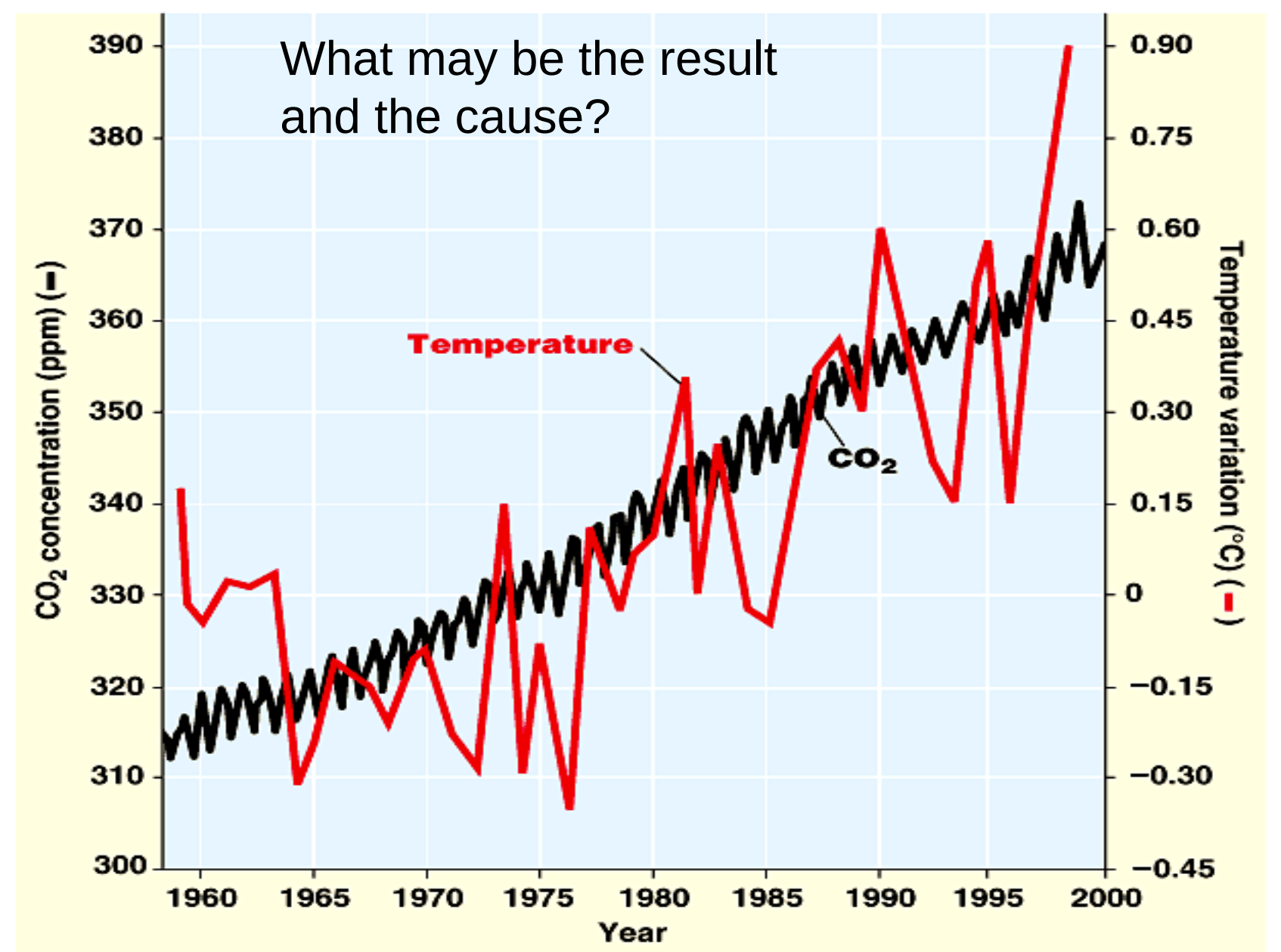
Average pH profiles in U.S. in 1999



Why is the eastern U.S. so high in acid rain?

Air Pollution

Green House Effect: Climatic change caused by increasing Greenhouse Gases (carbon dioxide)



Introduced Species: species from another ecosystem is a problem because there usually aren't natural checks
May reduce Biodiversity!

Nile perch (Lake Victoria)

Brown tree snake (Guam)

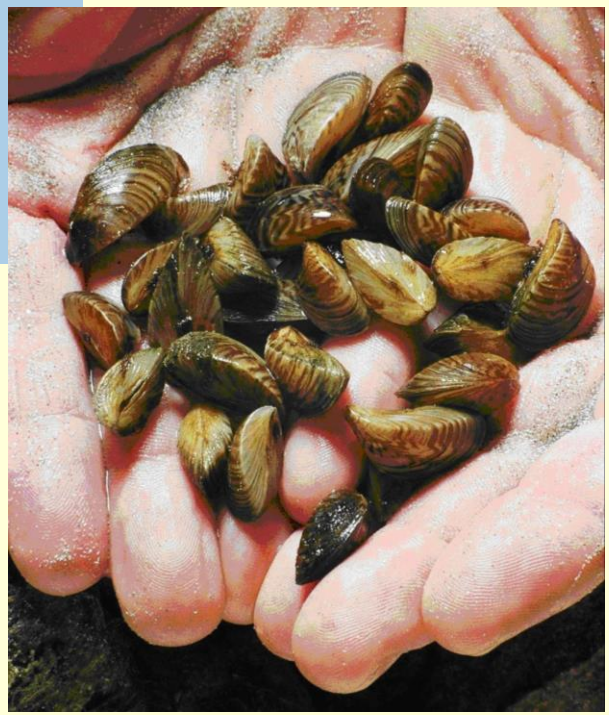
Argentine ants

Caulerpa (seaweed)

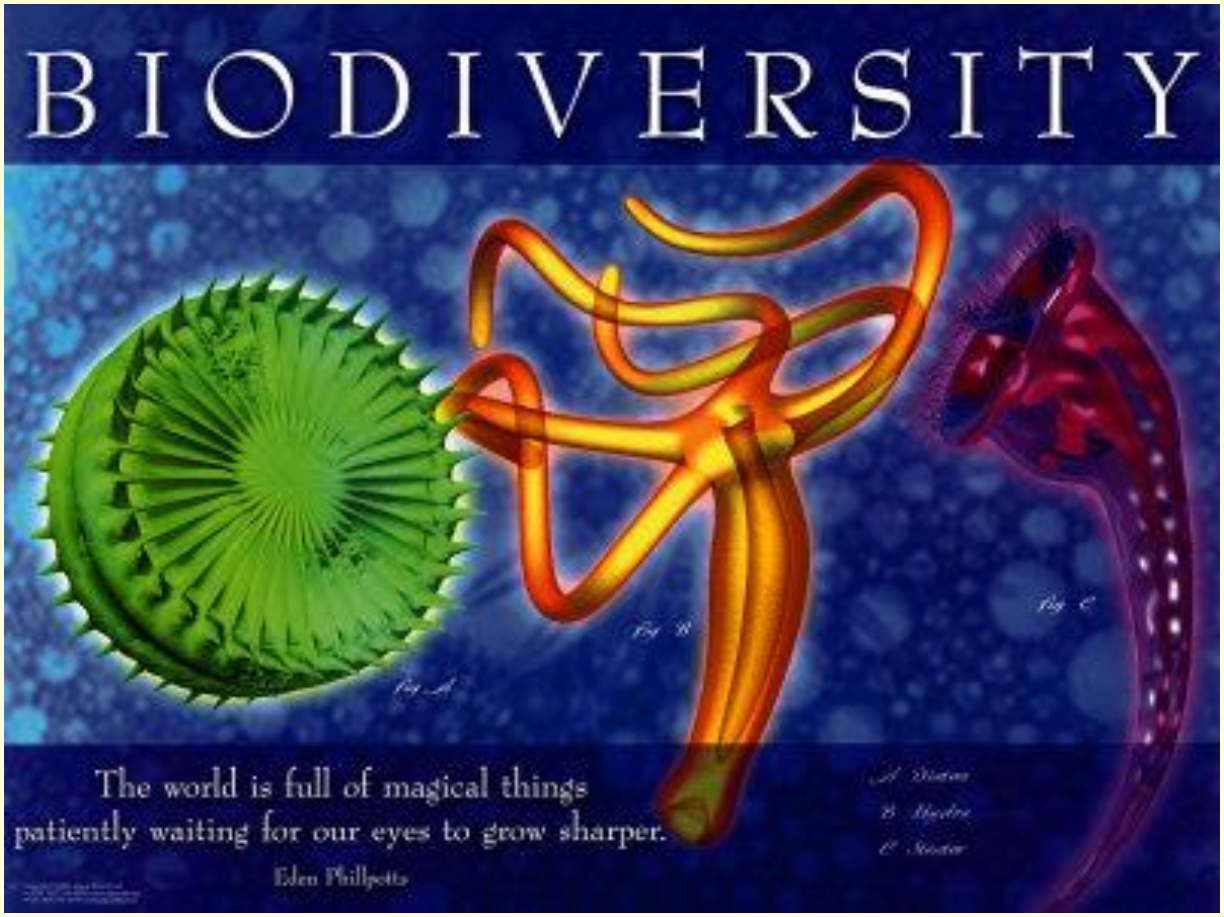
In the Northeast, purple loosestrife and gypsy moths

Zebra Mussels in the Great Lakes

Has reduced Biodiversity!



What is Biodiversity



Biodiversity is the variation of life forms within an ecosystem

High biodiversity leads to a **more stable ecosystem**.

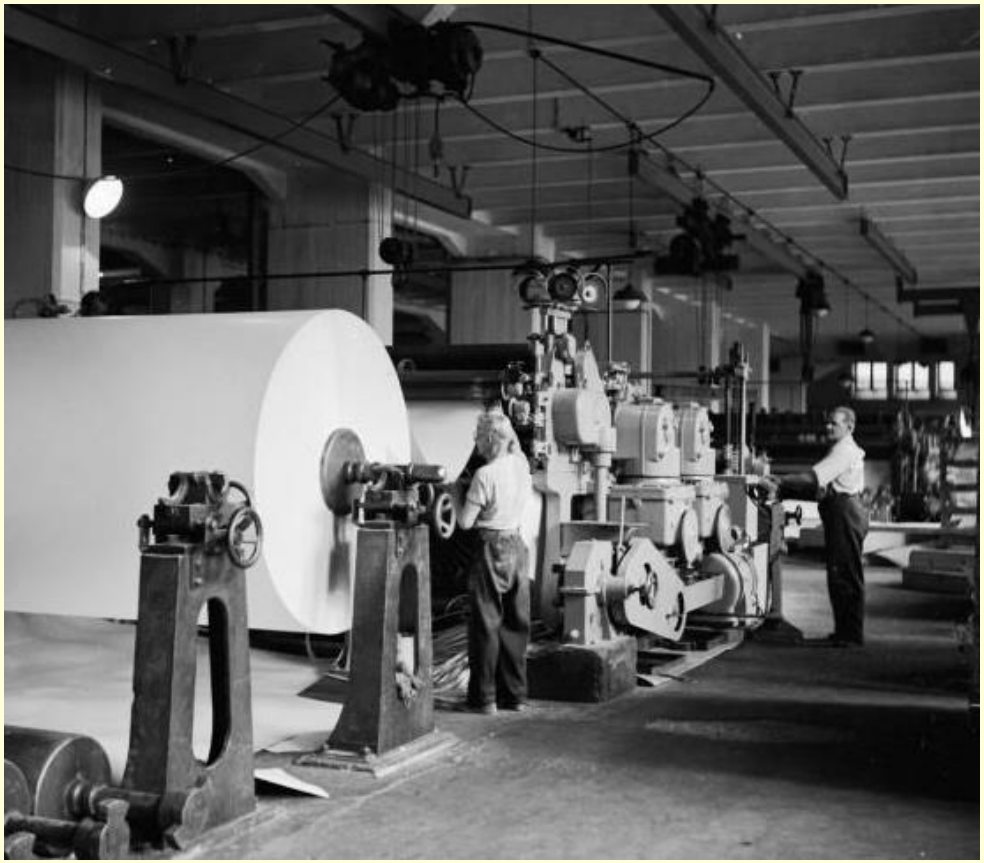
Trade-offs: solving environmental issues involves trade-offs. There are always costs associated with social decisions.

Nuclear Power provides electricity without fossil fuel but generates nuclear wastes.

Industrialization

Increased industrialization demands more resources and energy use.

This has positive and negative effects on humans and ecosystems



Societies must decide on proposals and assess risks, costs, benefits and trade-offs.

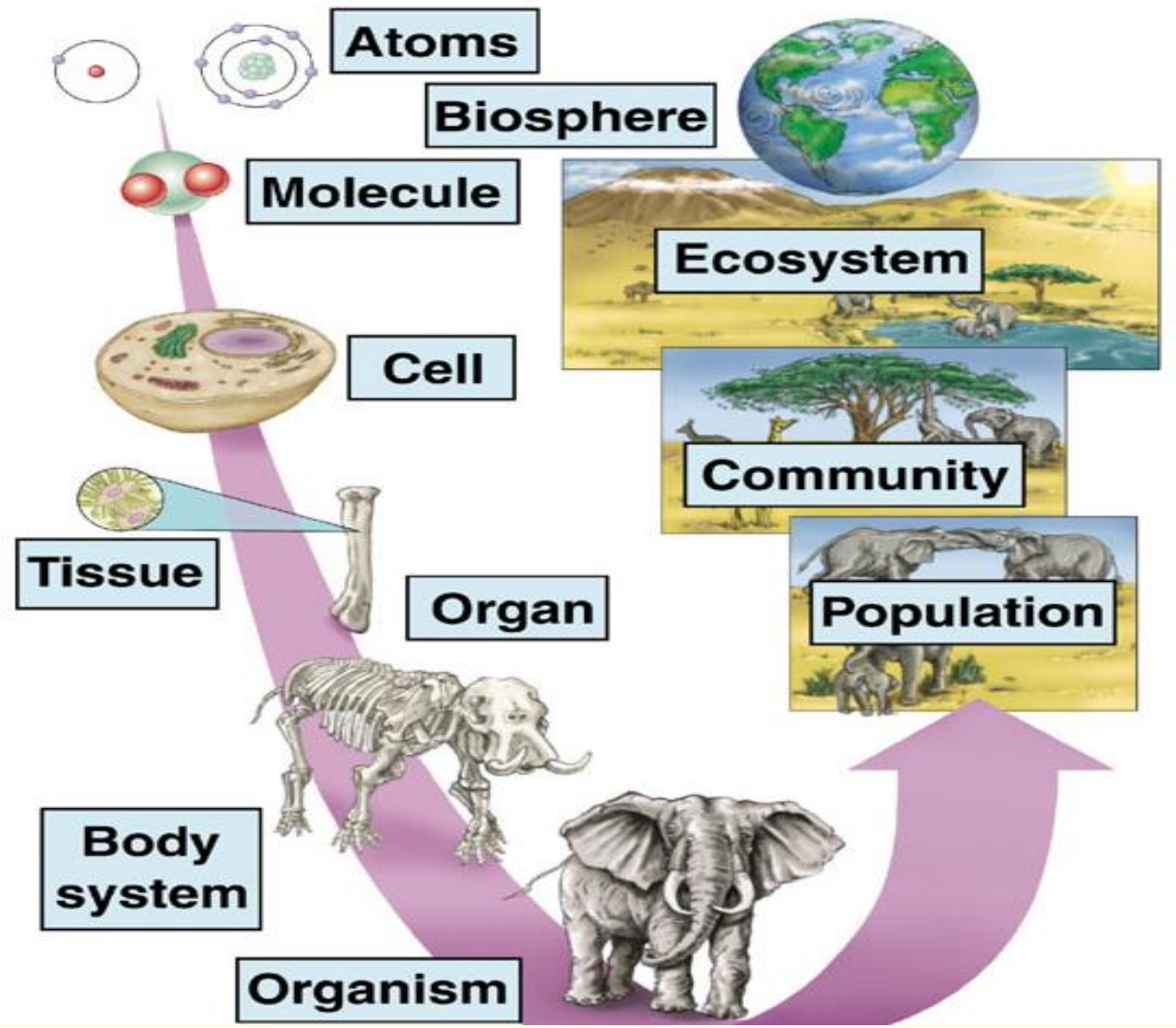
Solar Energy reduces dependence on fossil fuel but it is expensive.

Processes and Cellular Nature of Life

PERFORMANCE INDICATOR 1.2 Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles).

Levels of organization:

Begins with molecules



Level of Organization

Organelles

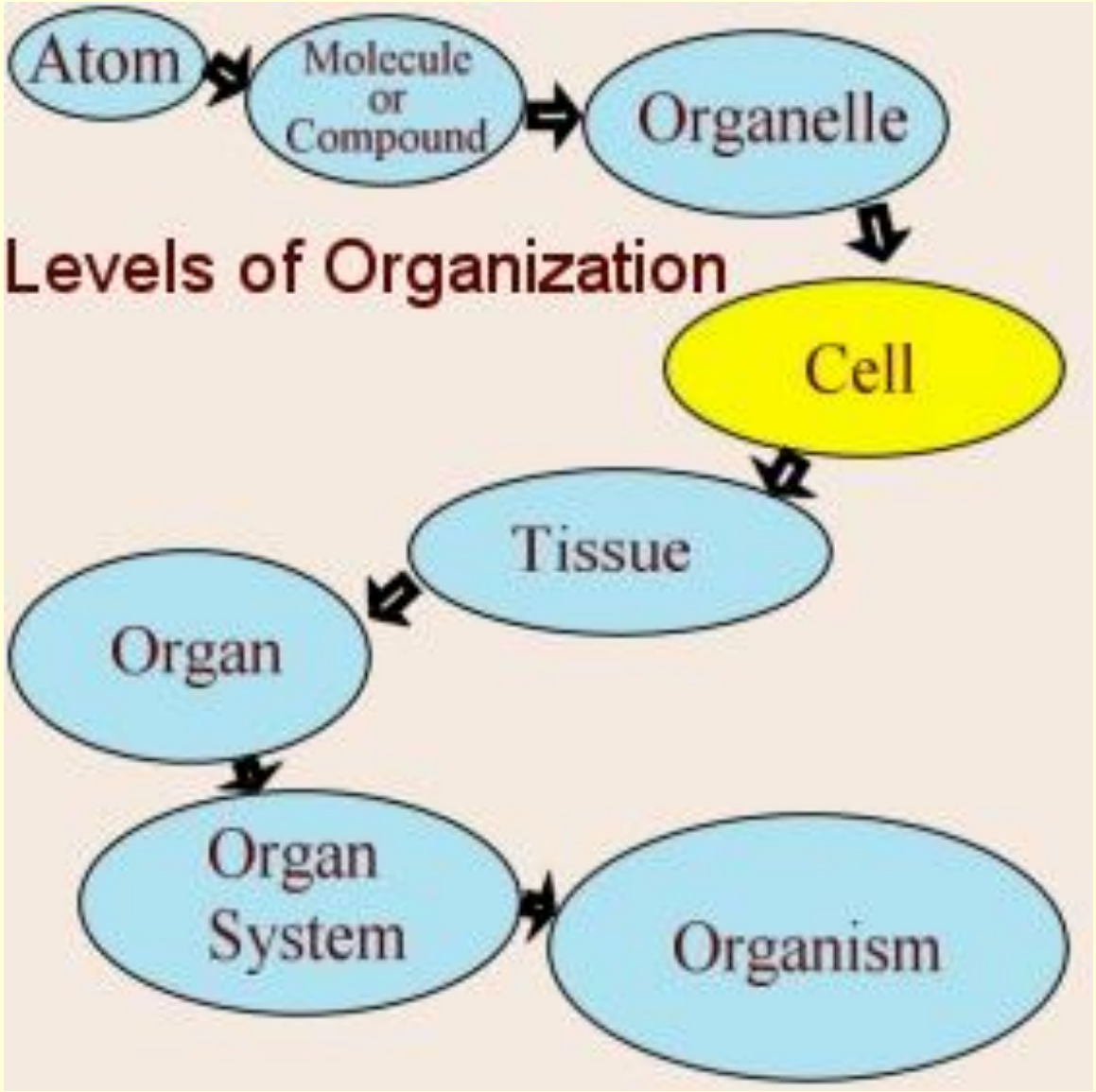
Cells

Tissues

Organs

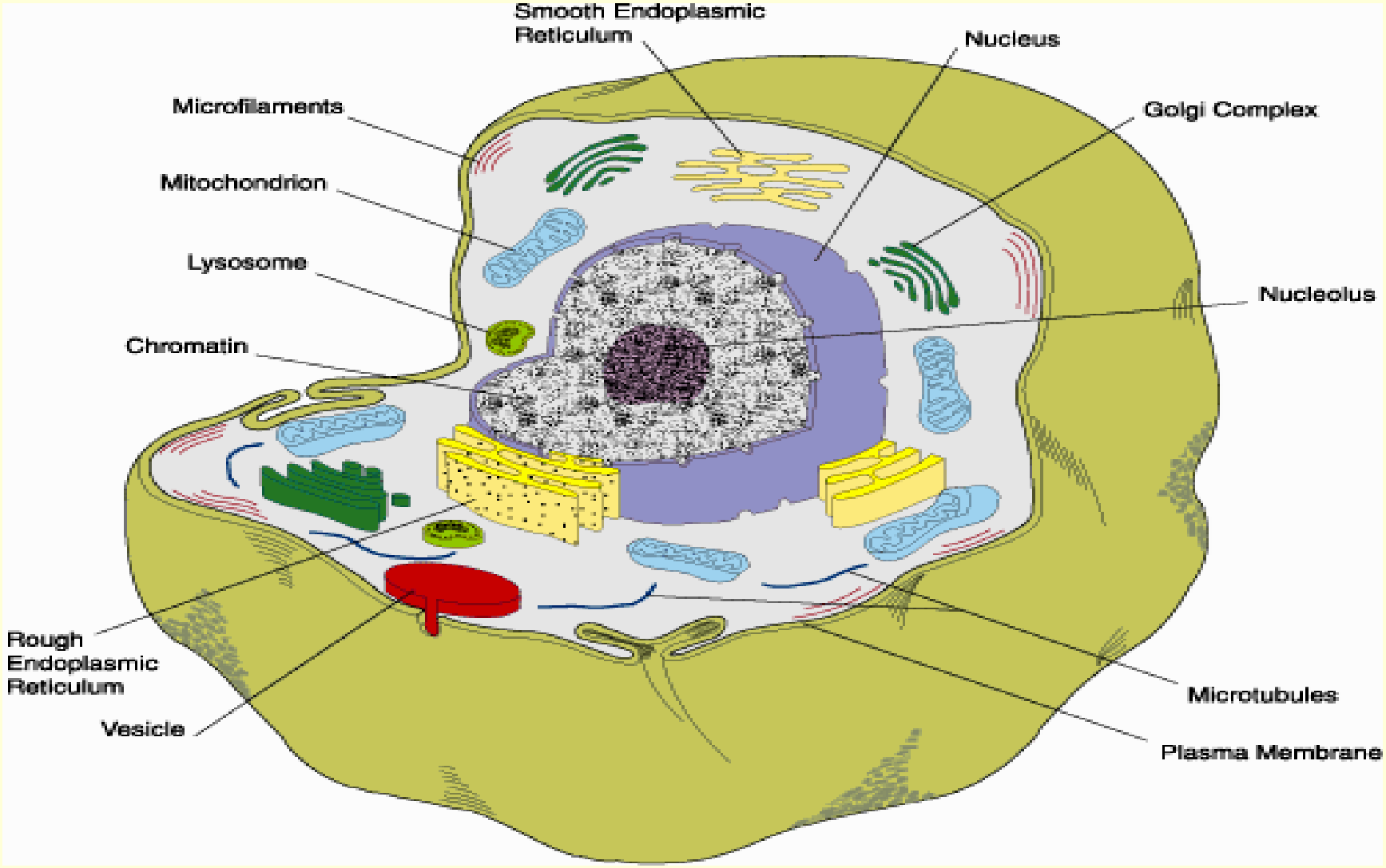
Organ systems

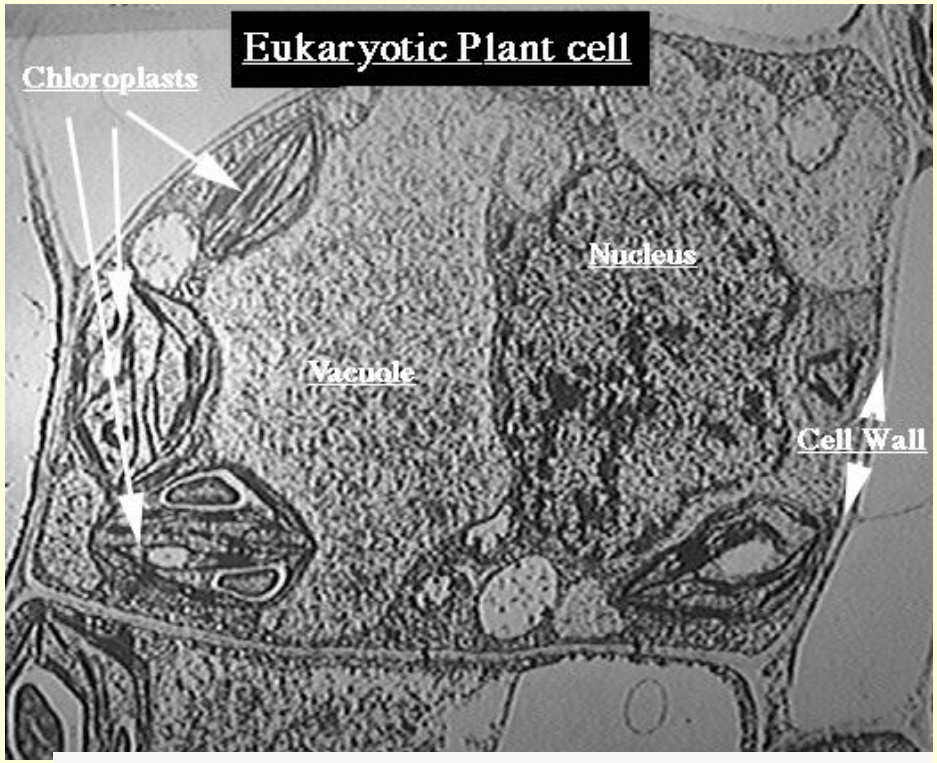
Whole organisms

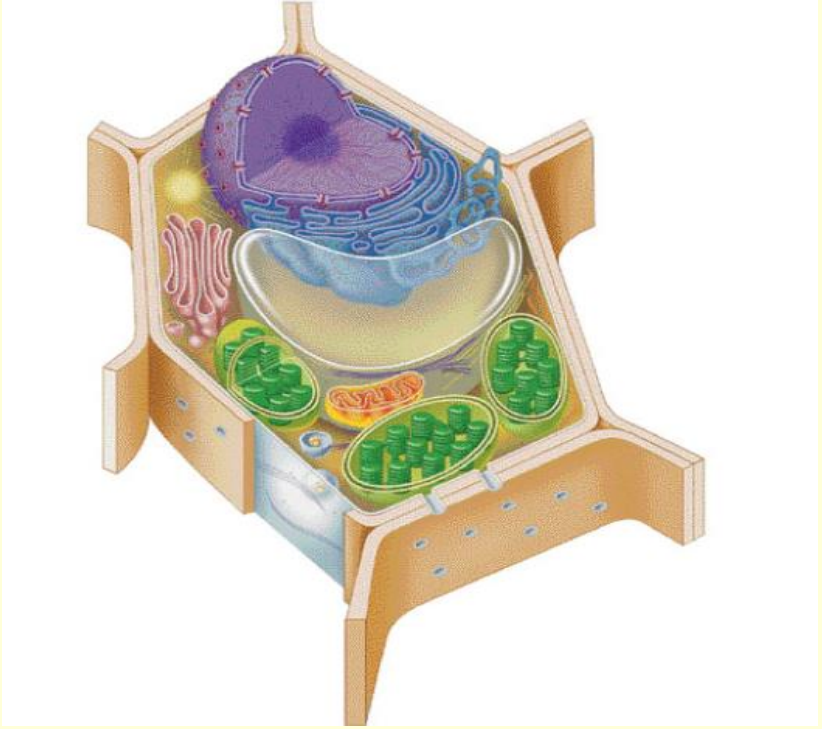


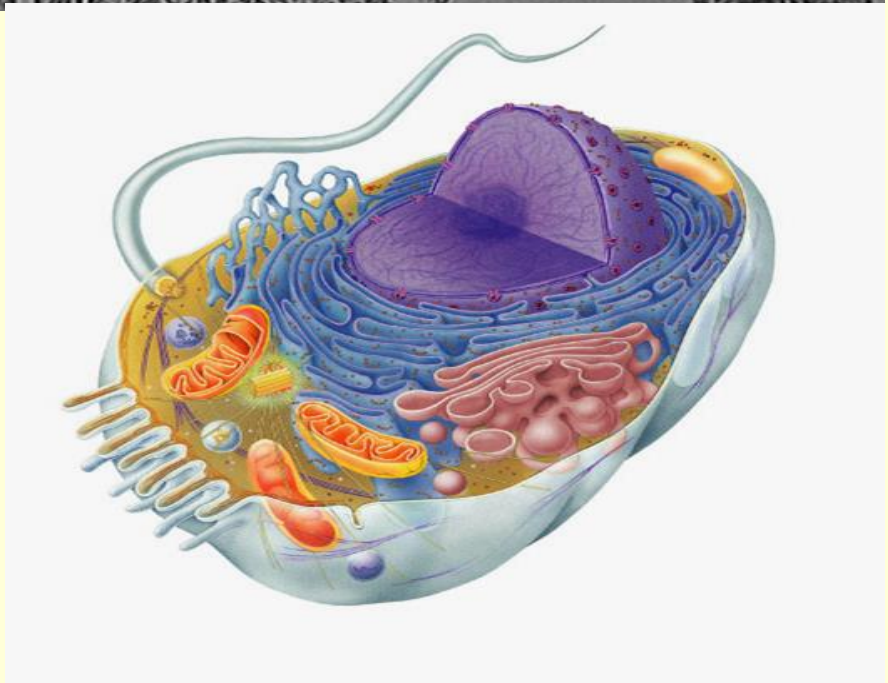
Cells have organelles for specific jobs.

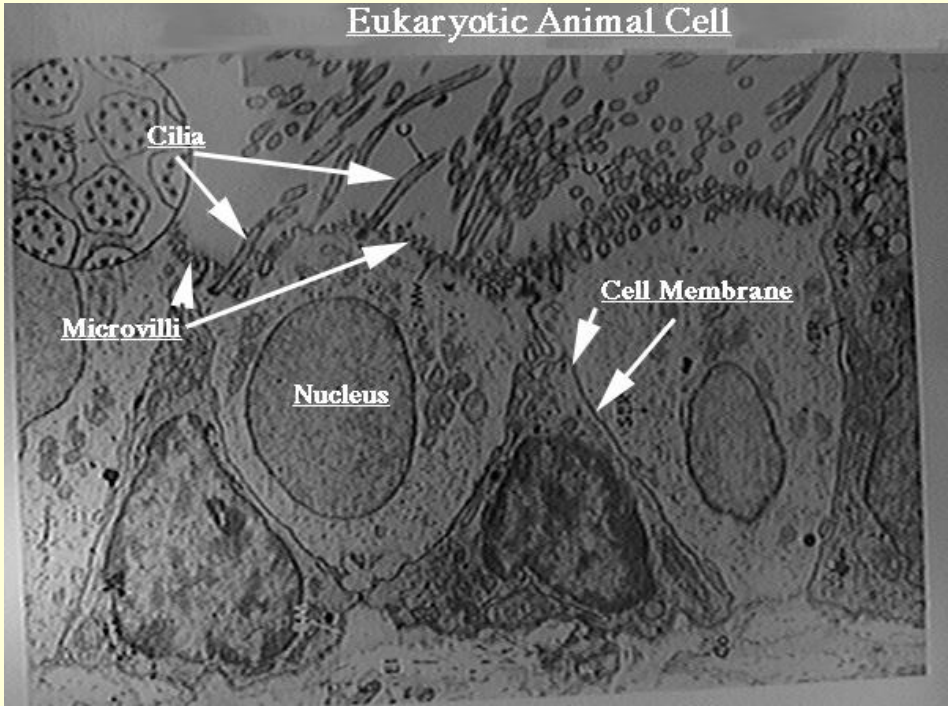
Just as body systems are coordinated, cell parts work together




Eukaryotic Plant cell
Chloroplasts
Nucleus
Vacuole
Cell Wall



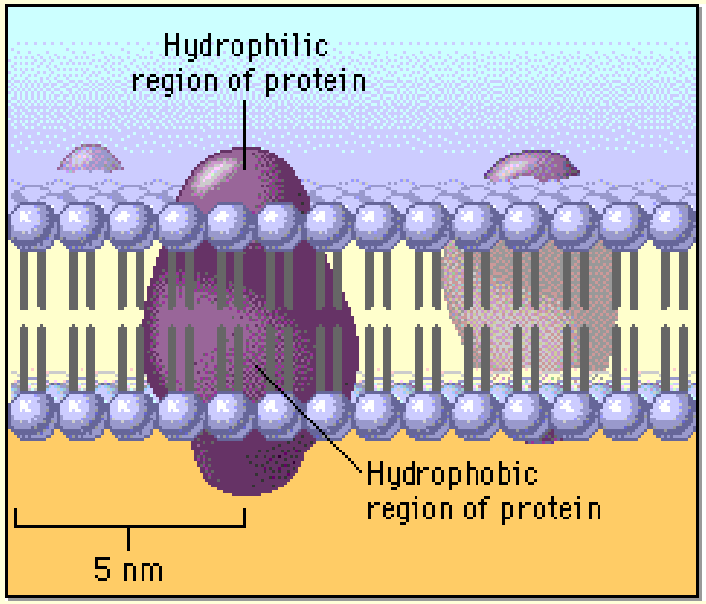


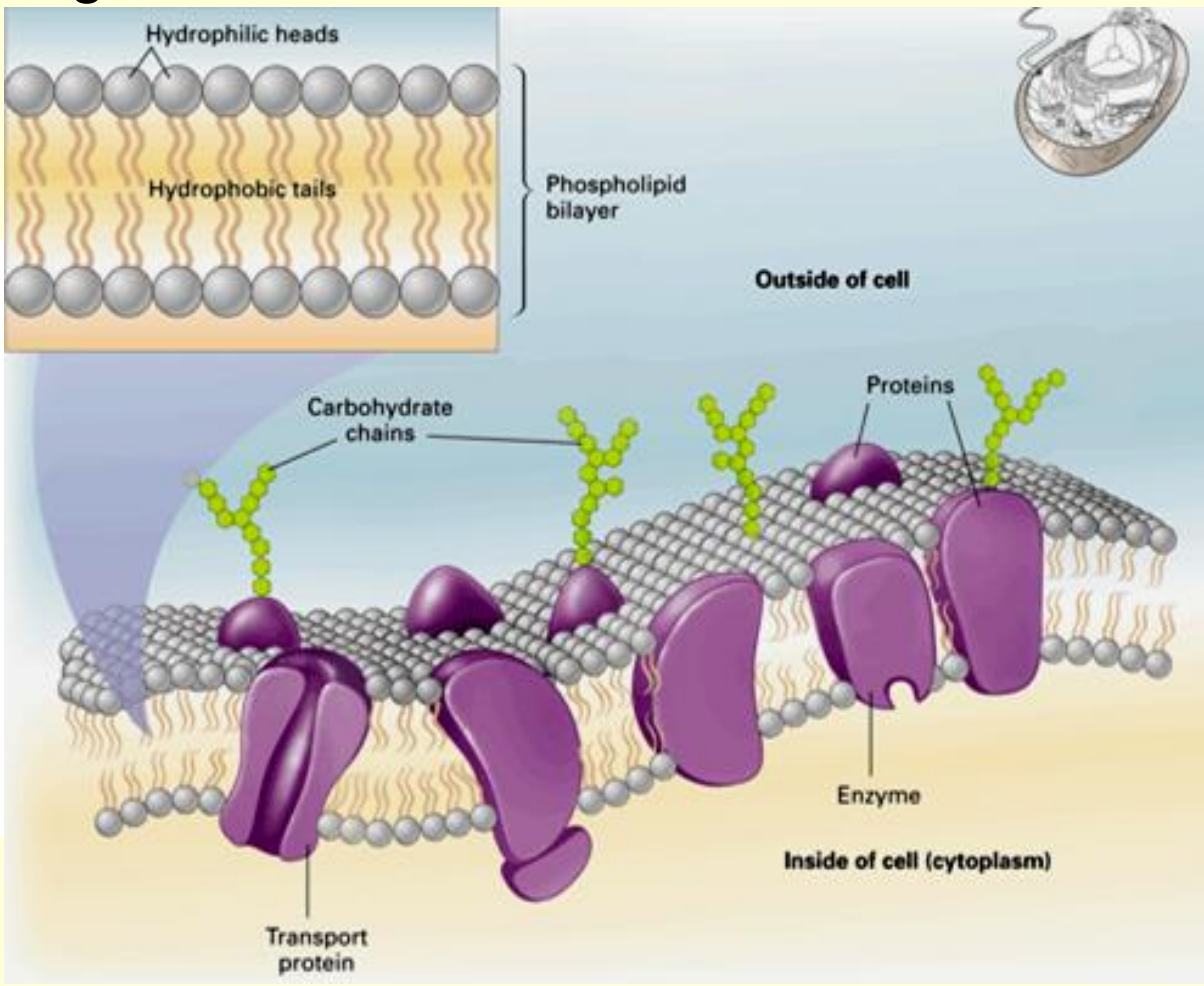

Eukaryotic Animal Cell
Cilia
Microvilli
Cell Membrane
Nucleus

Cell Organelles	Function
Cytoplasm	
Cell membrane	
Nucleus	
Ribosome	
Mitochondria	
Chloroplast	
Vacuole	

Cell Membranes have several functions

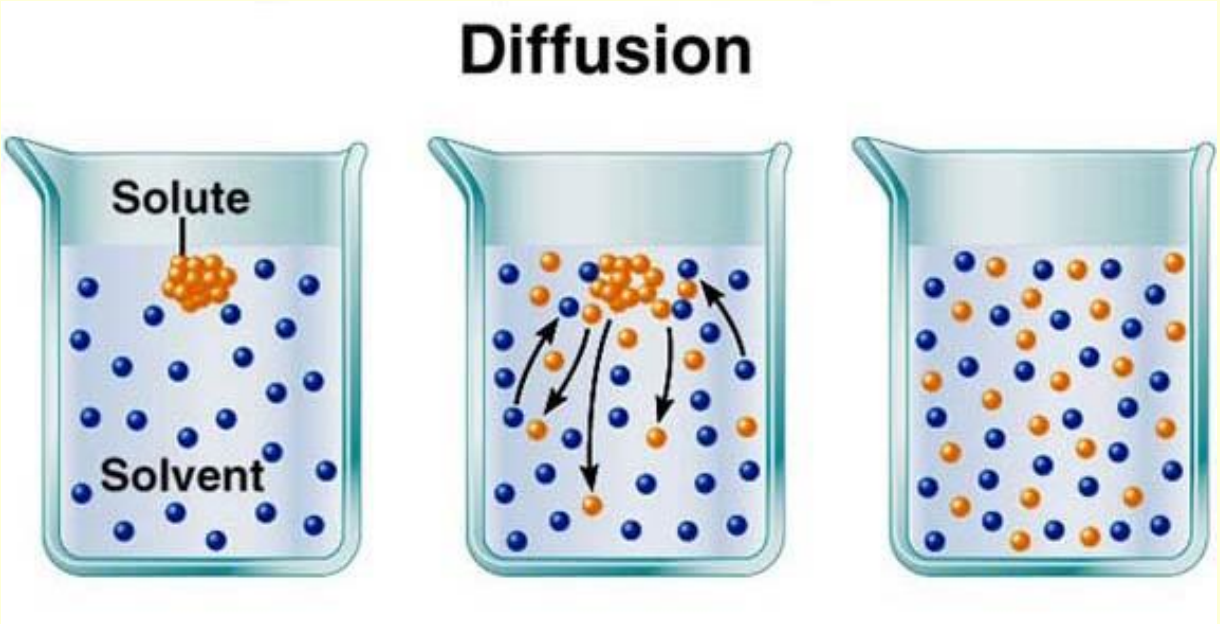
- Separation from outside environment
- Control transport in/out of cell
- Recognition of chemical signals

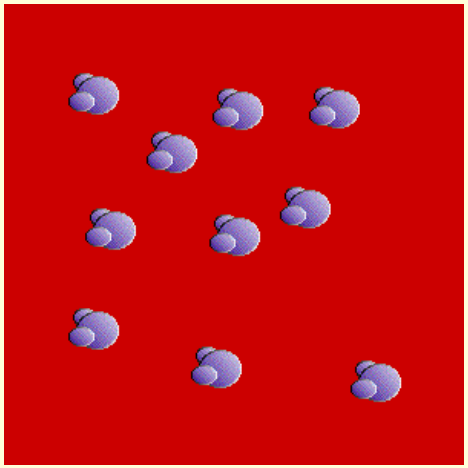


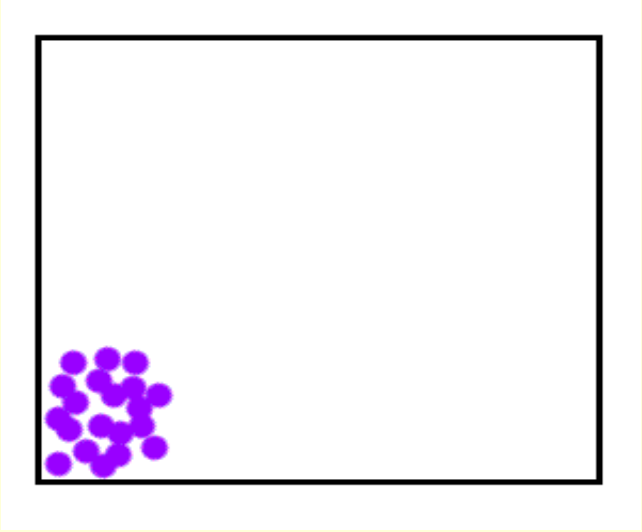


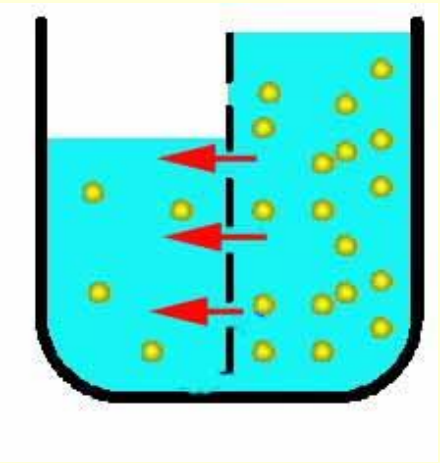
Membrane Transport

Passive transport doesn't require cell input of energy (ATP)





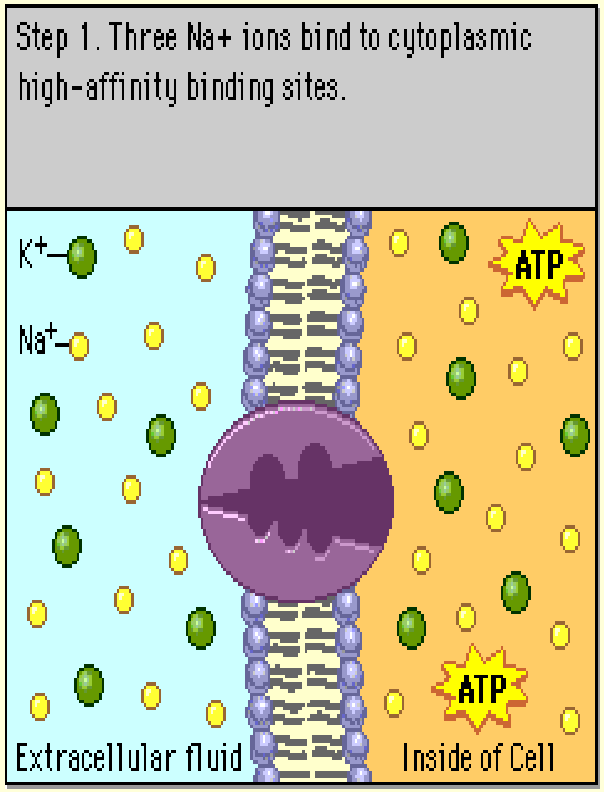


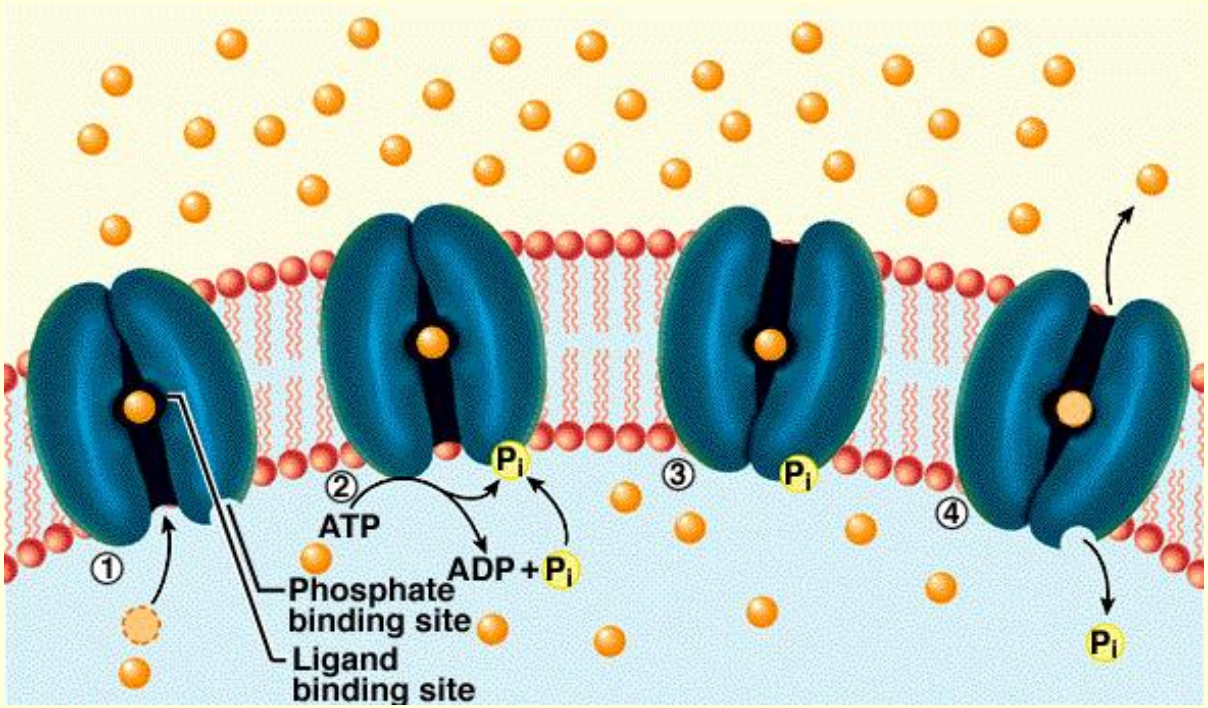


Active Transport

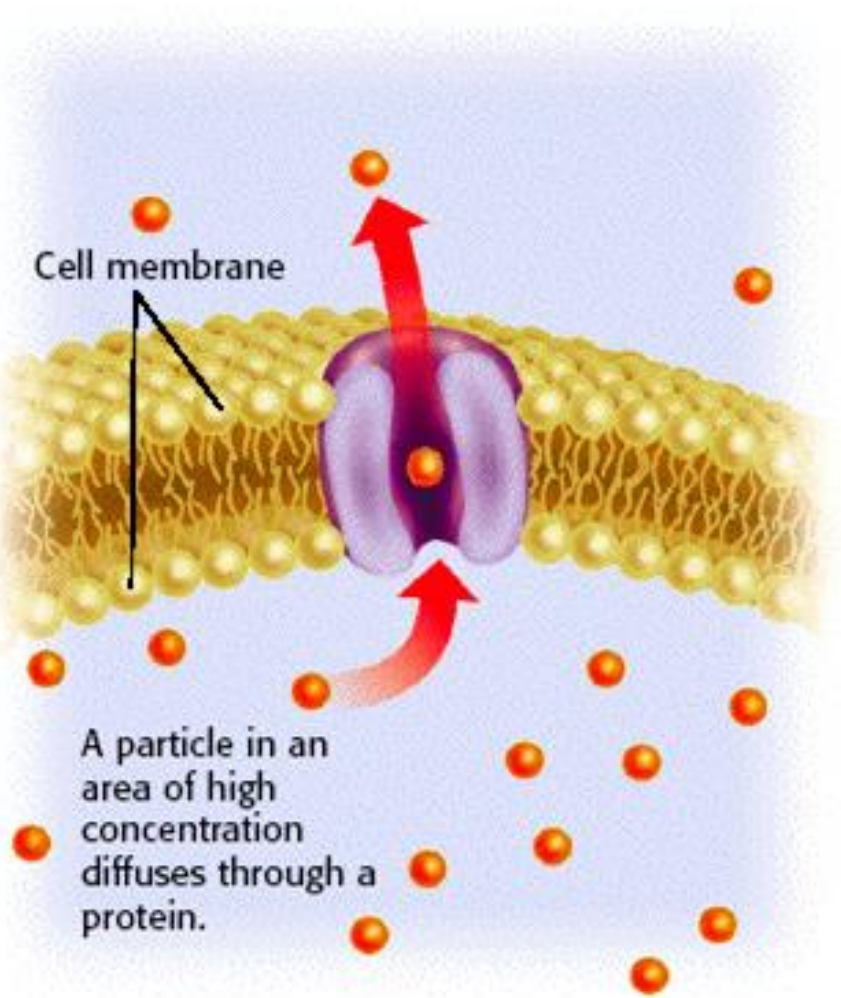
Molecules transport from lower to higher transportation with the use of cellular energy (uses ATP)

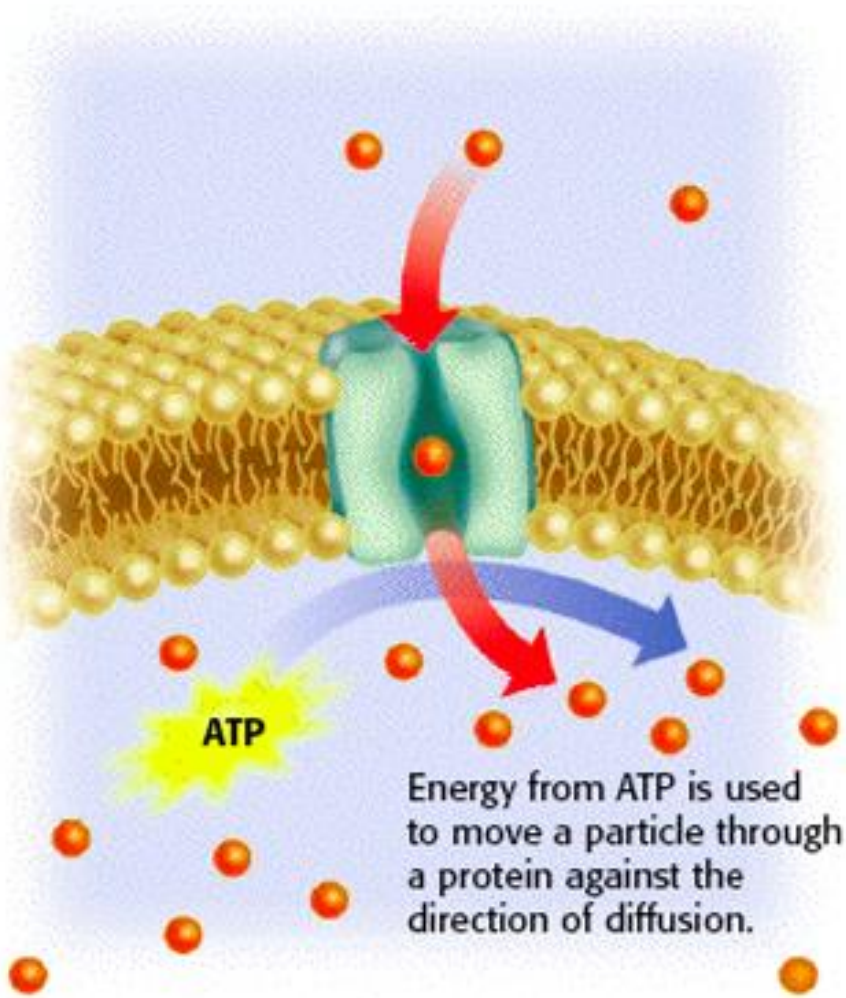
Special proteins transport molecules help transport





How can you determine which is passive or active transport?

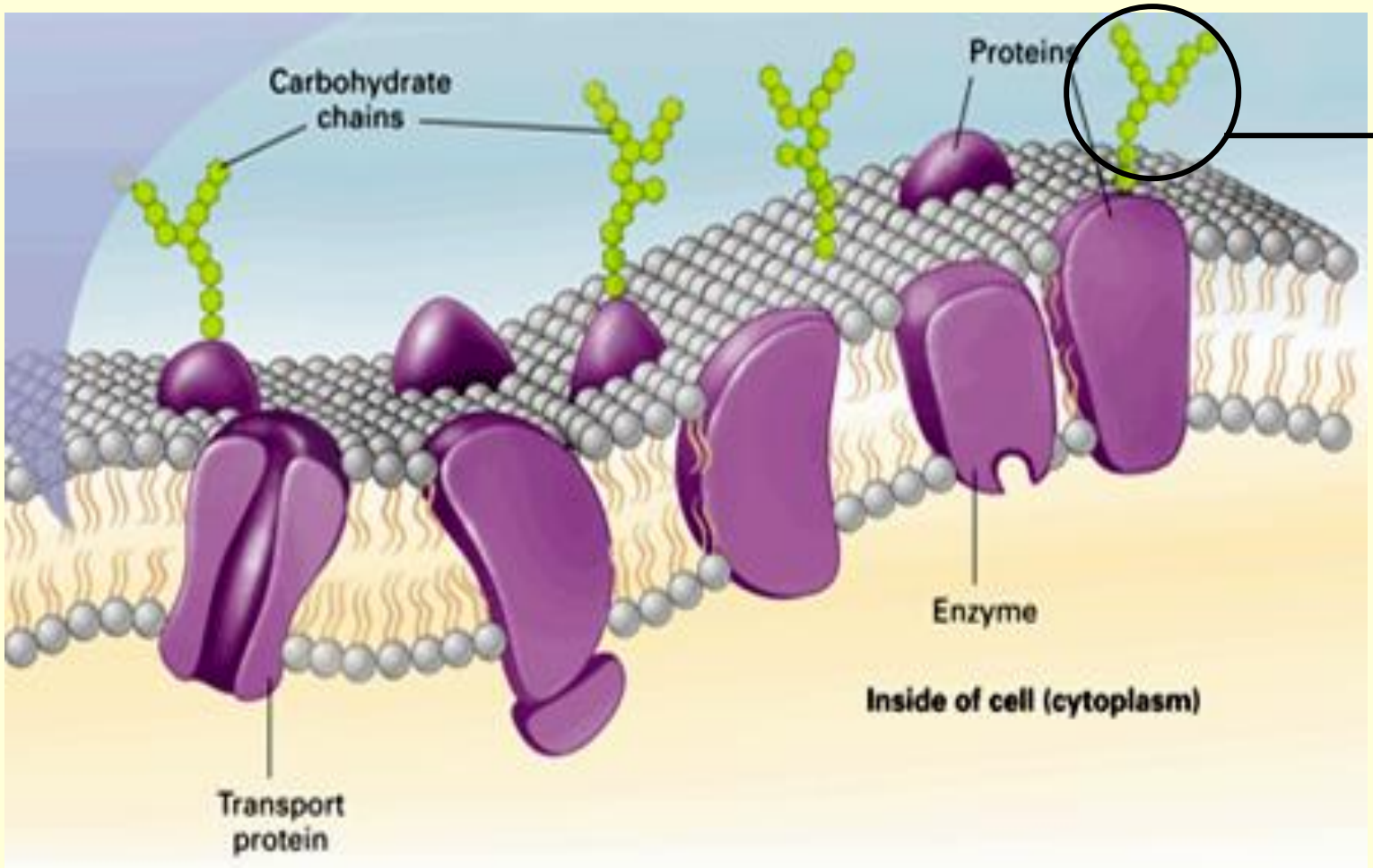




Diffusion may use special proteins

moves from high to low

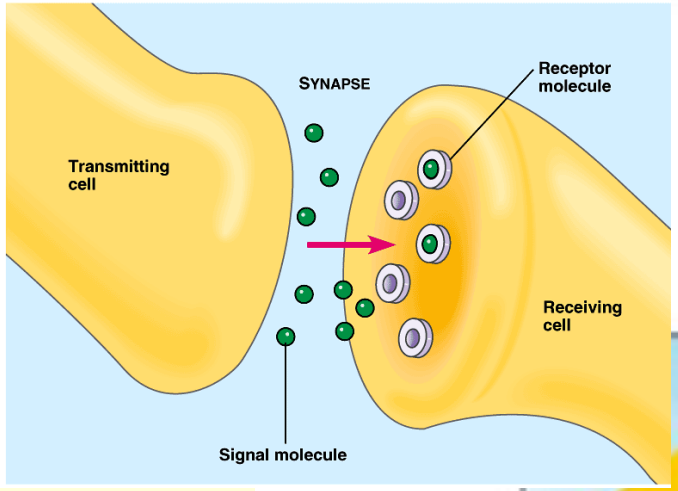
Receptor molecules are important for cell communication

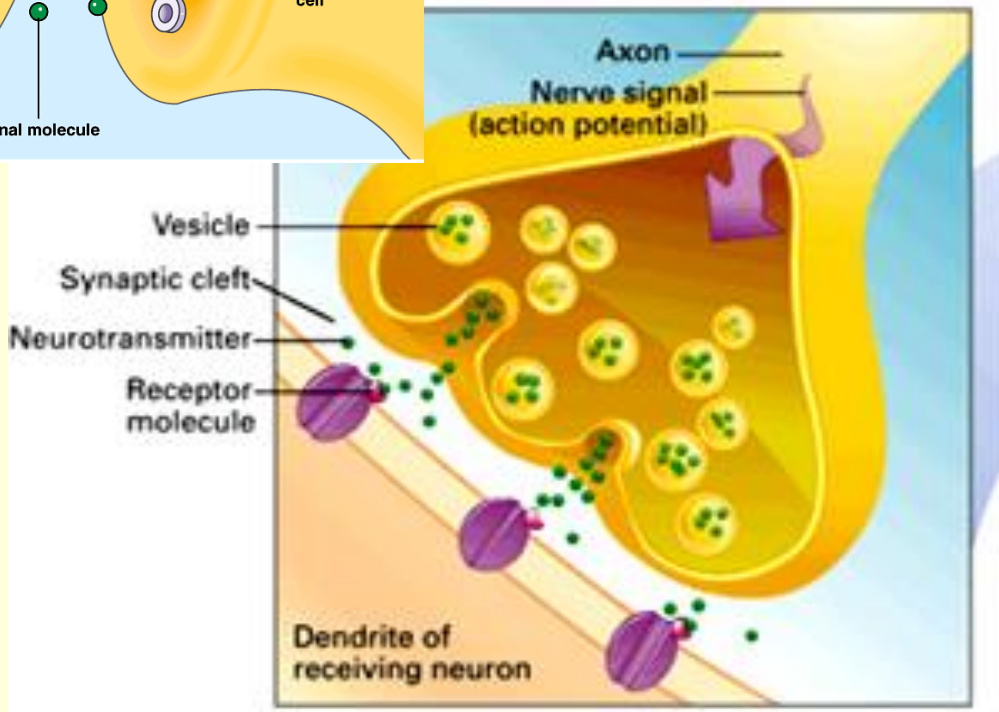


The receptors are specific in shape and to the individual organism

Nerves and hormones use specific chemical signals to communicate.

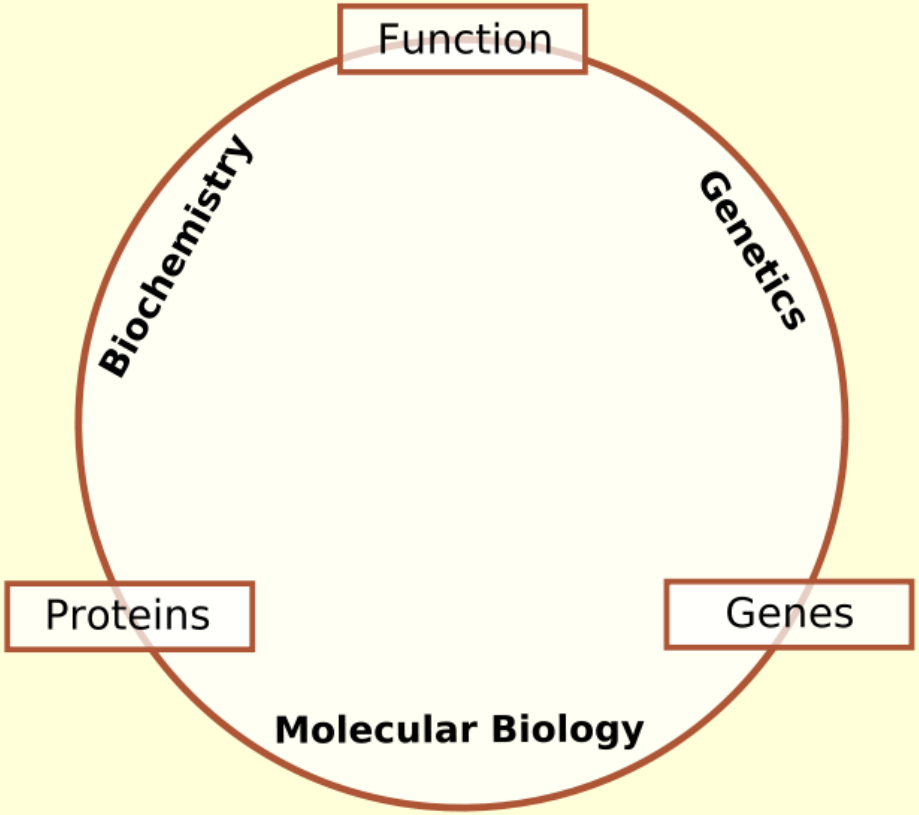
What happens if the signals are blocked?

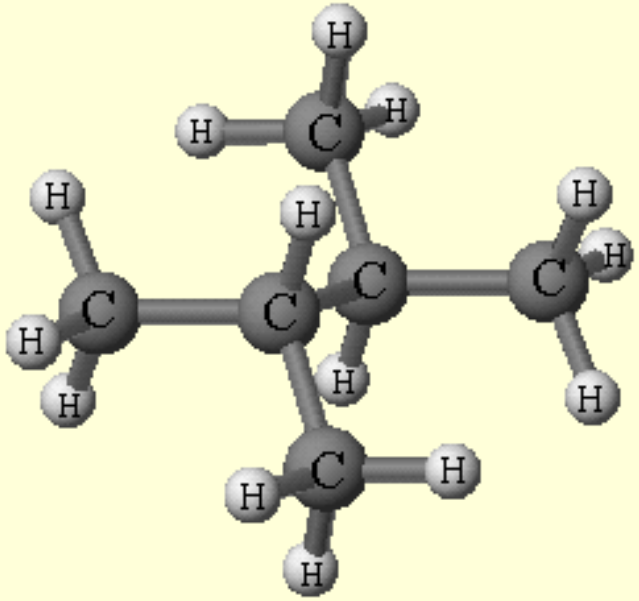




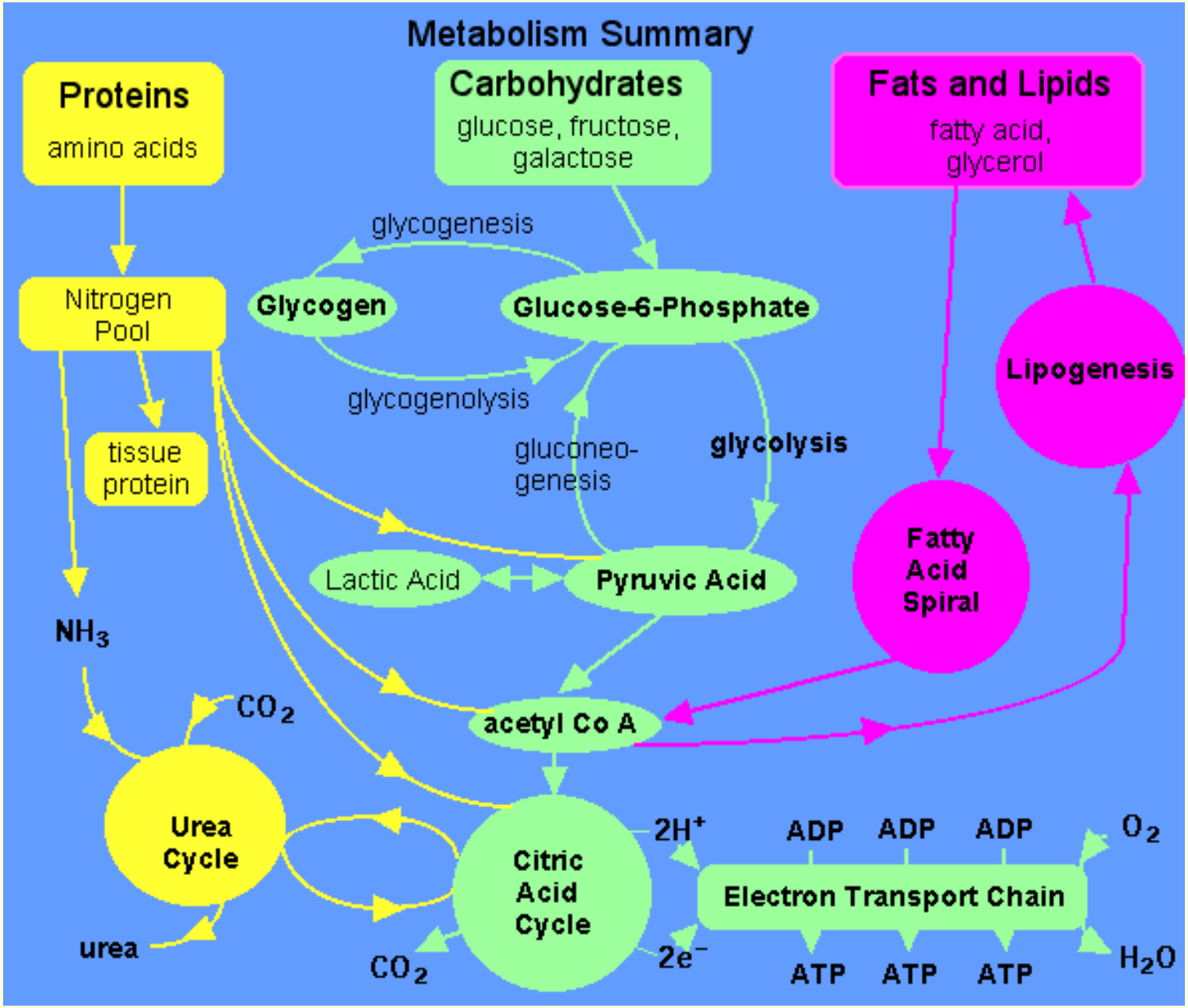
Biochemical Nature of Life

Biochemical processes and molecules are essential fro maintaining dynamic equilibrium.

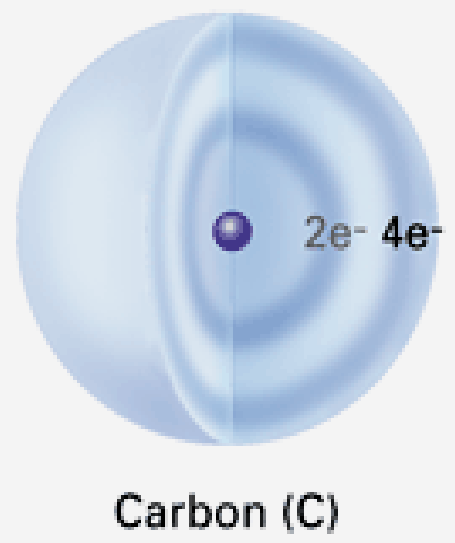


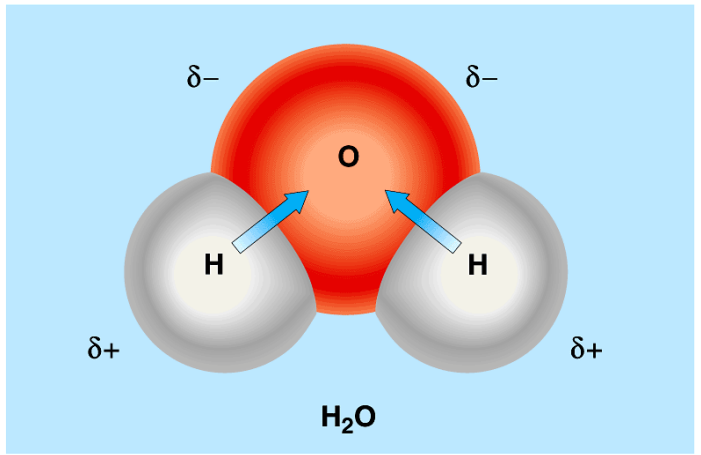


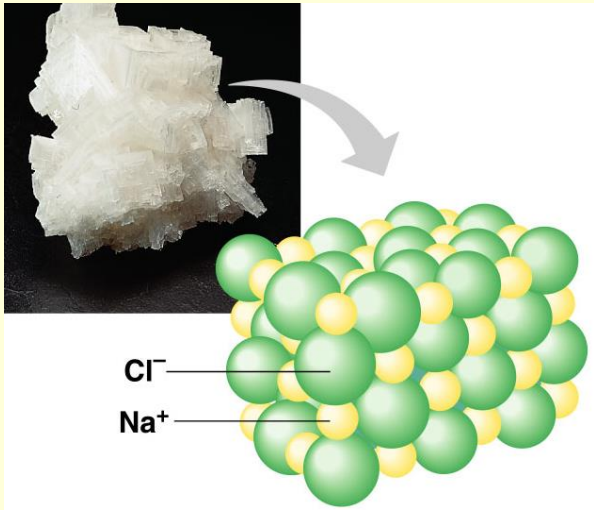
Metabolism is the sum of the processes in an organism



Carbon is the main ingredient of organic molecules







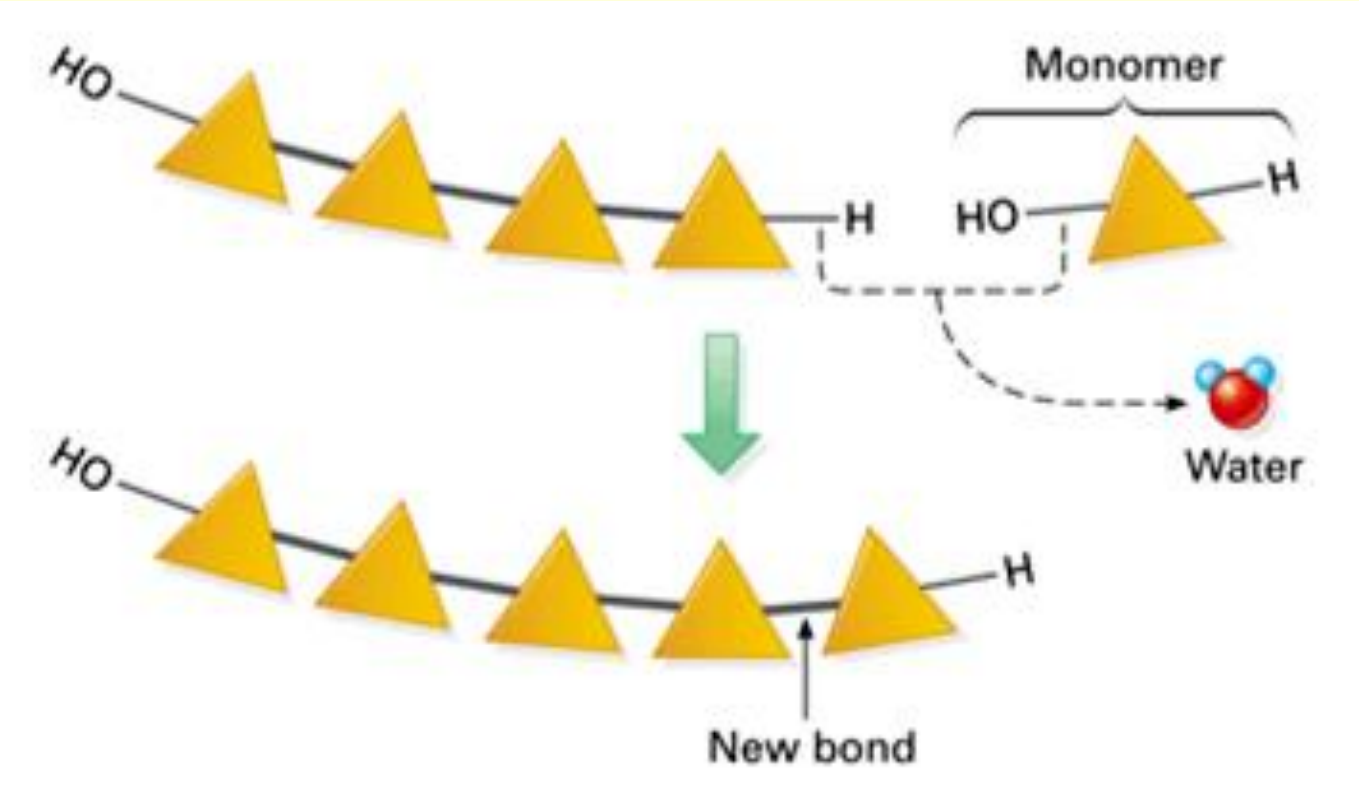
Organic compounds are carbon based and contain carbon and hydrogen.

Inorganic compounds are not carbon based. (Water, salt, minerals…)

Large and Small Organic Molecules

Small molecular units that are the building block of a larger molecules

Polymer: long chain of small molecular units (monomers)

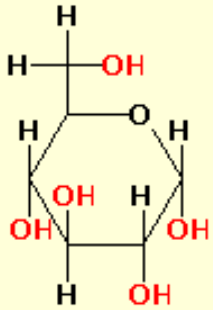


Living things must both synthesize (build) large molecules and break them down.

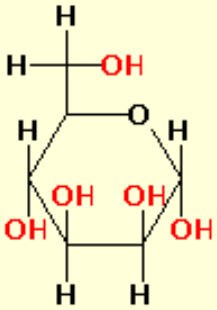
Can you think of examples when this is done?

Organic chemistry is the study of carbon compounds

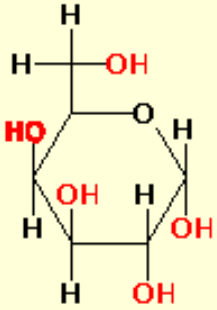
Carbohydrates, Proteins, Fats, Nucleic Acids



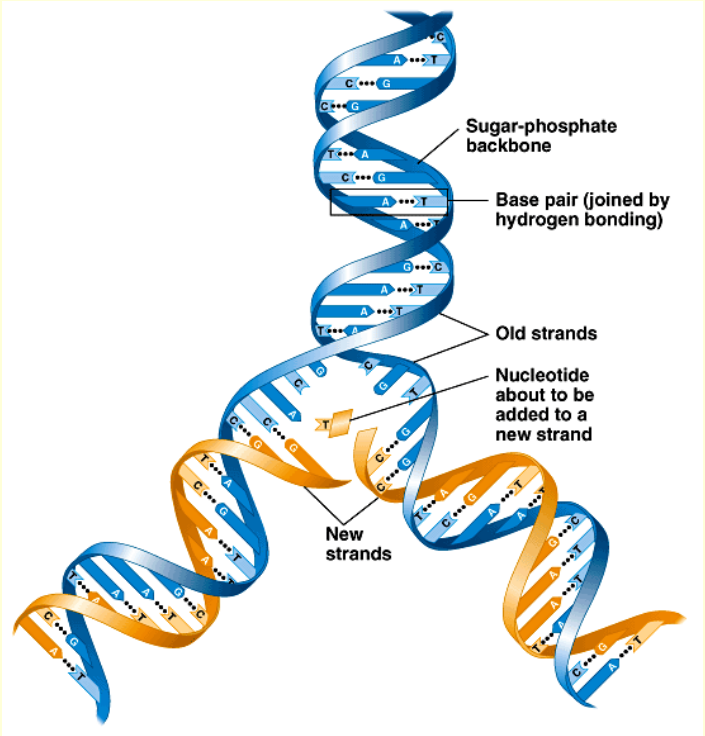
Glucose

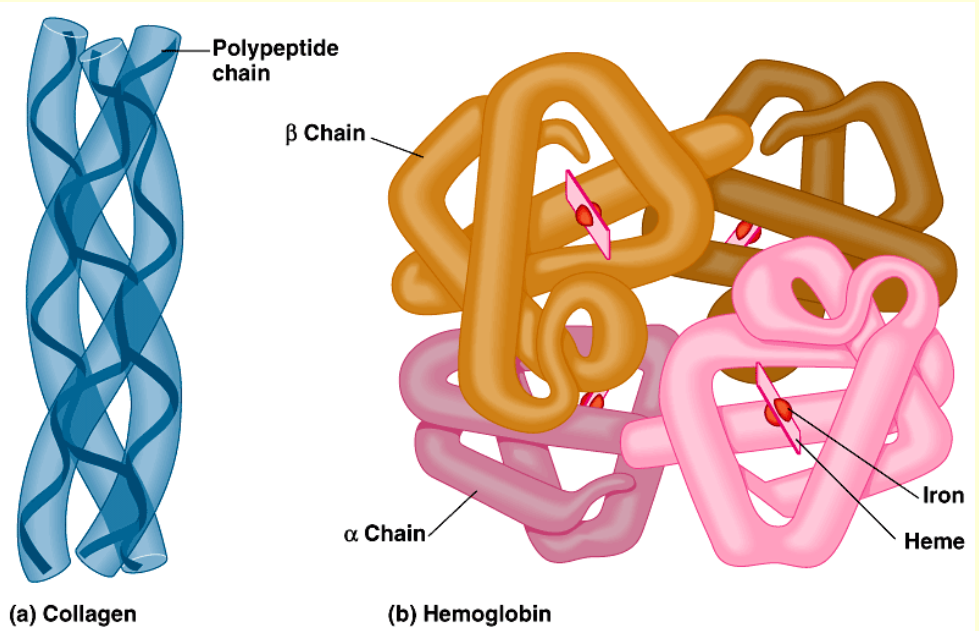


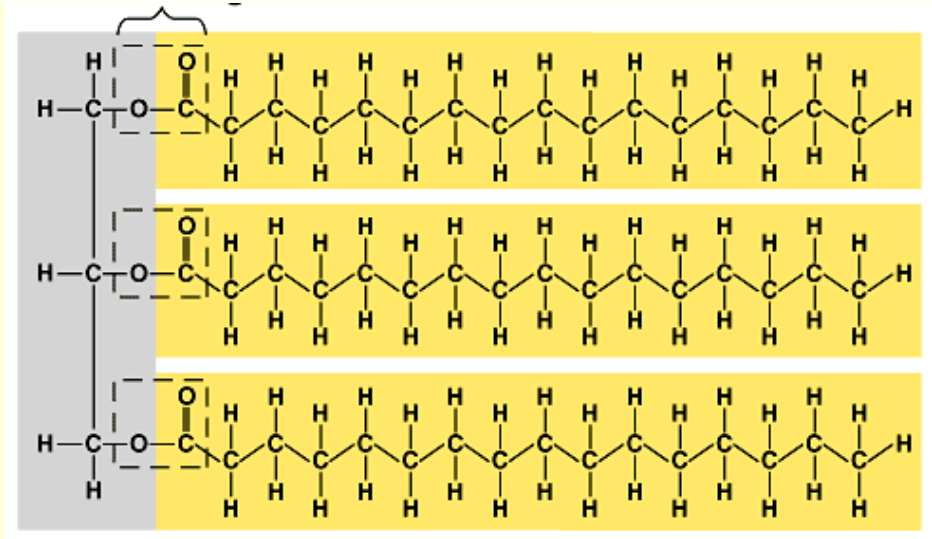
Mannose



Galactose





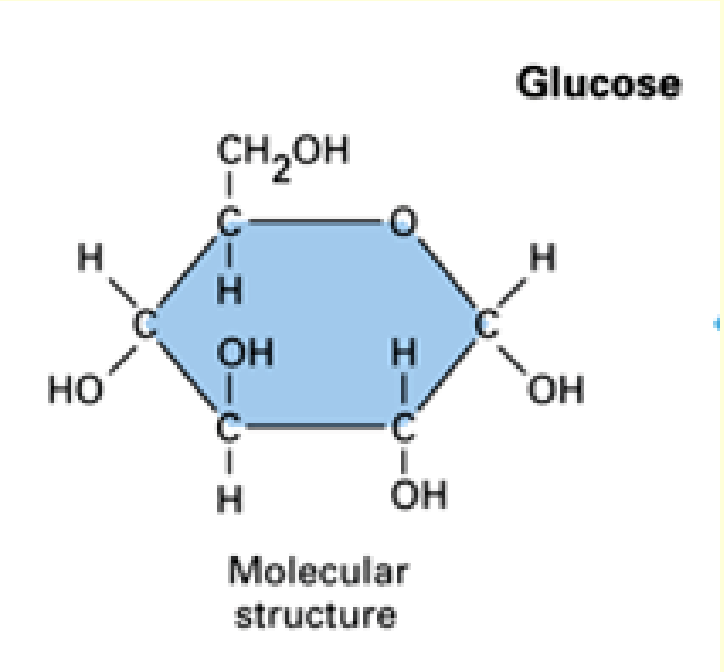


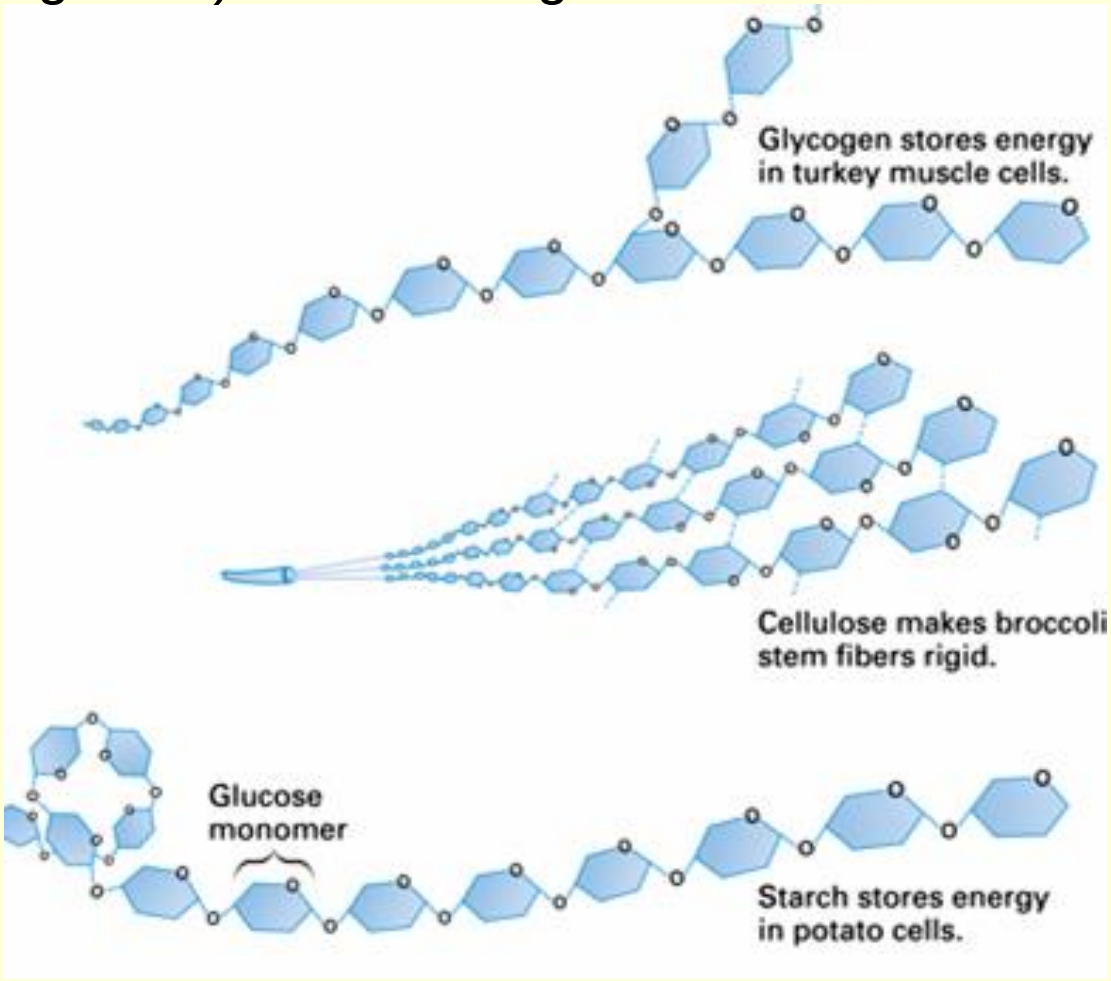
Carbohydrates provide fuel and building material

Carbohydrates are organic compounds made of sugar molecules.

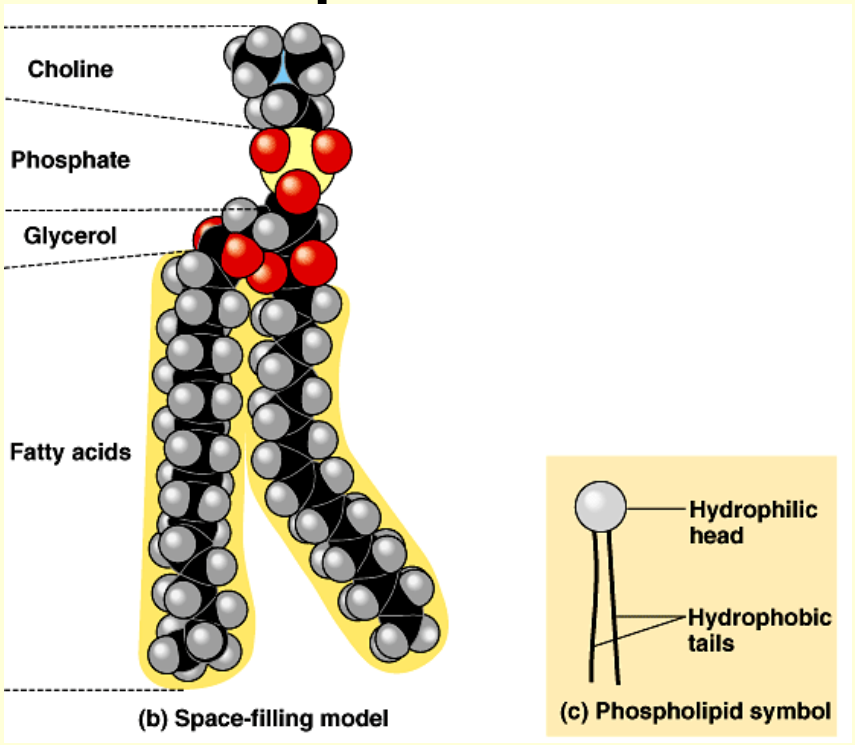
Sugars are combined to synthesize starch.

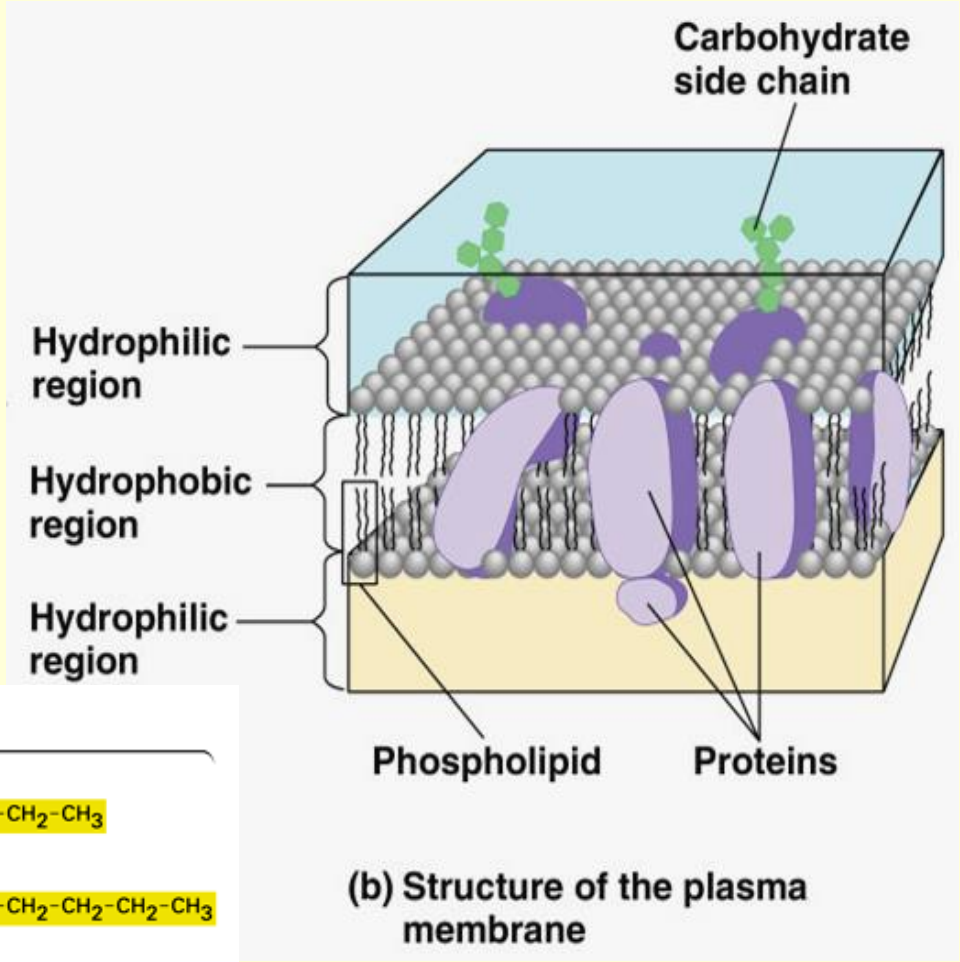
Starches are broken down (digested) to make sugars.

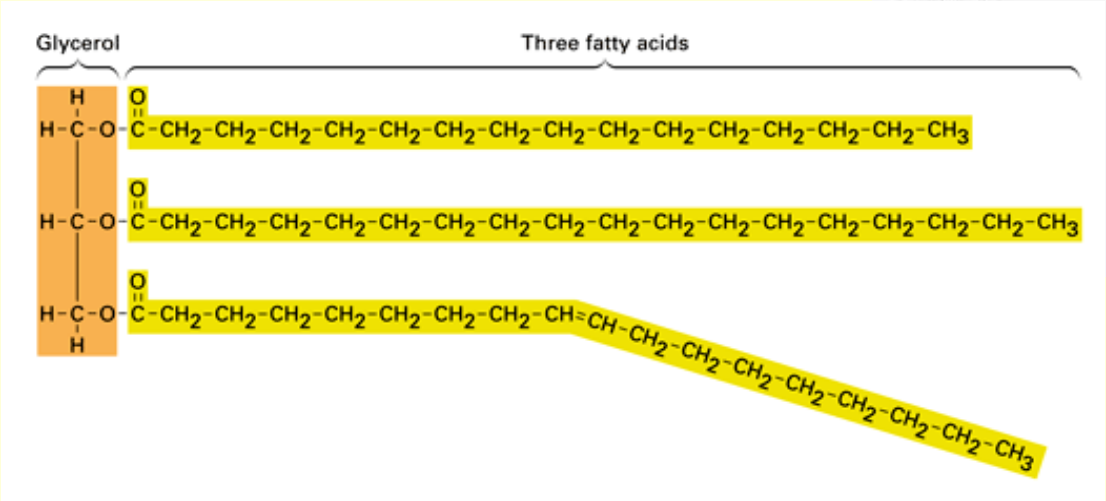




Fats are important for stored energy and membrane structure

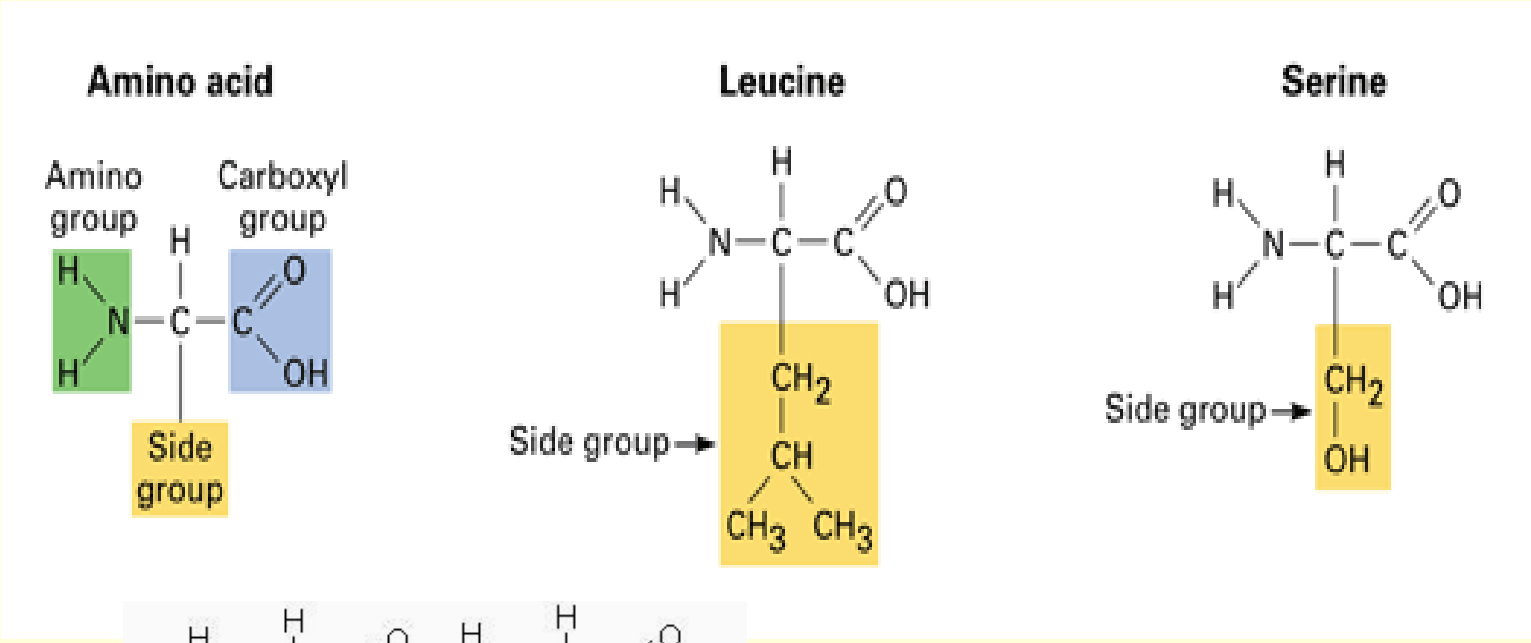






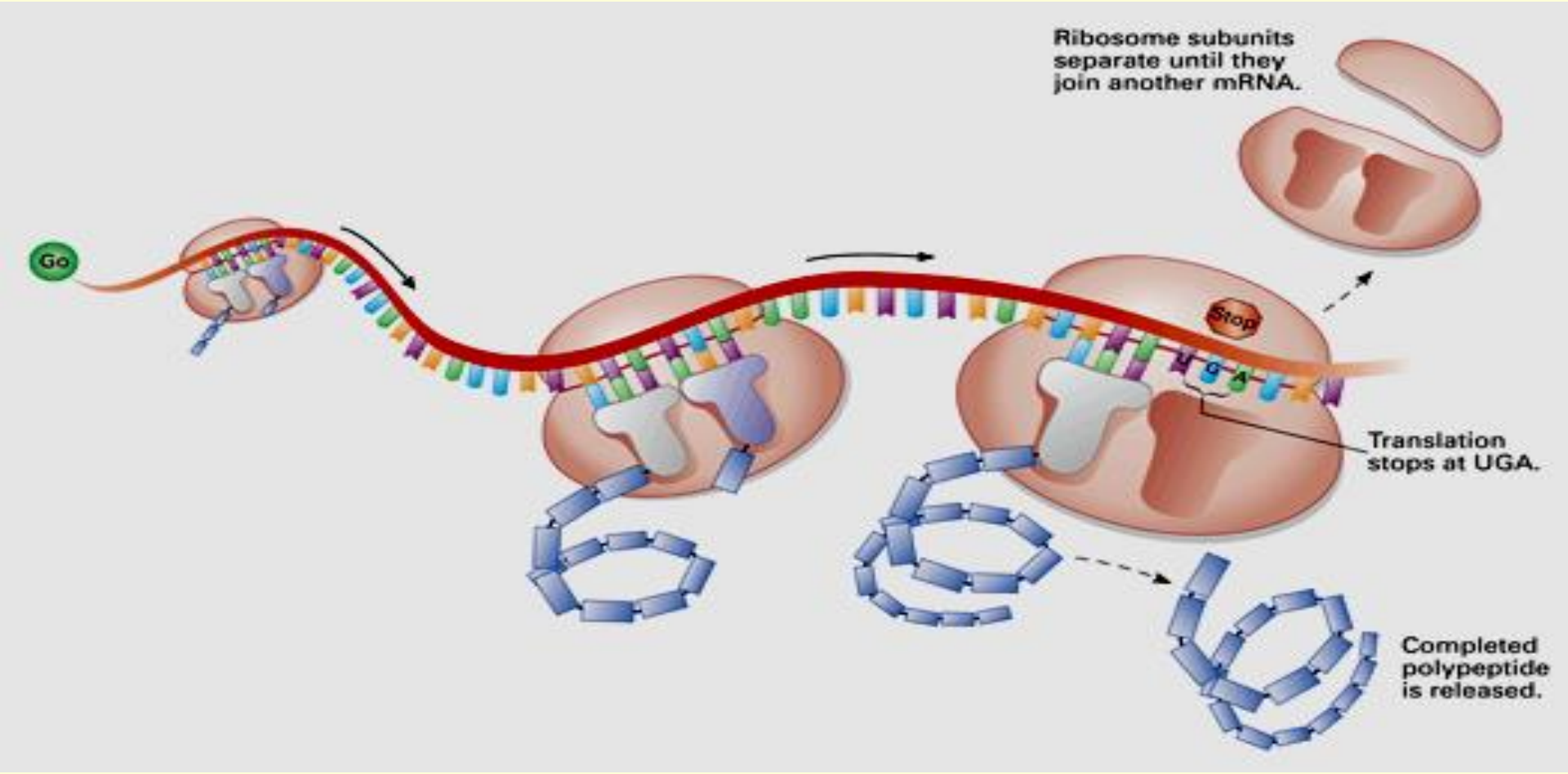
Proteins are long folded chains made of 20 different kinds of amino acids

Specific shape determines its function.



A molecule of water is removed from two glycine amino acids to form a peptide bond.

Proteins are synthesized at the ribosomes and folded into specific shapes



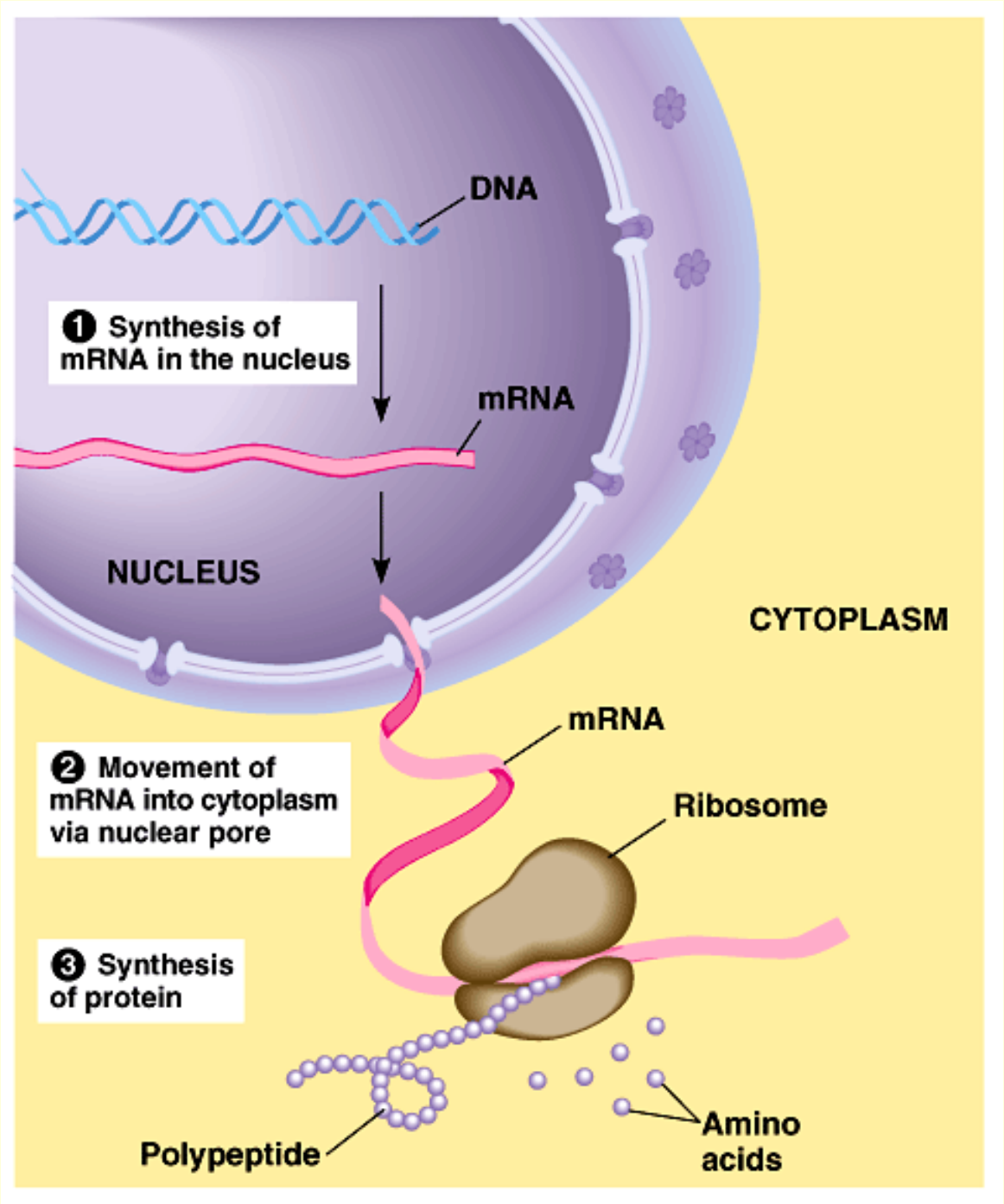
Protein shape is essential to function

Protein Synthesis

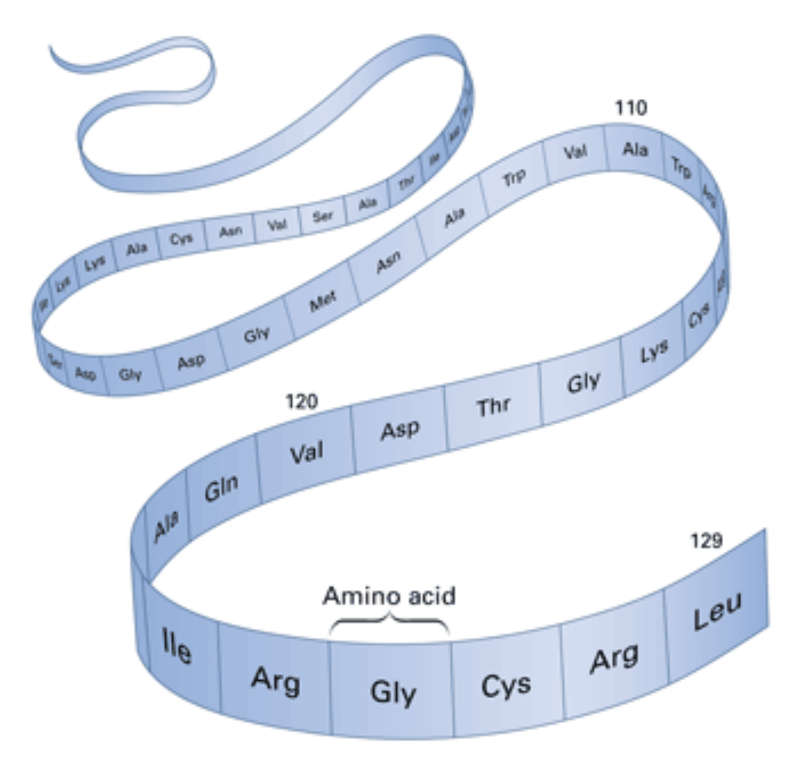
Review the process and outline the steps.

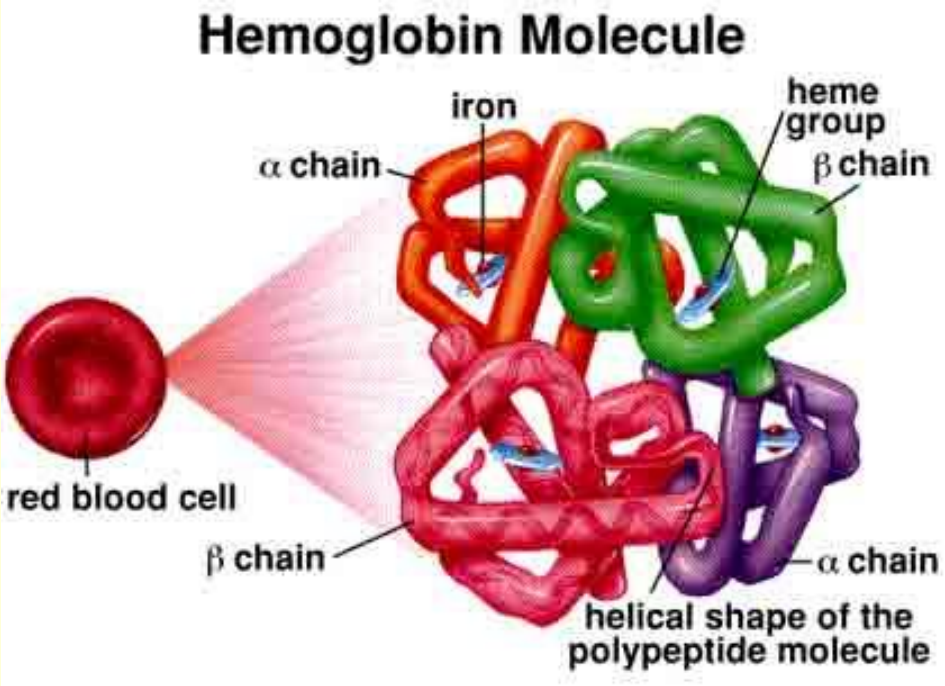
Why is this process important?

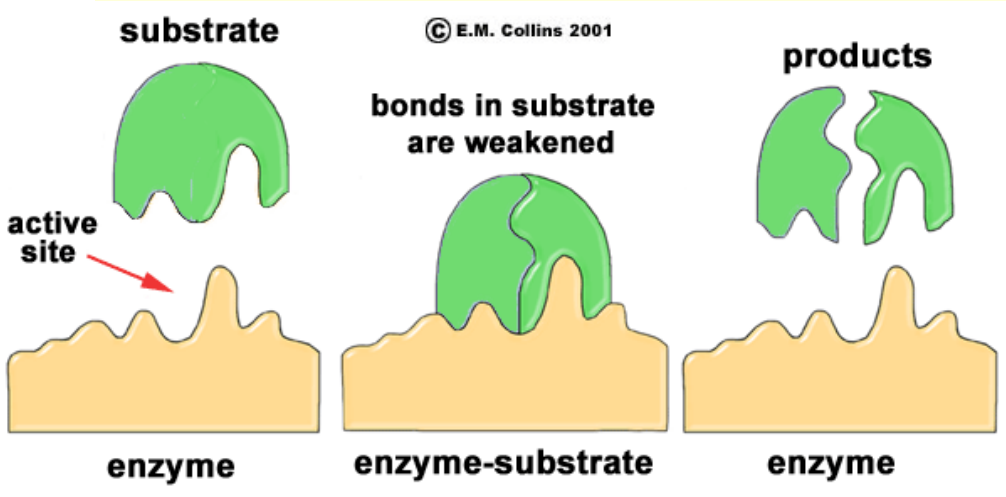
How does it relate to the nuclear control of the cell?



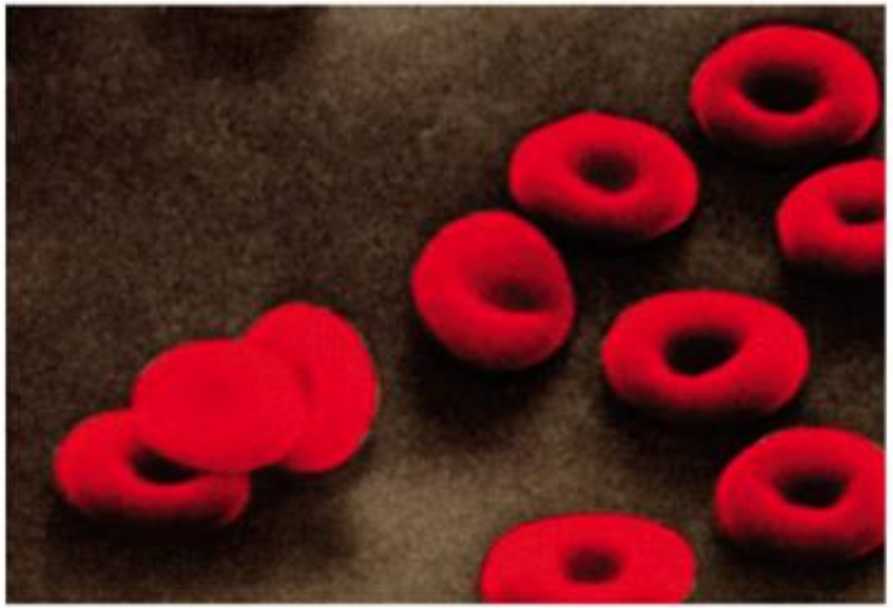
Protein shape determines function







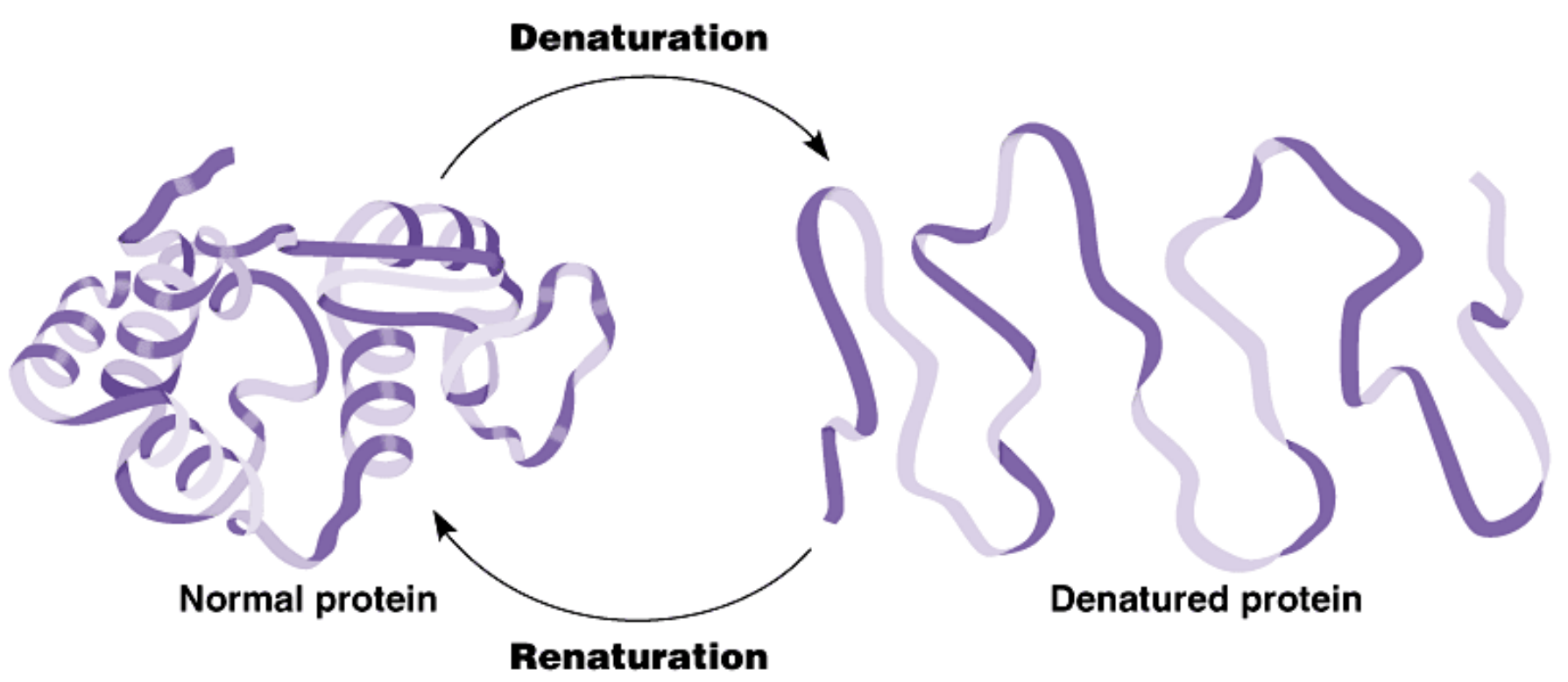
A single amino acid substitution in hemoglobin causes sickle-cell disease. How does an individual get this disorder?



(a) Normal red blood cells and the primary structure of normal hemoglobin

(b) Sickled red blood cells and the primar structure of sickle-cell hemoglobin

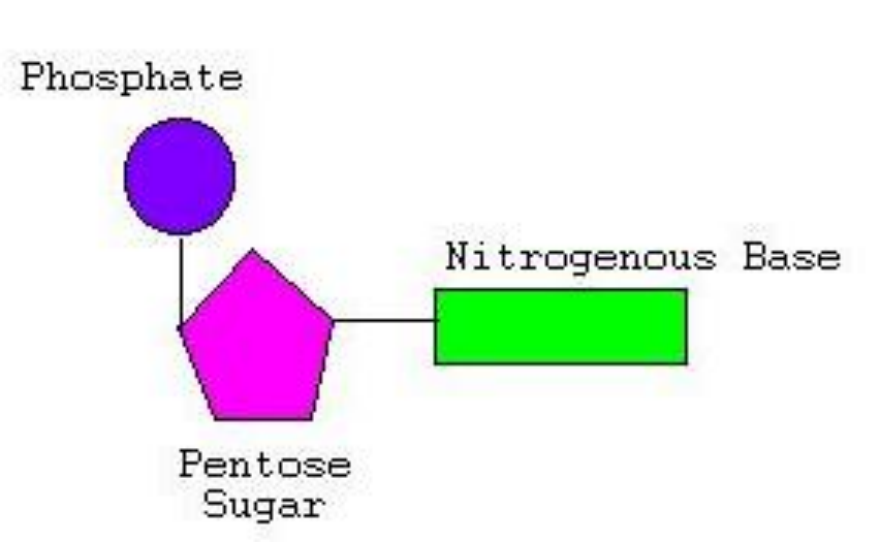
Denaturation occurs at high temperatures or various chemical treatments. Shape maybe permanently changed.



How will denaturation effect the functioning of the protein?

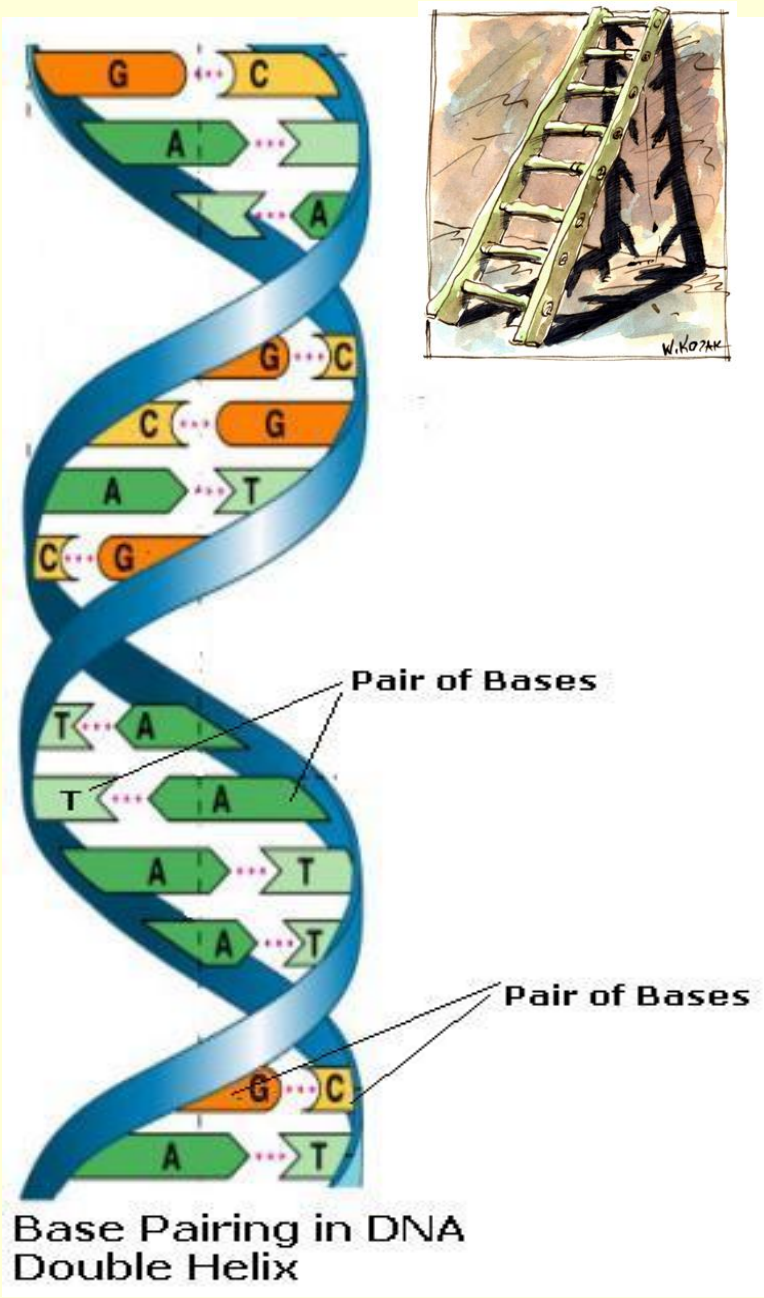
Structure of DNA (Nucliec Acids)

Building Blocks are Nucleotides



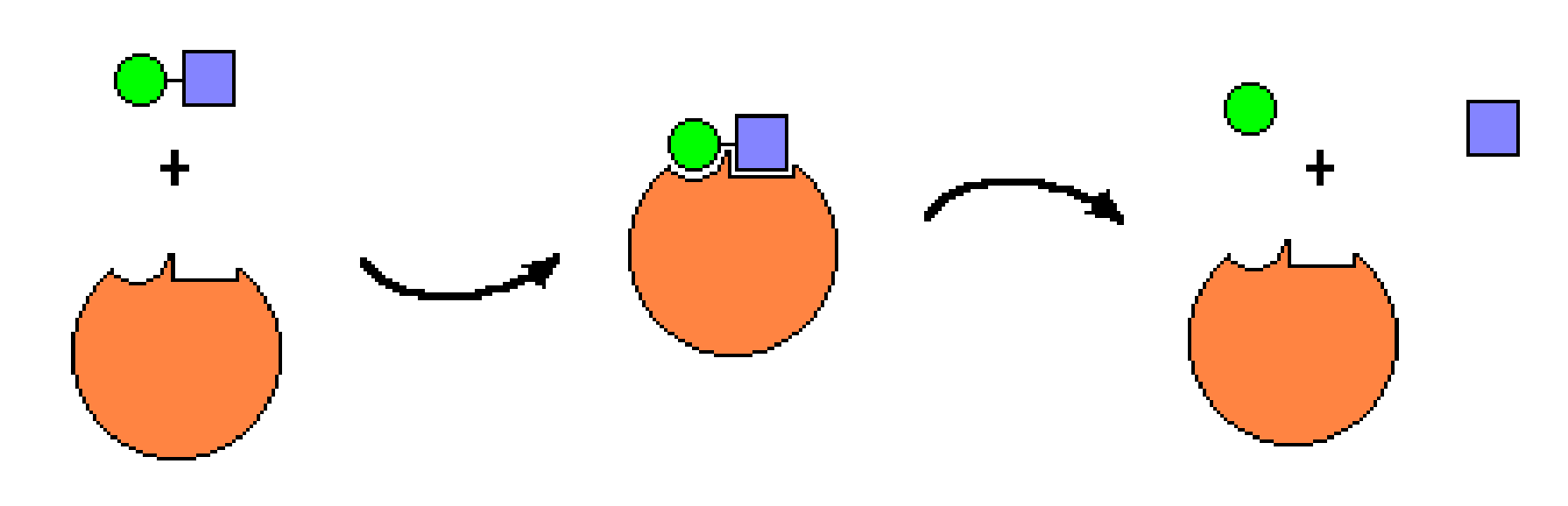
Nitrogen Bases

- Adenine
- Thymine
- Guanine
- Cytosine



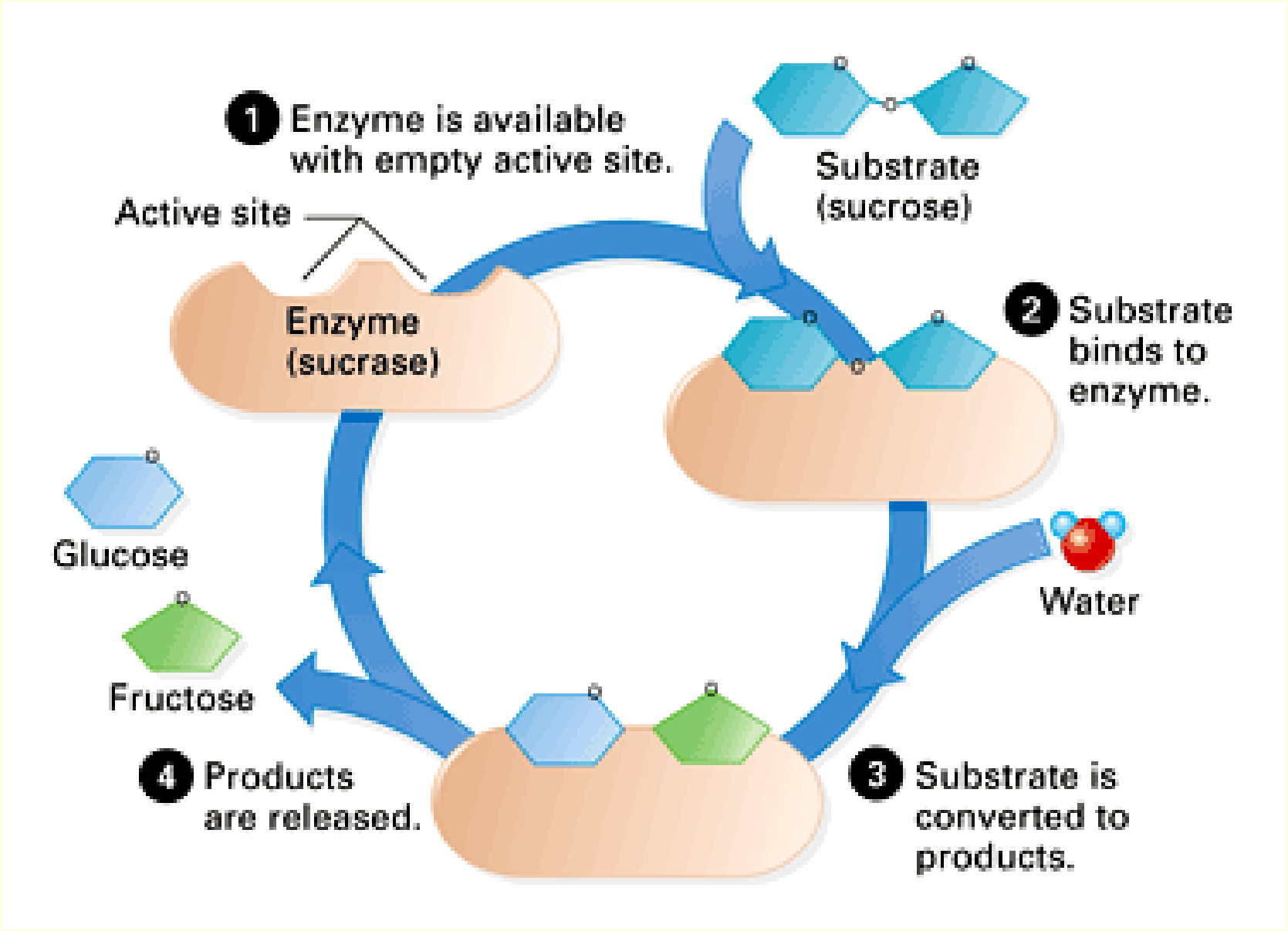
Enzymes specialized protein that catalyzes the chemical reactions of a cell

- Enzyme shape fits the shape of only particular reactant molecules called the substrate.
- Enzymes are specific to the substrate.
- The substrate fits the enzyme at the active site.

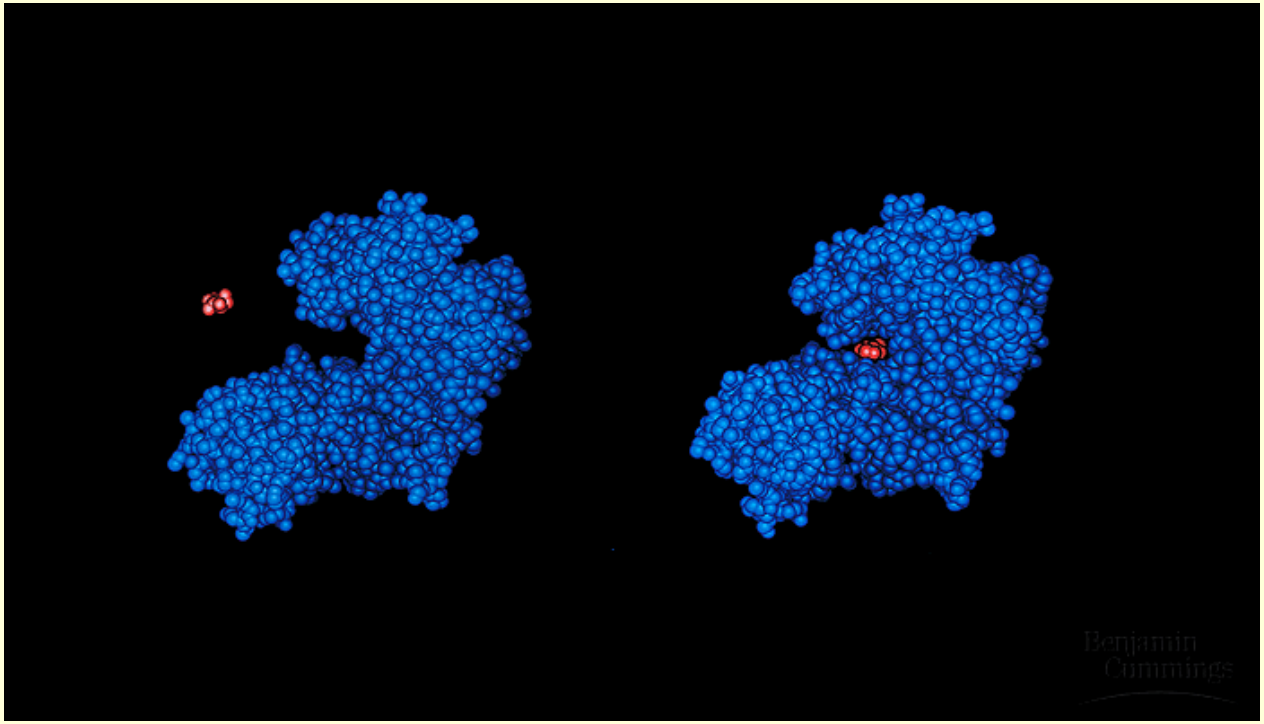


Identify the enzyme, substrate, and active site

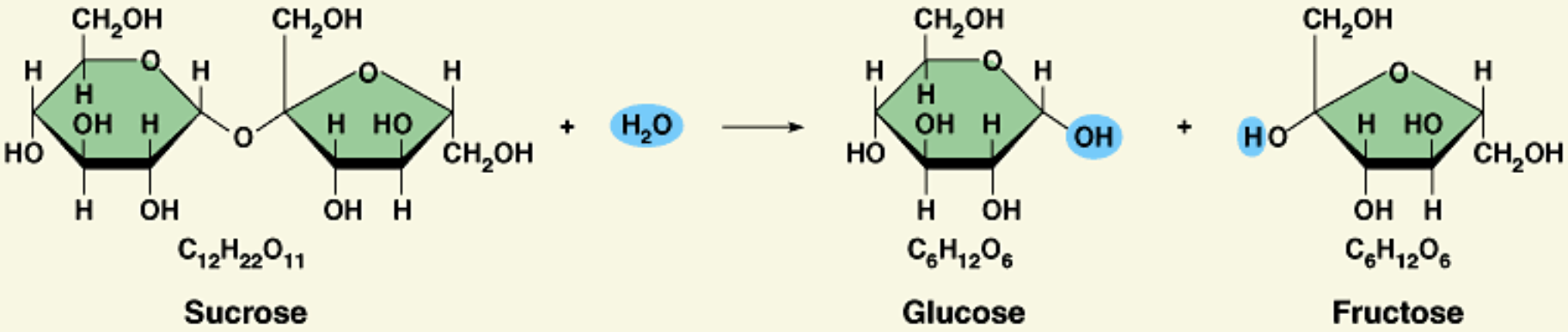
Catalytic cycle of a enzyme



Enzymes are substrate specific due to the “fit” at the active site of the enzyme.



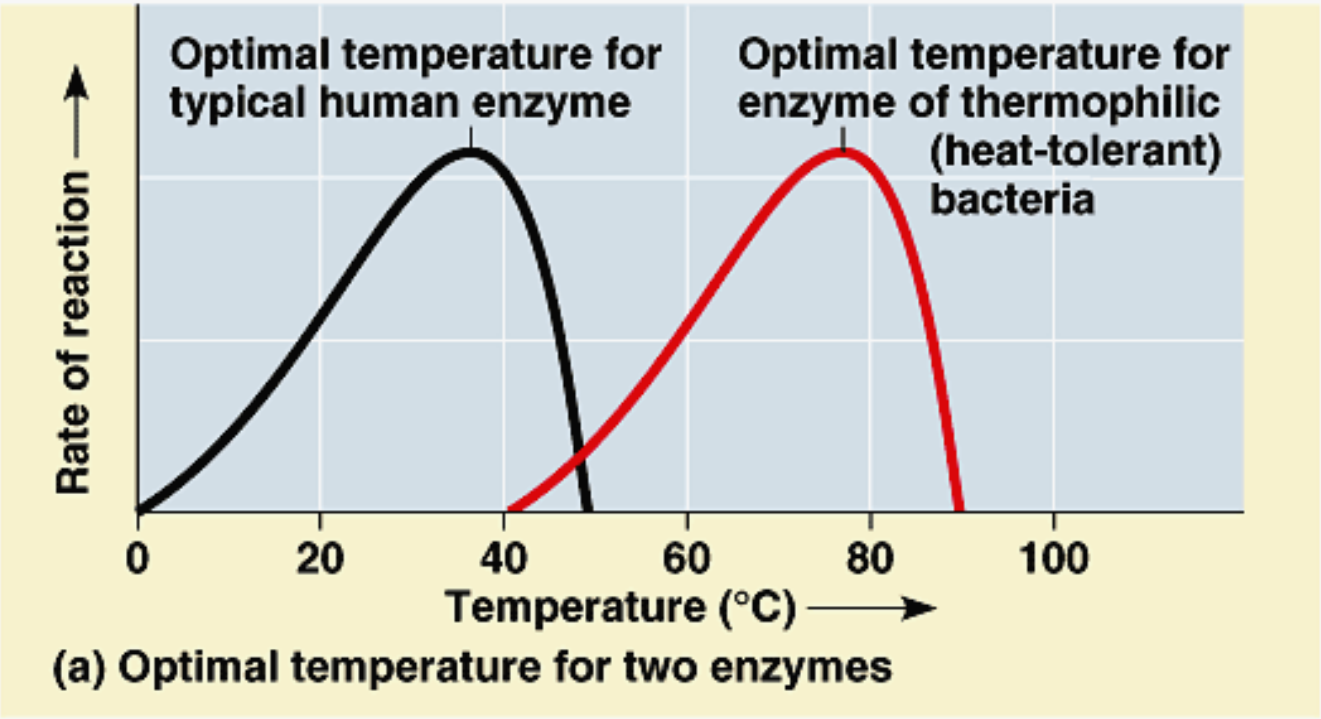
Enzyme sucrase will catalyze this reaction



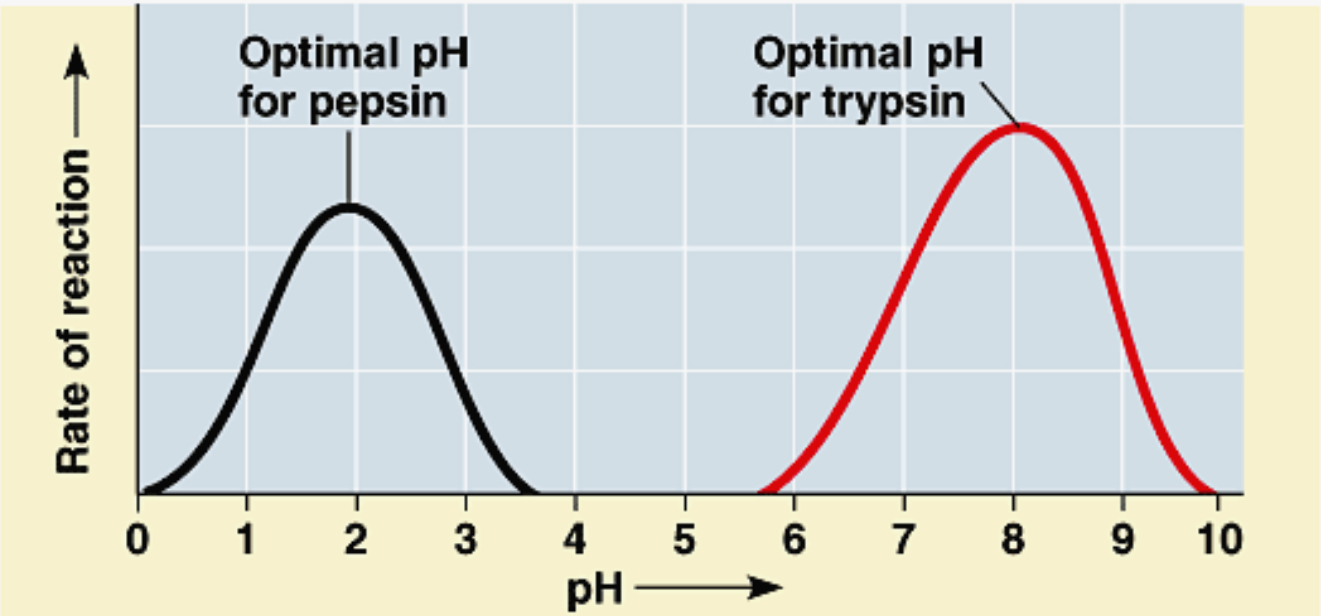
Factors influence rate of enzyme reactions

Do all enzymes require the same condition?

What happens when enzymes are heated beyond optimal temperatures?



(a) Optimal temperature for two enzymes



(b) Optimal pH for two enzymes

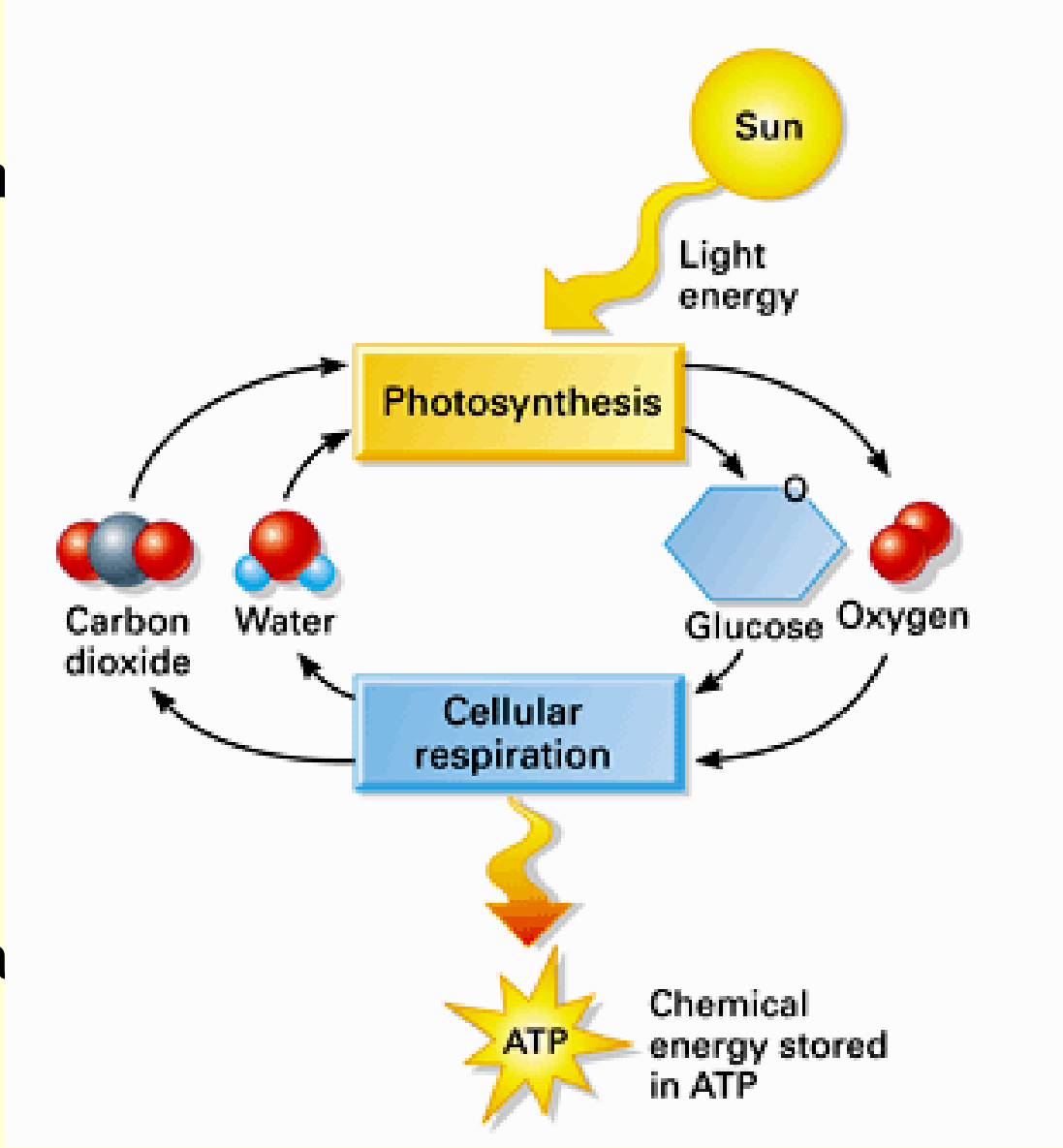
Principles of Energy Harvest

Energy flow occurs through the ecosystem

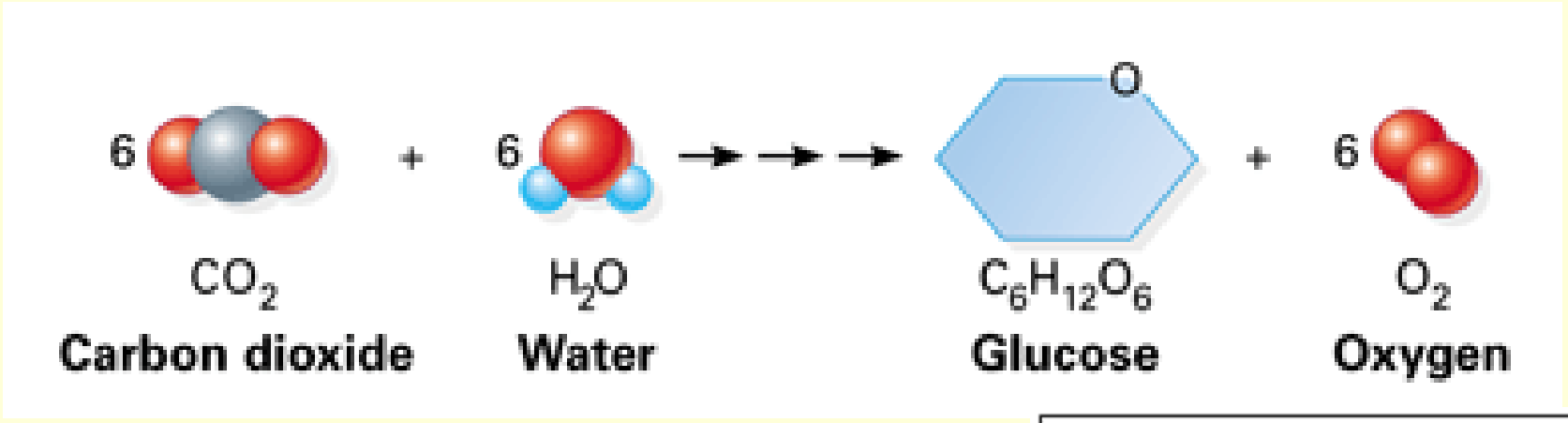
The products of photosynthesis are used in cellular respiration.

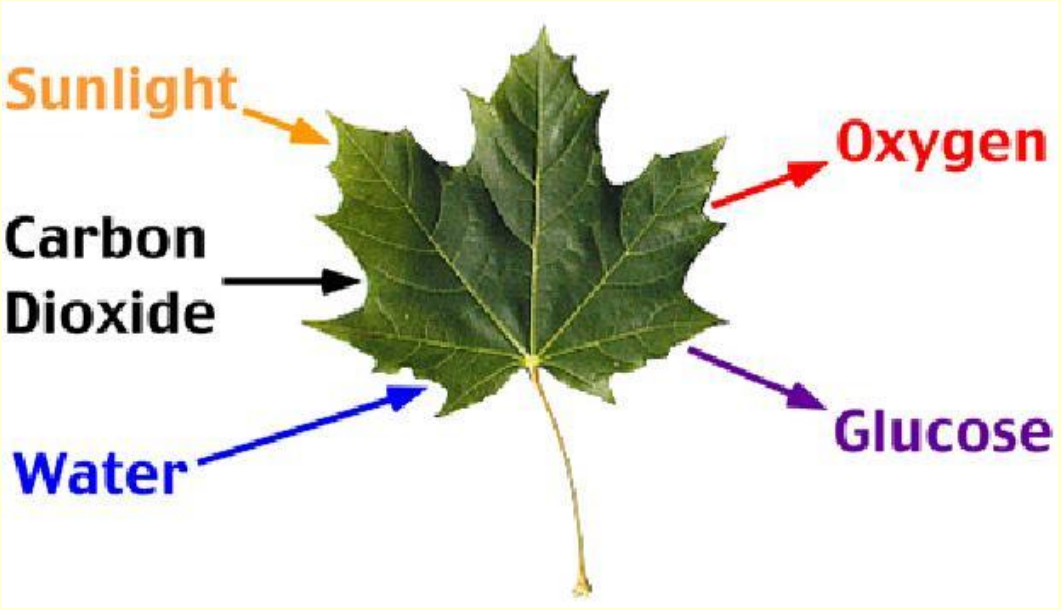
The products of cellular respiration are the ingredients for photosynthesis.

What is needed to keep it a going?

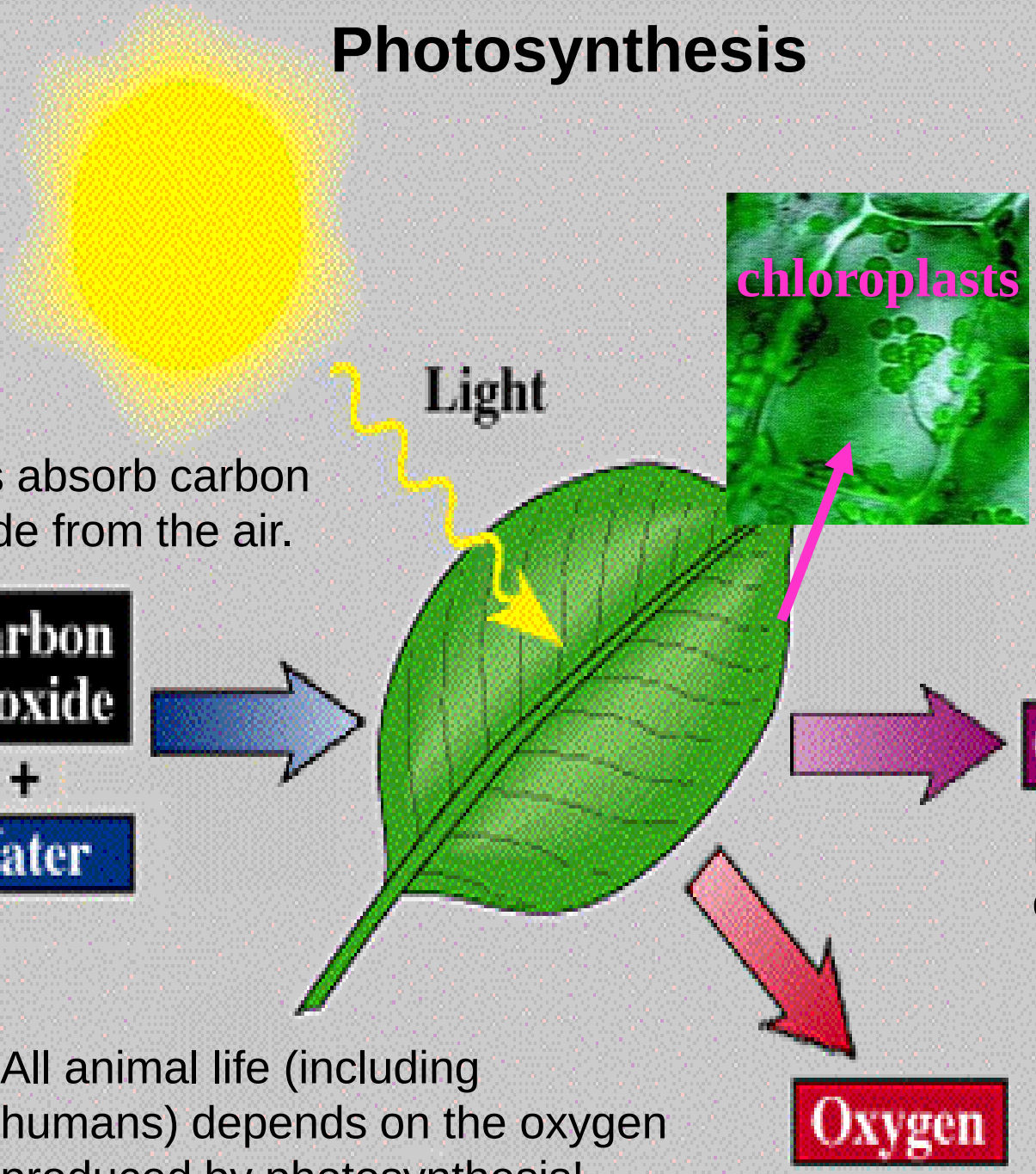


Photosynthesis: Use light energy from the sun to make sugar from carbon dioxide and water.



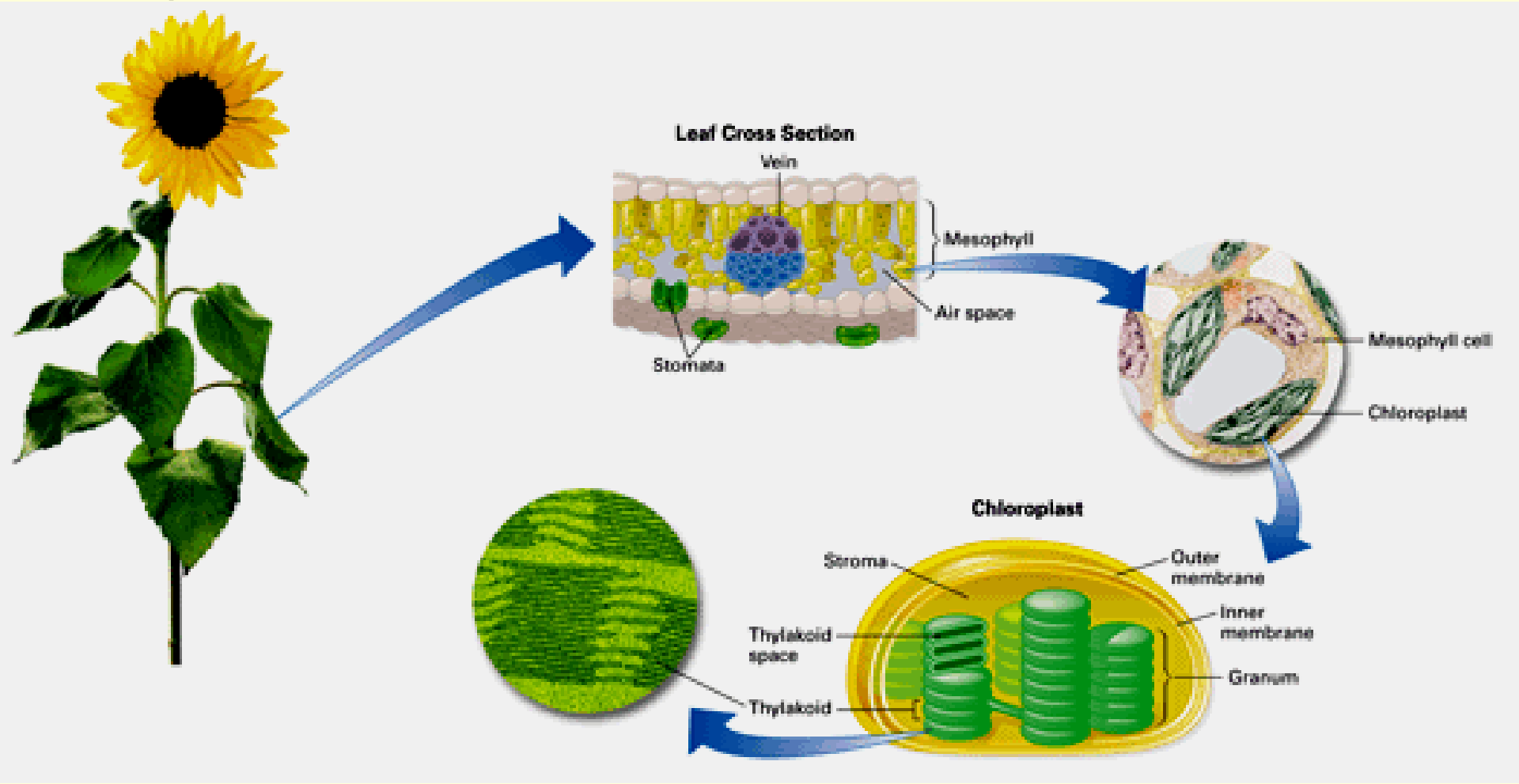


Photosynthesis



Chloroplasts are the sites of photosynthesis in plants

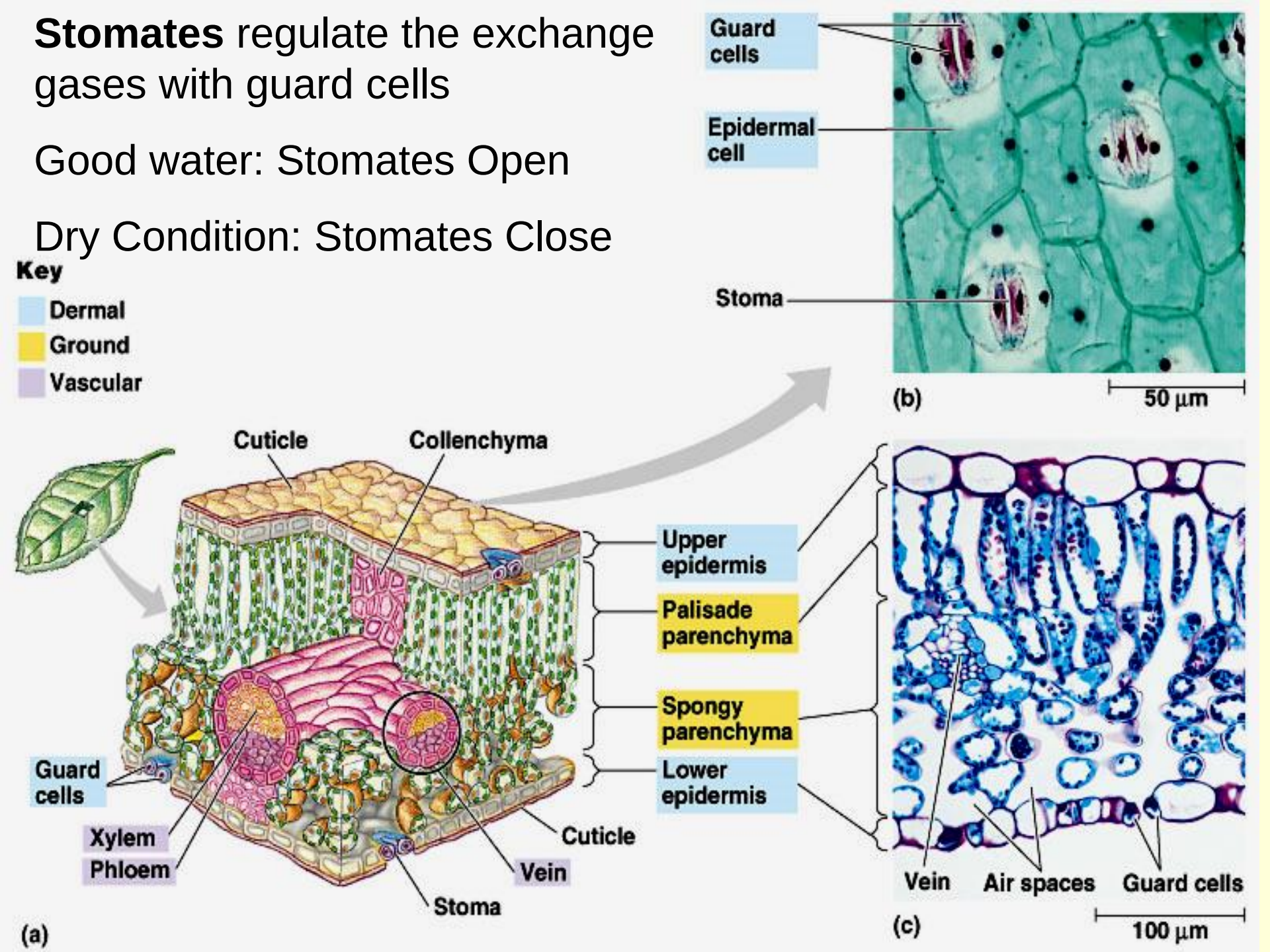
The leaf is the organ of photosynthesis.
Photosynthesis takes place in cellular organelles called chloroplasts.



Stomates regulate the exchange gases with guard cells

Good water: Stomates Open

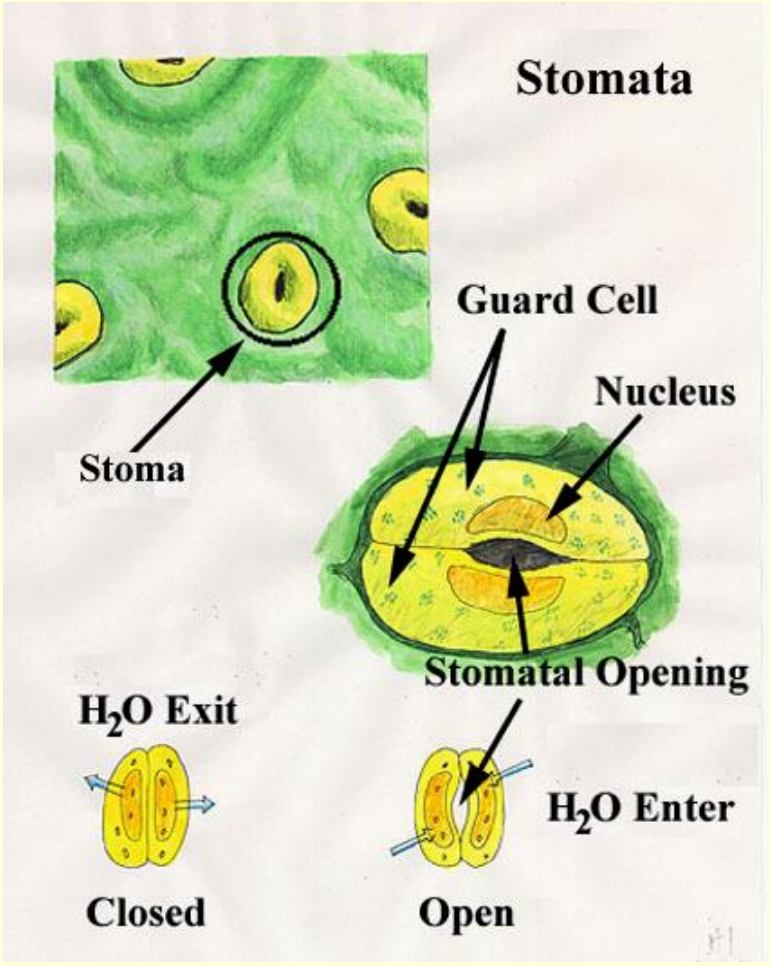
Dry Condition: Stomates Close

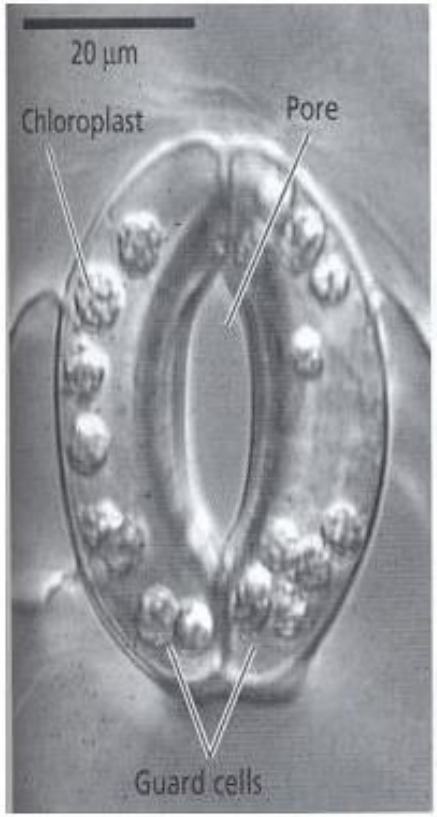


Feedback: Conditions regulate guard cells to open or close stomates

Open – water vapor exits & carbon dioxide enters

Closed – plant is conserving water

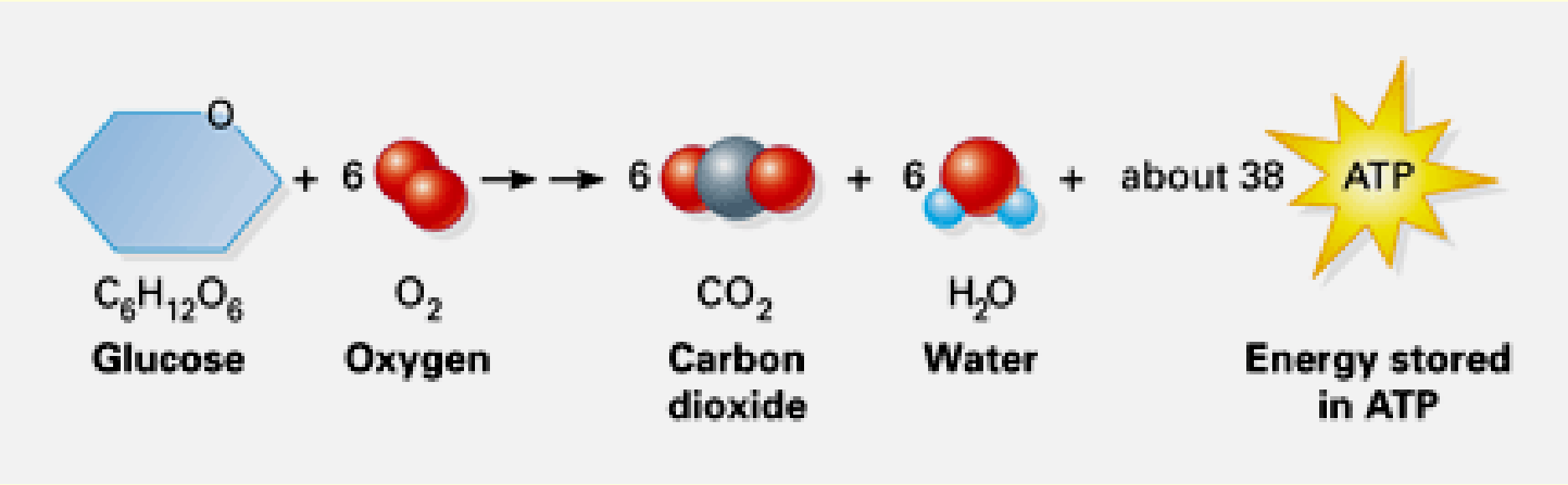




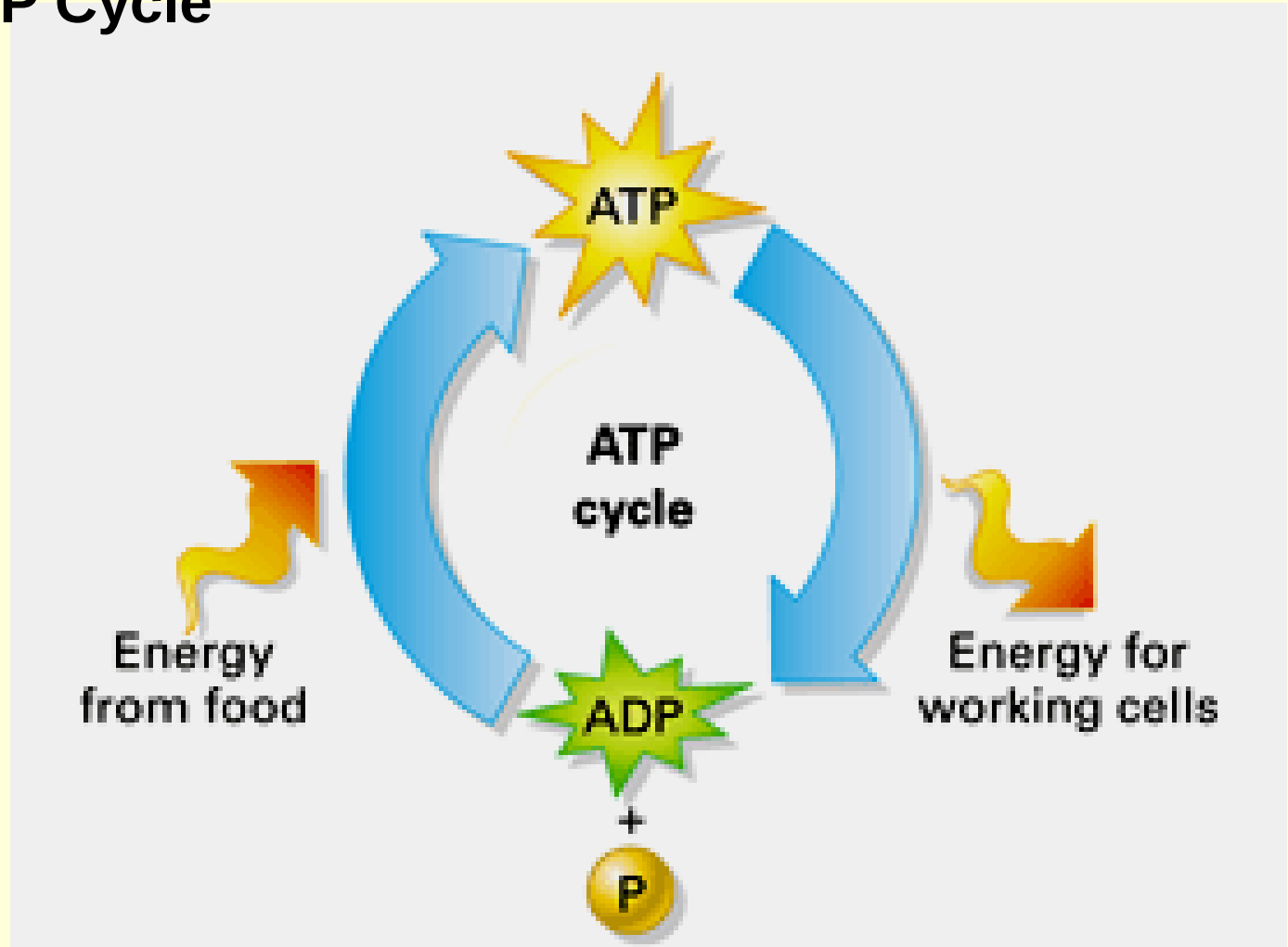
Cell Respiration

Energy stored in organic molecules is released as and temporarily stored as ATP

Organic compounds + Oxygen → Carbon dioxide + Water + Energy



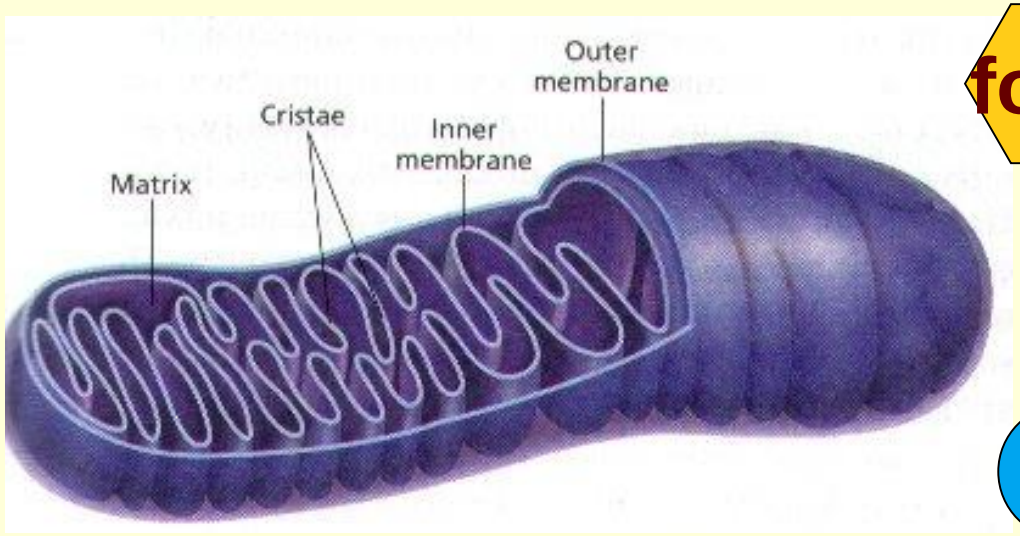
The ATP Cycle

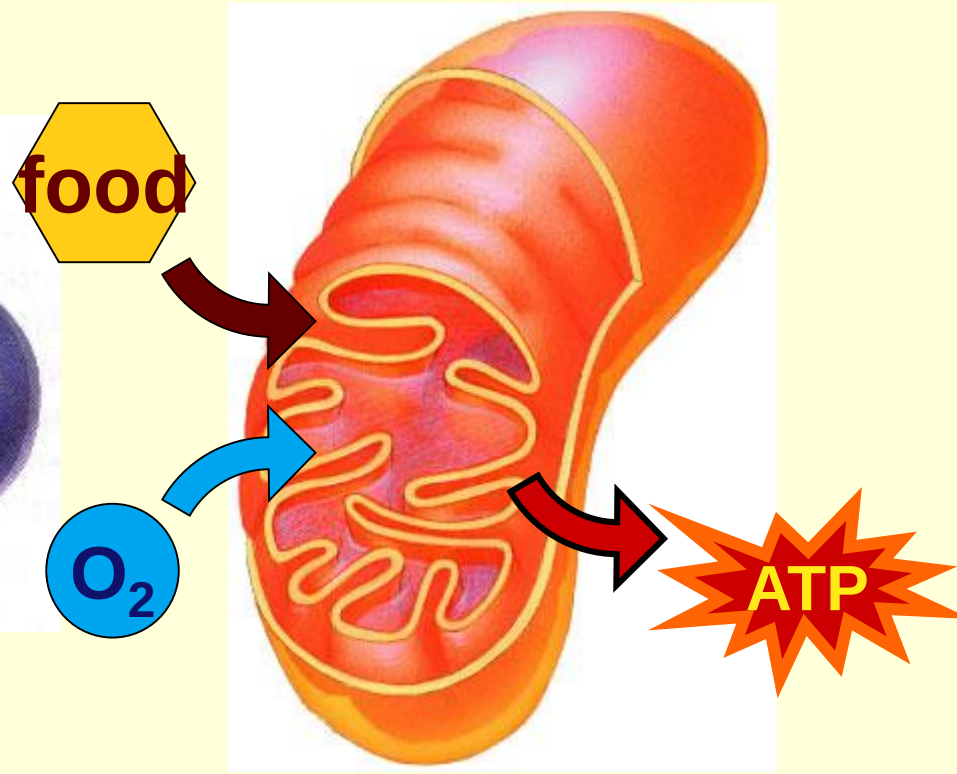


ATP is constantly recycled in your cells. A working muscle cell recycles all of its ATP molecules about once each minute. That's 10 million ATP molecules spent and regenerated per second!

Cell Respiration takes place in the mitochondria in eukaryotic cells (cell with organelles bound by membrane)

Plants and Animals perform cell respiration.



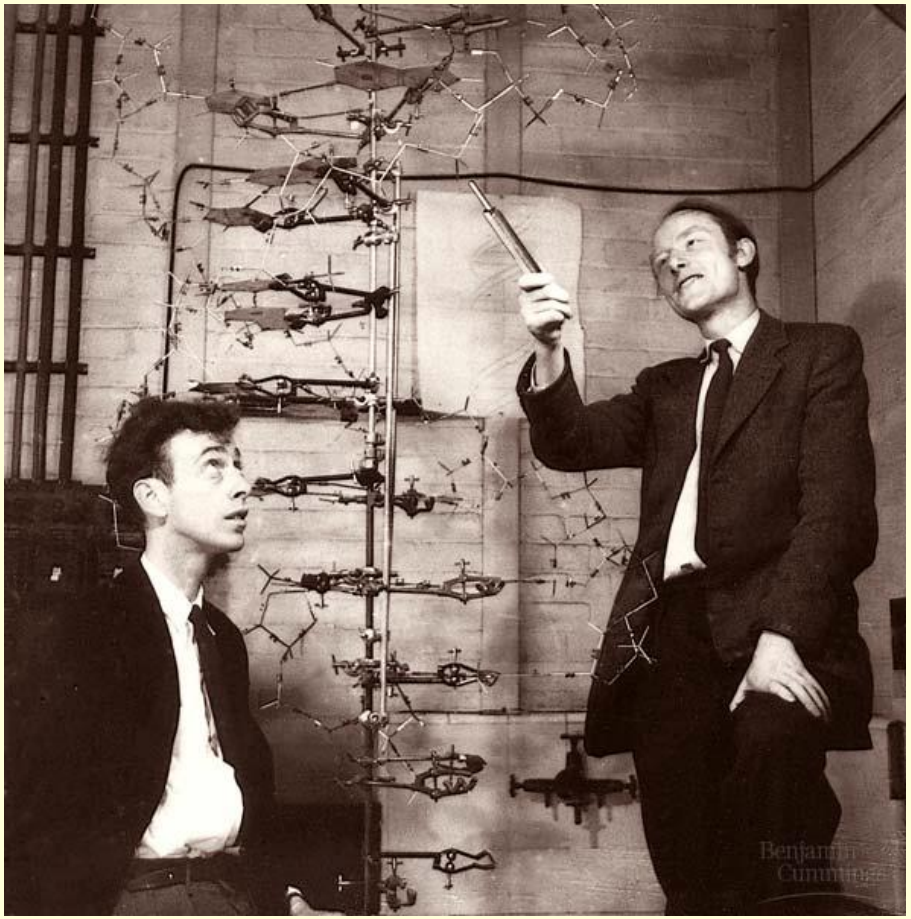


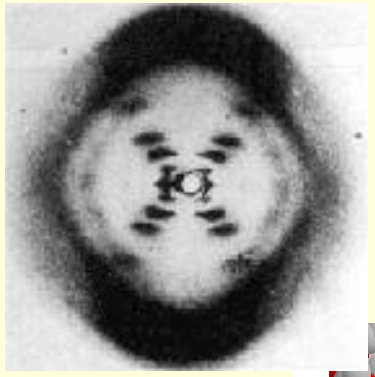
$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy (ATP + heat)}$$

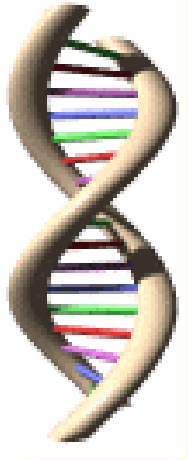
Genetic Nature of Life

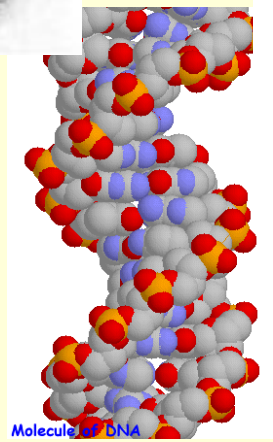
Key Idea 2:

Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.



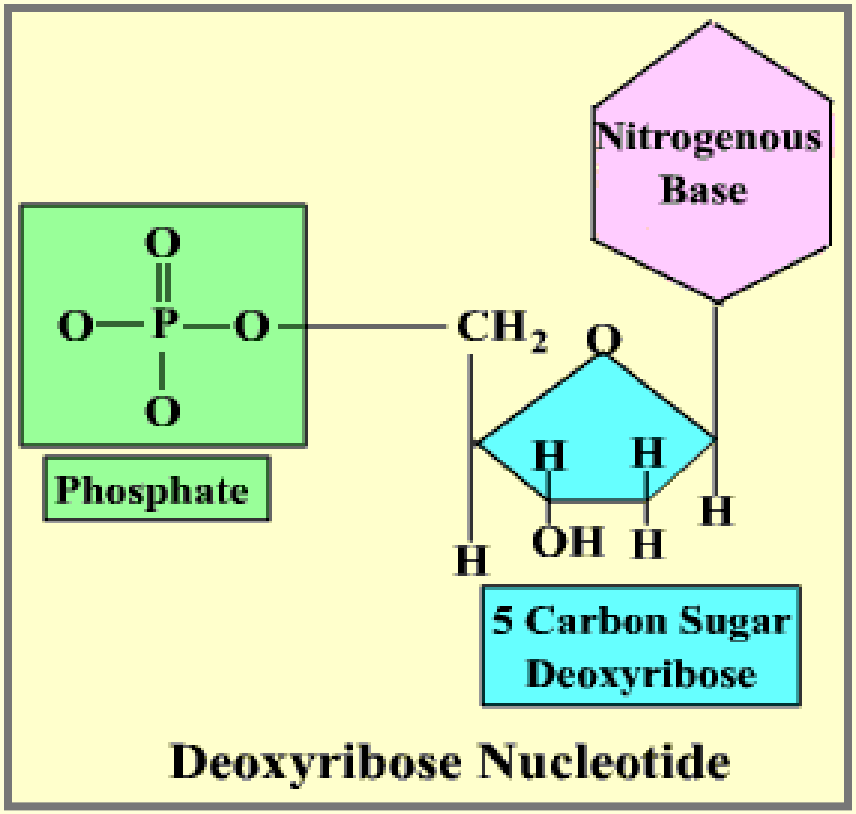




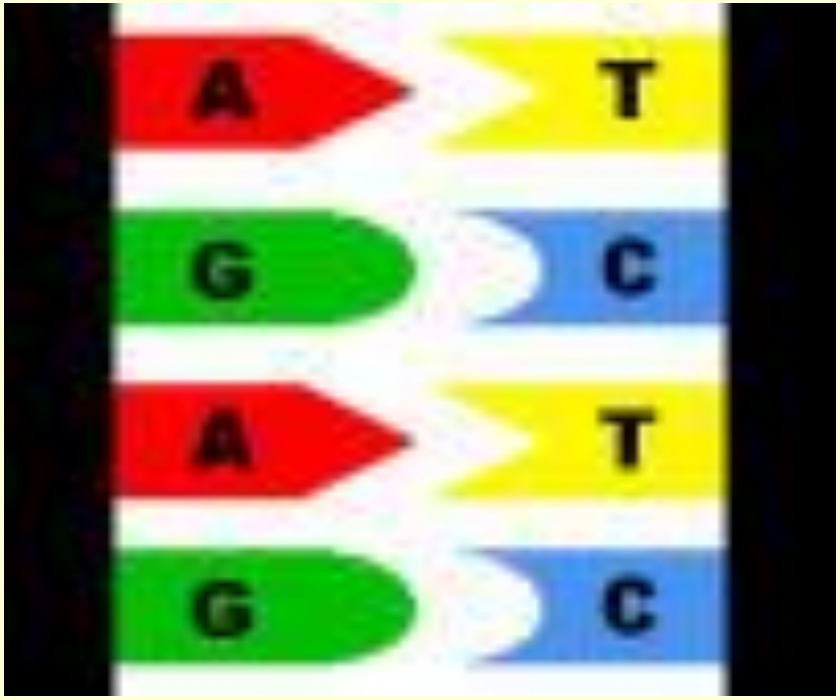


DNA is the language of life

Nucleotides: The building blocks of DNA



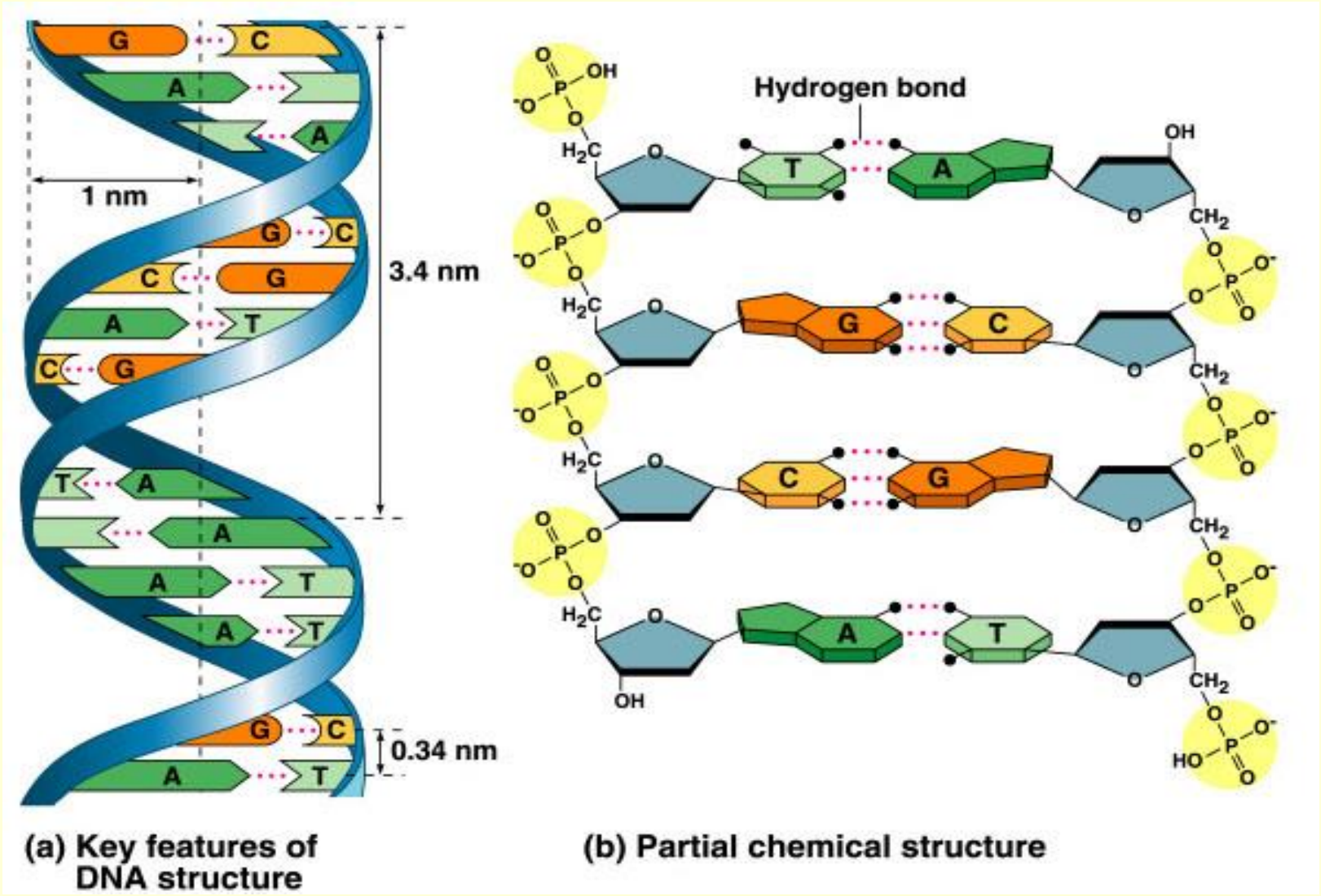
Nitrogen Bases



Structure of DNA

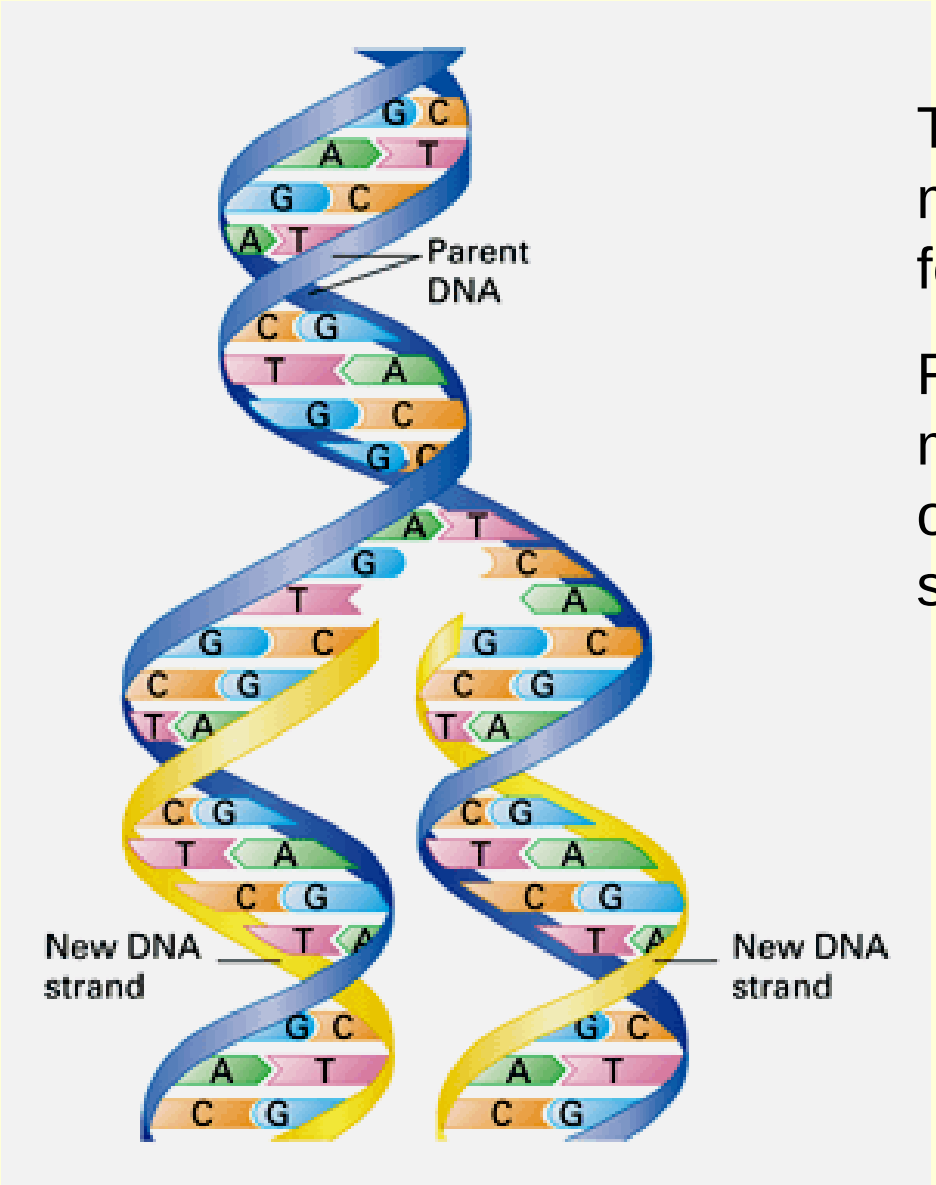
Nucleotides of sugar, phosphate, nitrogen bases

The bases pair forming the a **double helix** A:T and G:C.



DNA Replication occurs when cells divide

Occurs before cells divide in mitosis and meiosis



The original parent DNA molecule **serves as a <u>template</u>** for making a new strand.

Results in two daughter DNA molecules, each consisting of one original strand and one new strand.

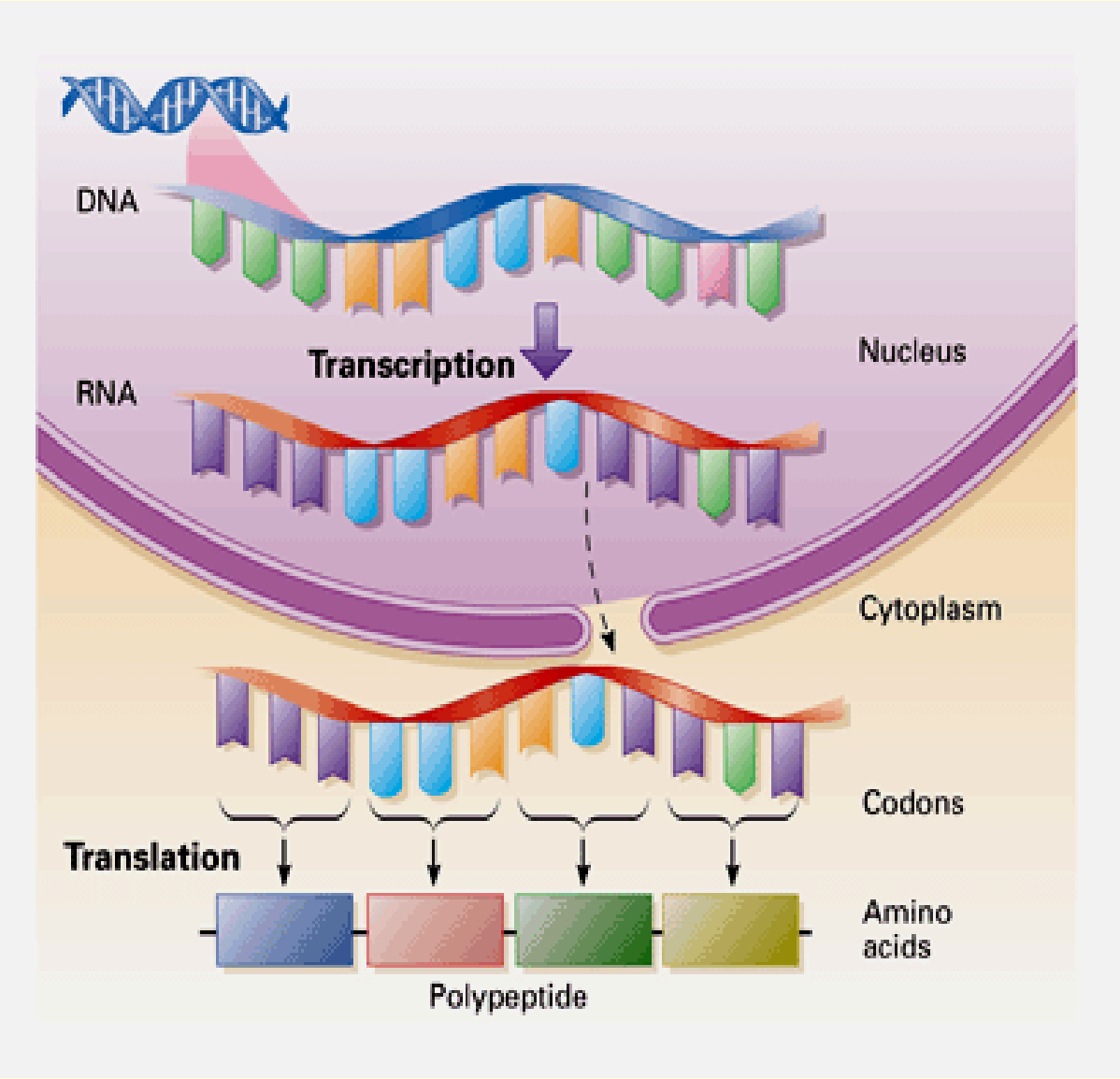
DNA regulates cell processes with its specific code to synthesize proteins.

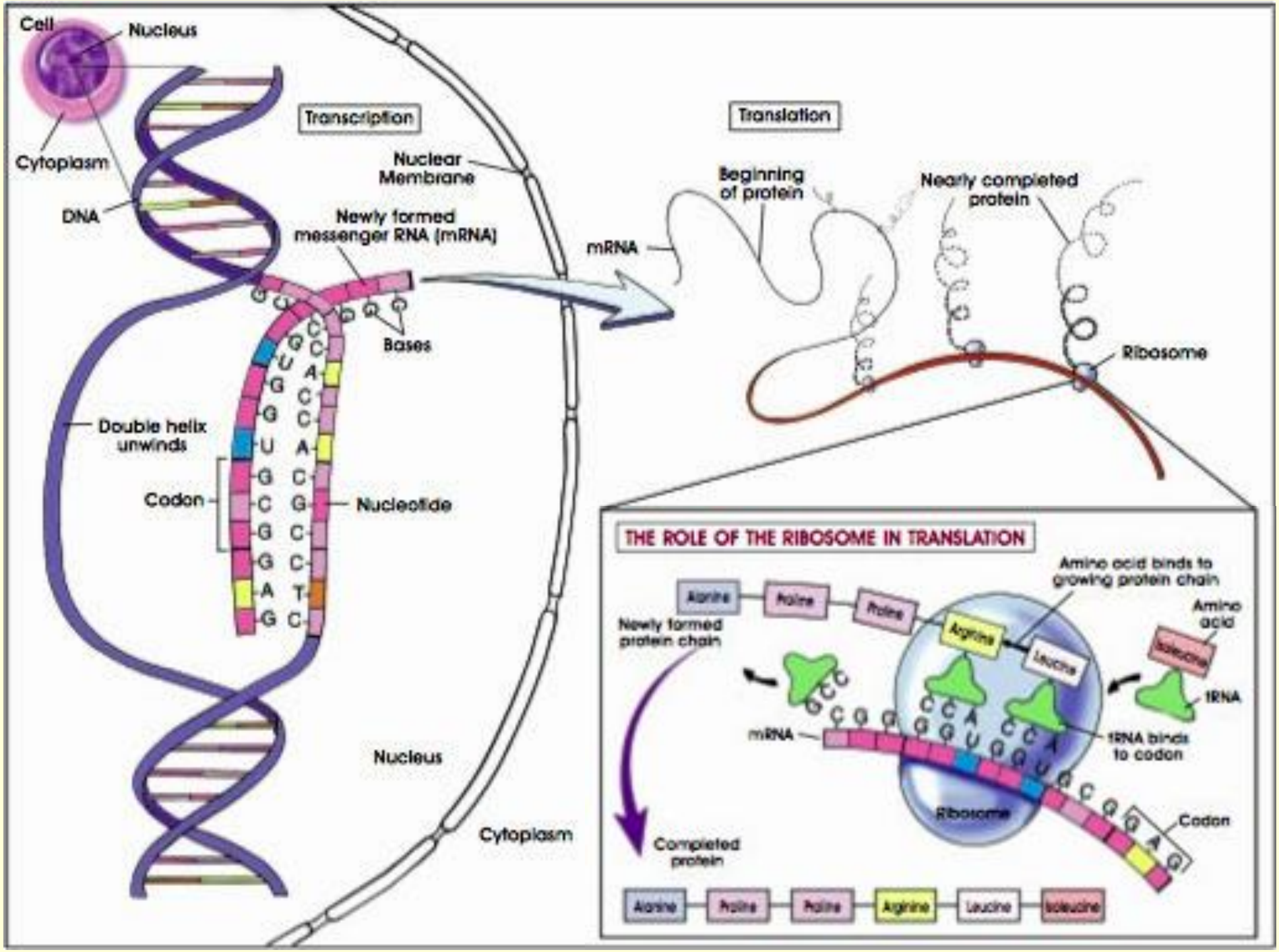
DNA to RNA to Protein

Information flows from gene to protein.

DNA (a gene) is copied to make RNA in the cell's nucleus.

The RNA travels to the ribosome where it is **translated** into the specific amino acid sequence of a protein.

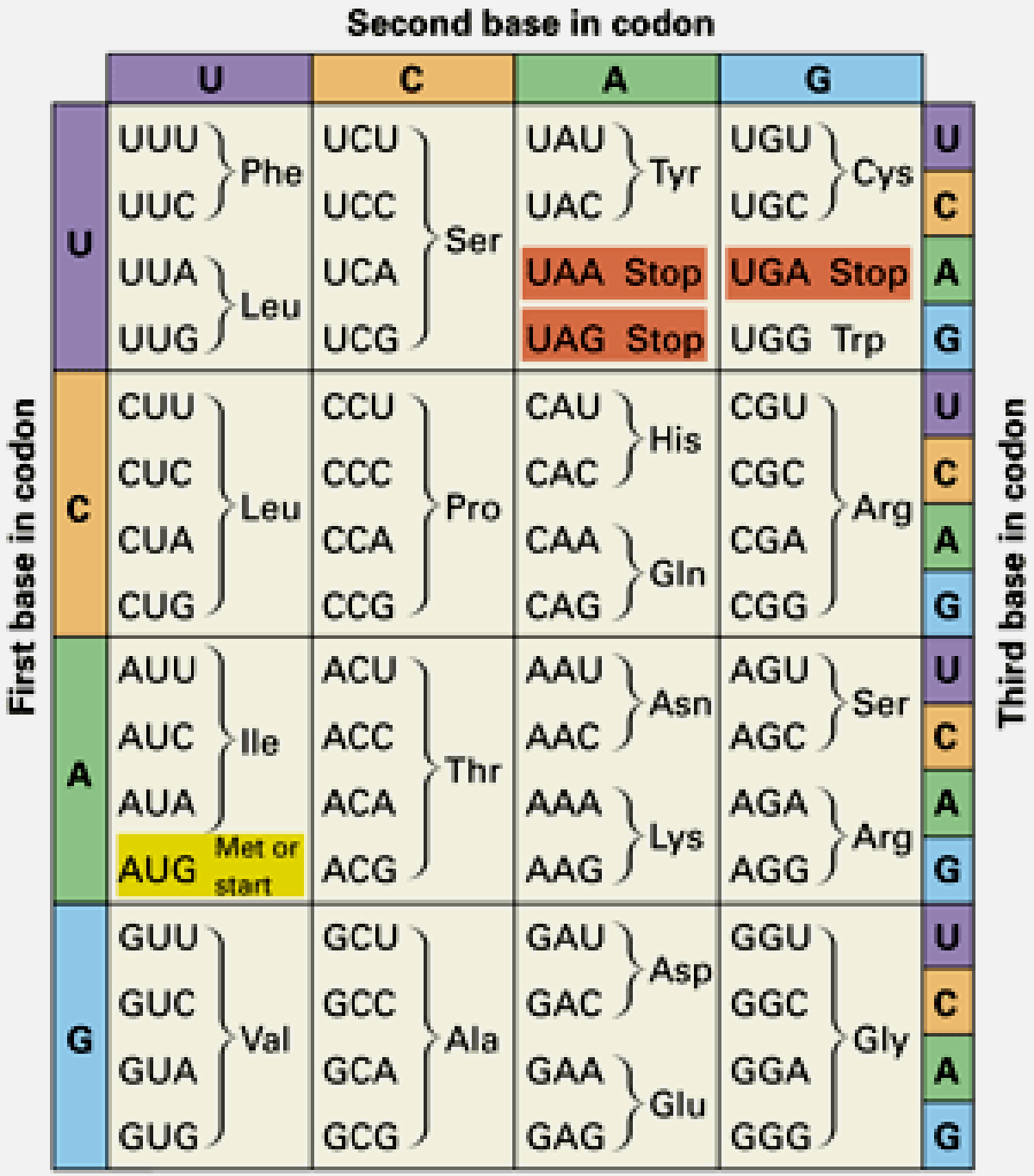



Cell
Nucleus
Cytoplasm
DNA
Transcription
Nuclear Membrane
Newly formed messenger RNA (mRNA)
Bases
Double helix unwinds
Codon
Nucleotide
Nucleus
Cytoplasm
Translation
mRNA
Beginning of protein
Nearly completed protein
Ribosome
THE ROLE OF THE RIBOSOME IN TRANSLATION
Amino acid binds to growing protein chain
Amino acid
Newly formed protein chain
tRNA
mRNA
tRNA binds to codon
Ribosome
Codon
Completed protein
Alanine
Proline
Proline
Arginine
Leucine
Isoleucine

The Triplet Code

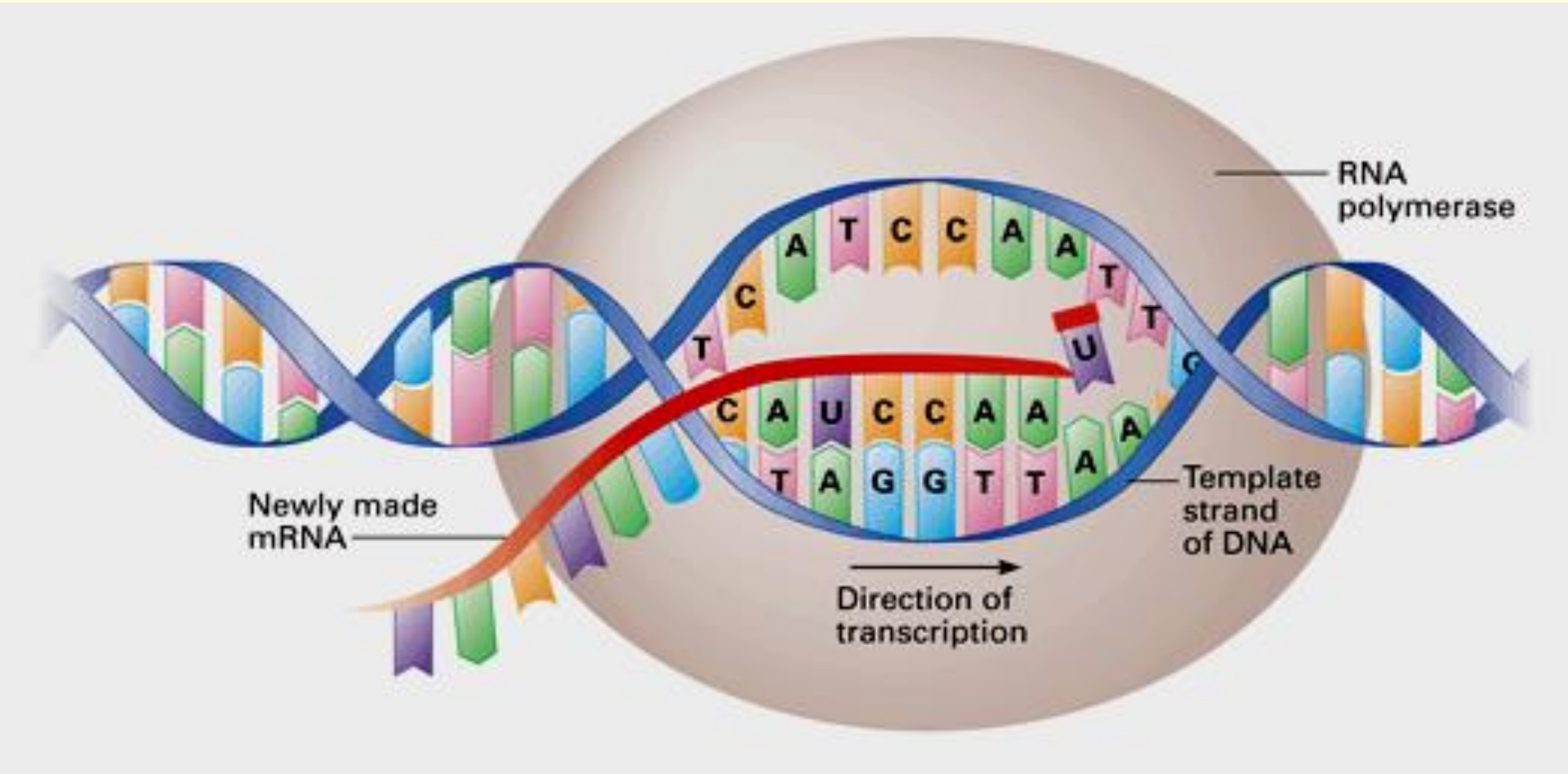
Each RNA codon codes for a particular amino acid.

The genetic code is a universal dictionary for the synthesis of proteins from the DNA nucleotides.



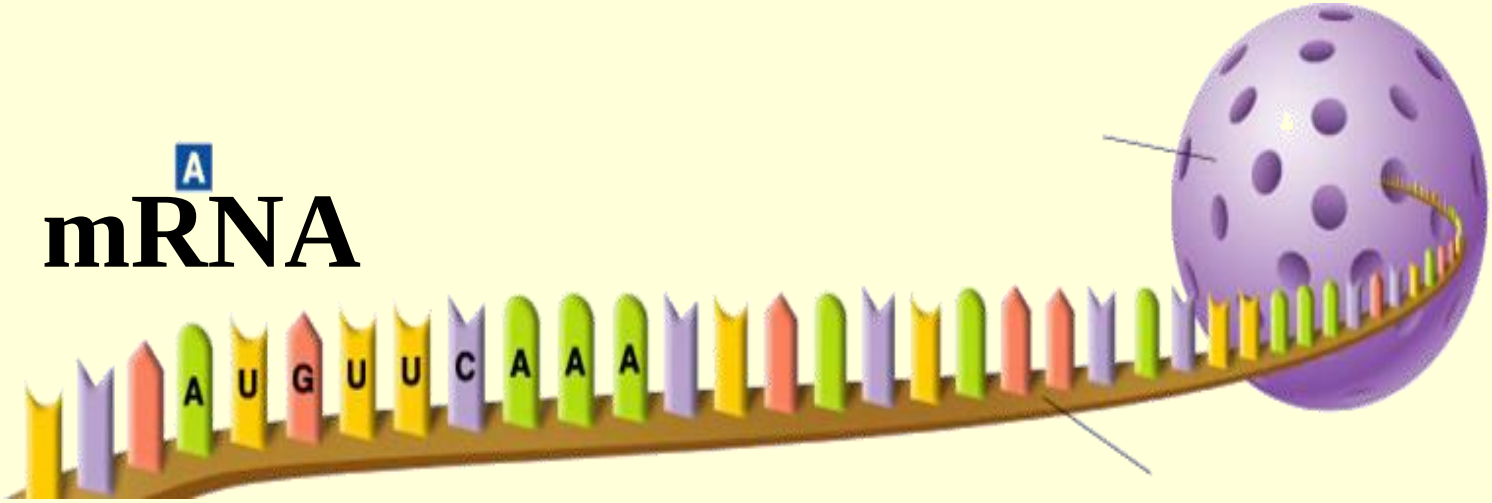
Step 1: DNA to RNA

The DNA template is used to make a single stranded RNA.

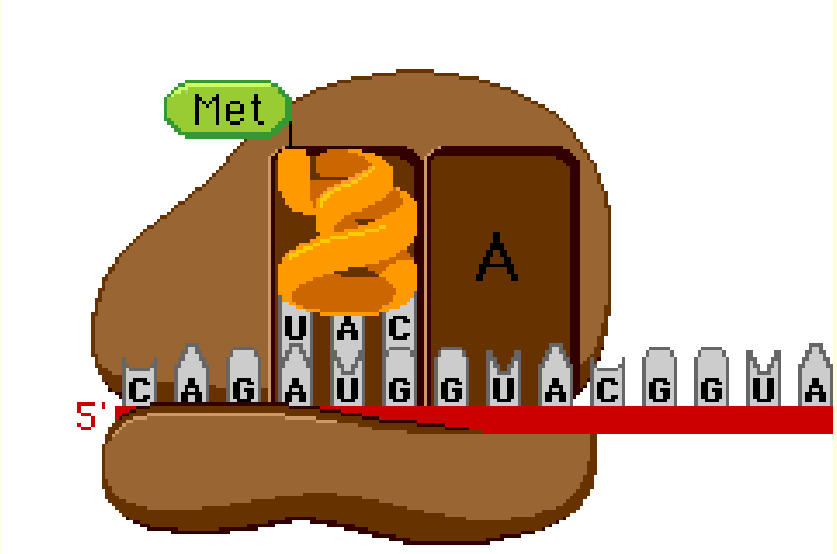


RNA nucleotides base-pair with DNA nucleotides on the template strand. RNA has the base U which pairs with A in DNA.

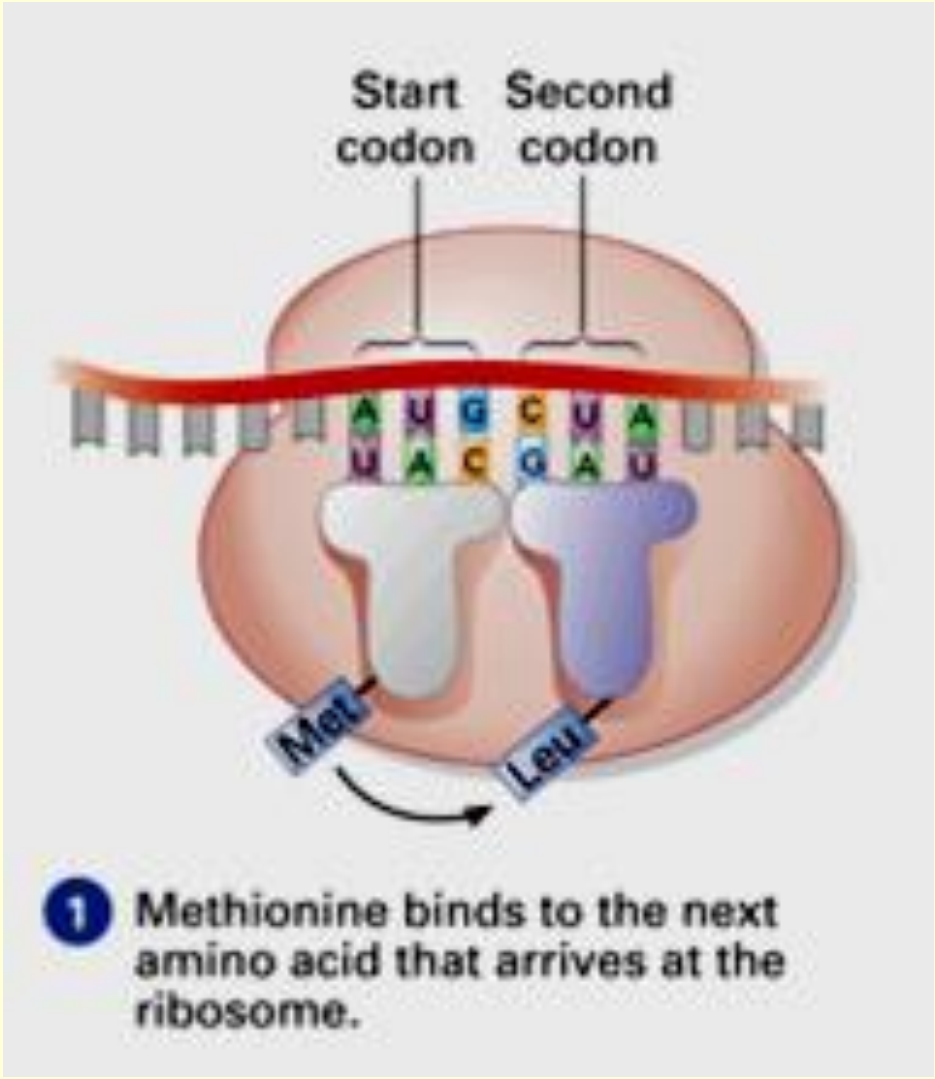
Step 2: mRNA leaves the nucleus

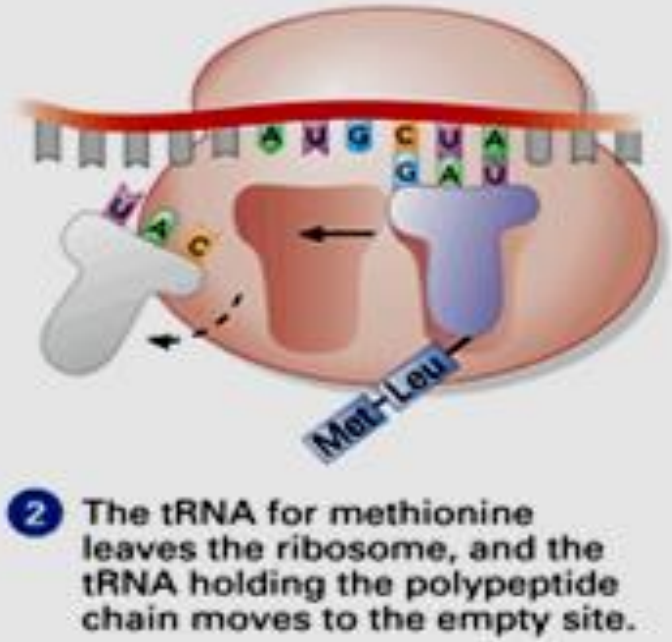


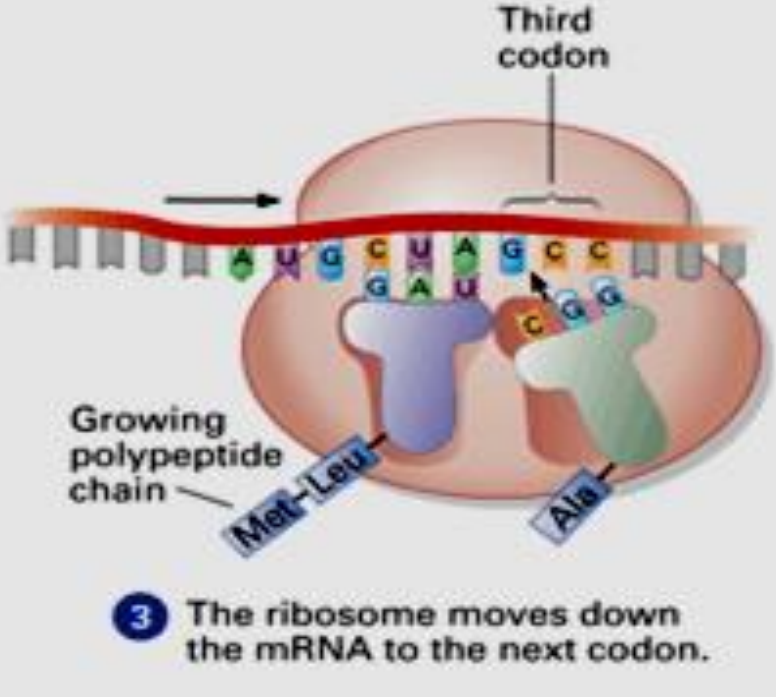
Step 3: mRNA and Ribosome join in cytoplasm



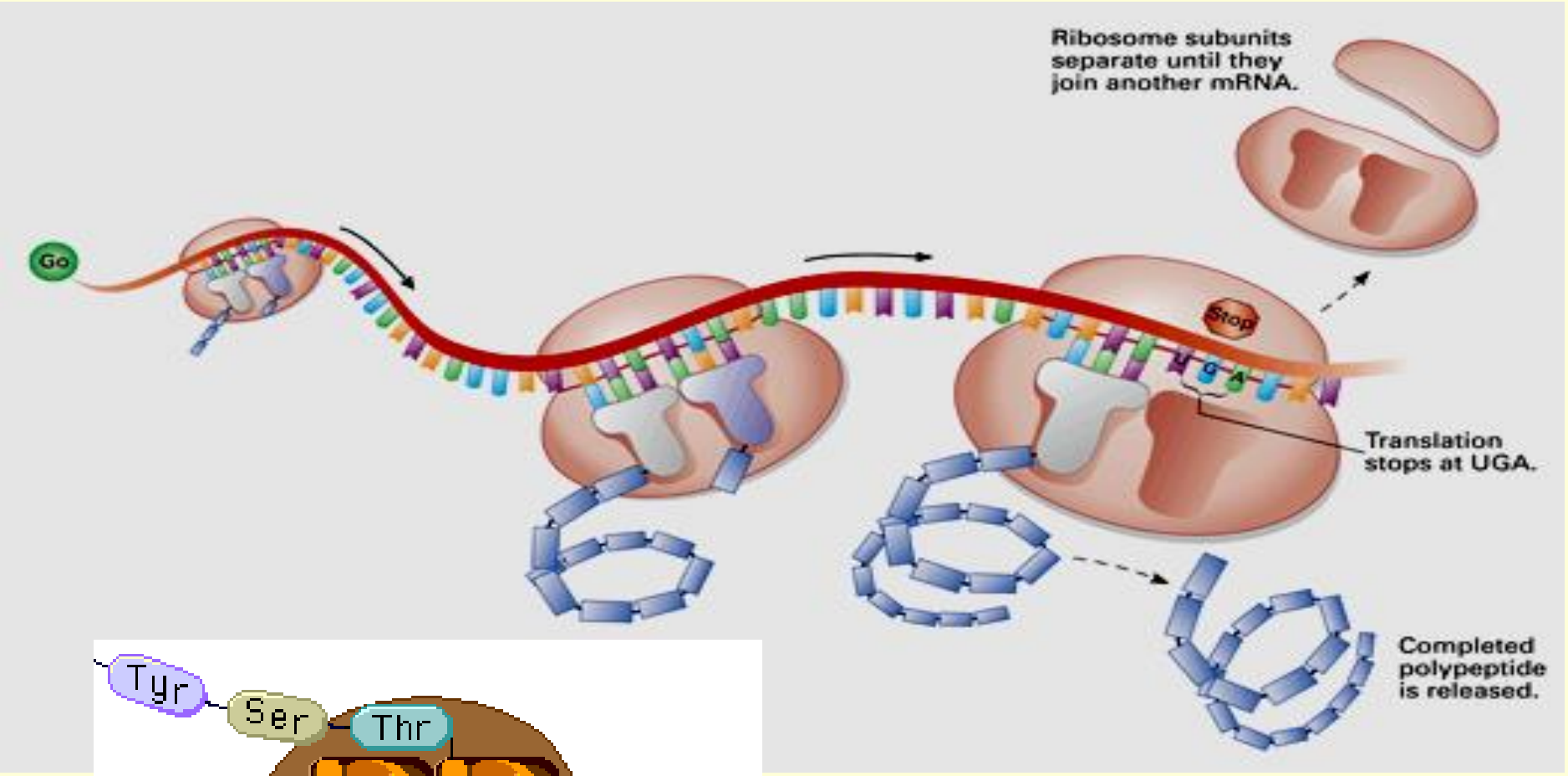
Step 4: Amino Acids are carried to ribosome and joins according to the triplet code

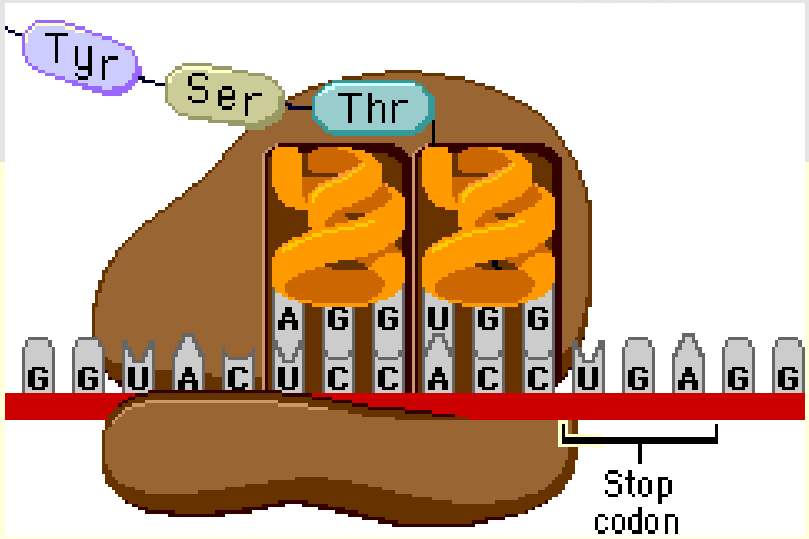






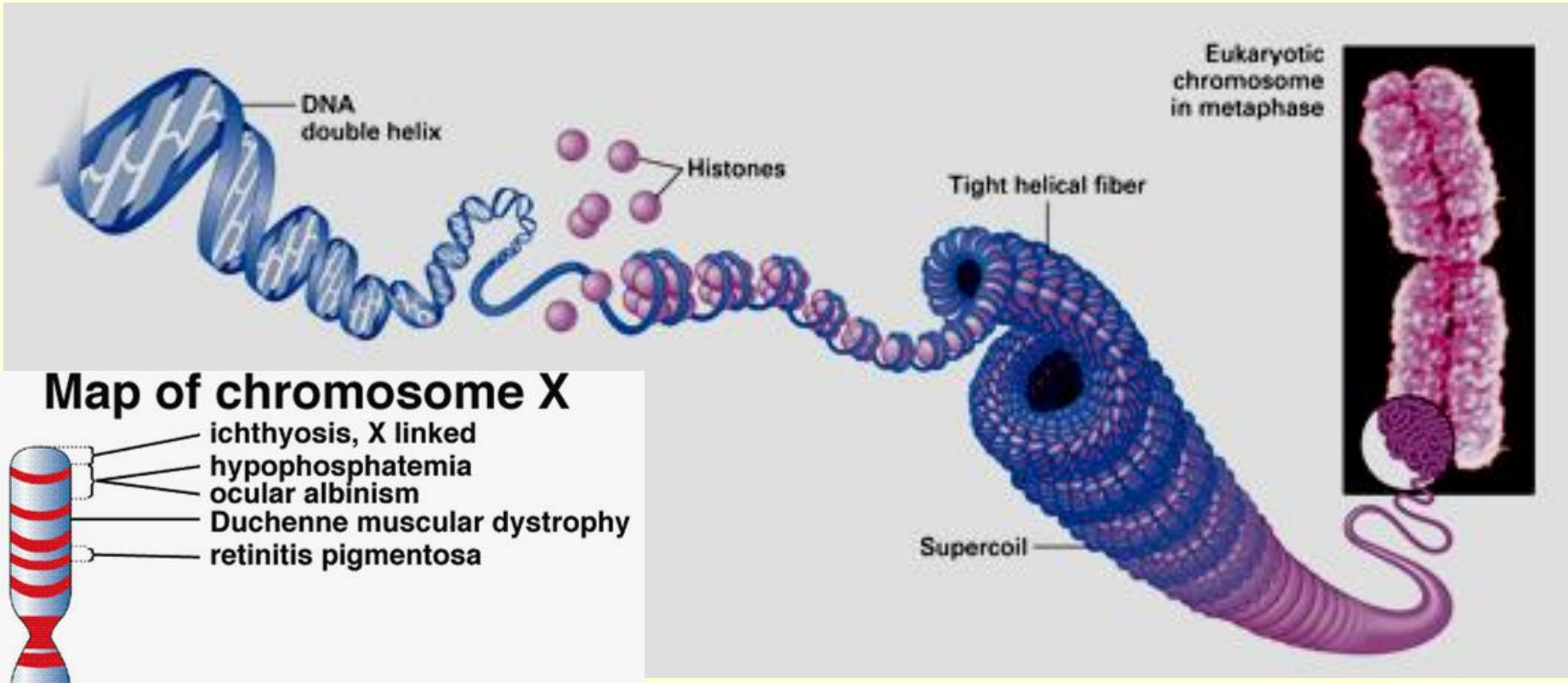
Step 5: The protein chain is created

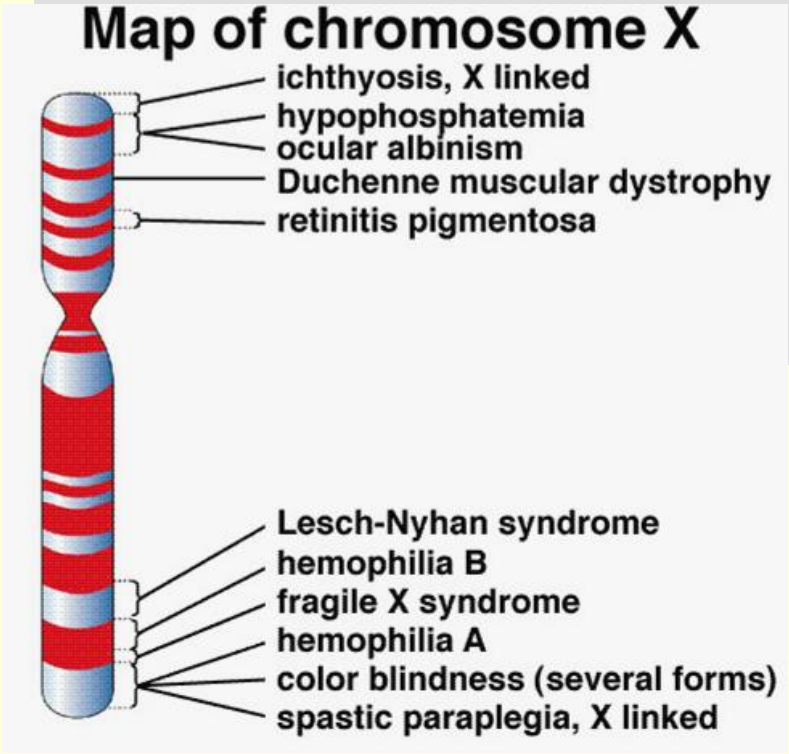




The DNA is wrapped around proteins to form Chromosomes

The Gene is a unit of information within a chromosome

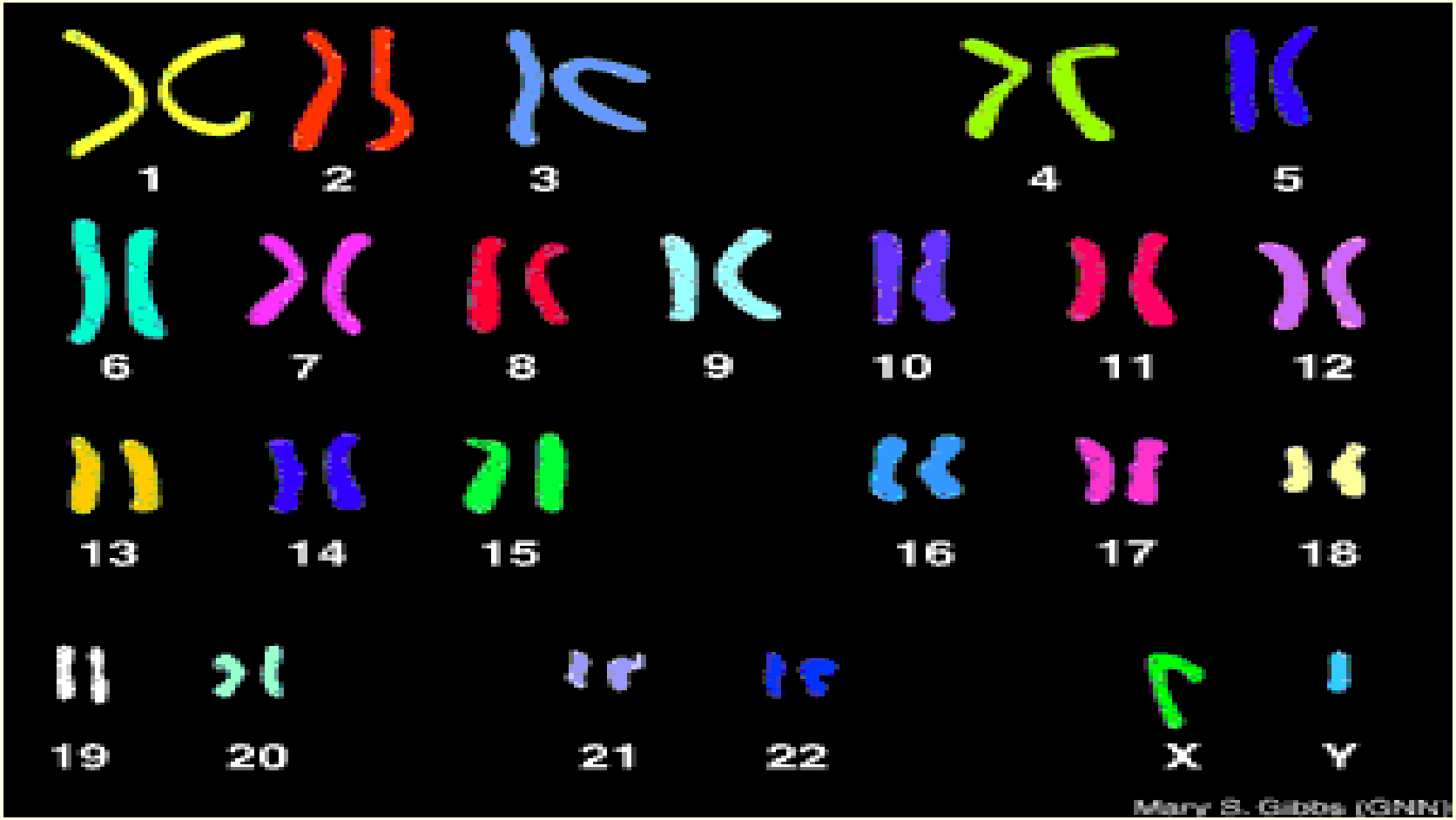




Many genes or on a chromosome

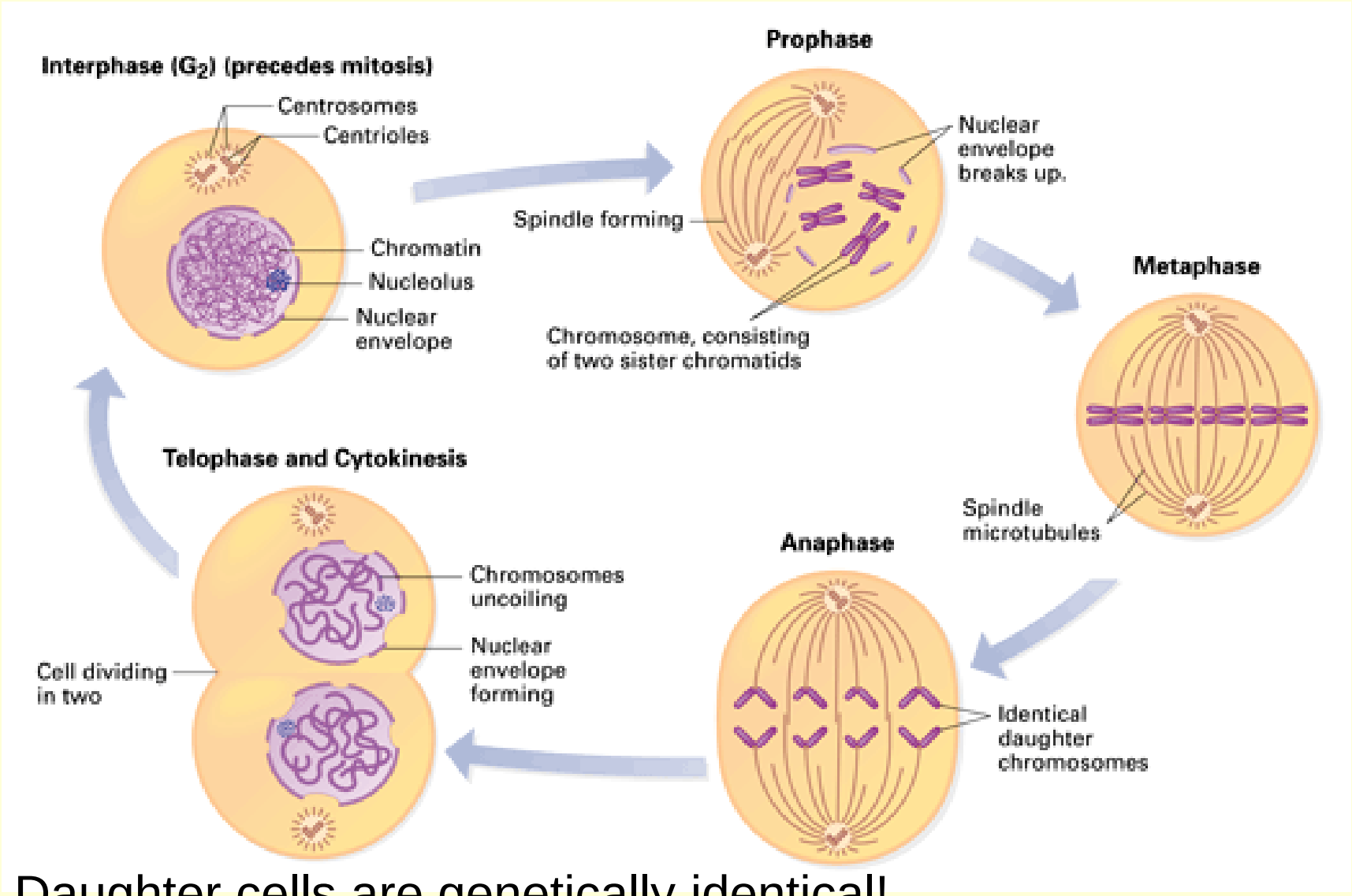
Humans have 46 chromosomes in a “normal” body cell.

Chromosomes in a body cell are paired, so we have two of each one.



Sex chromosomes: Males are XY and Females are XX

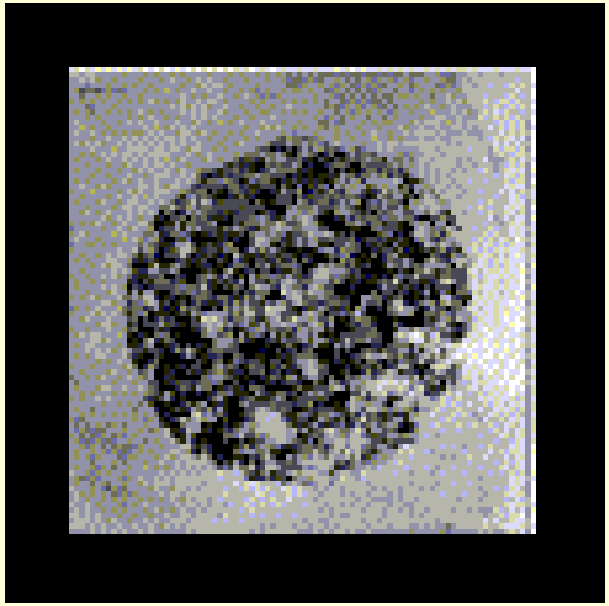
Chromosomes replicate and separate so body cell have the same chromosomes



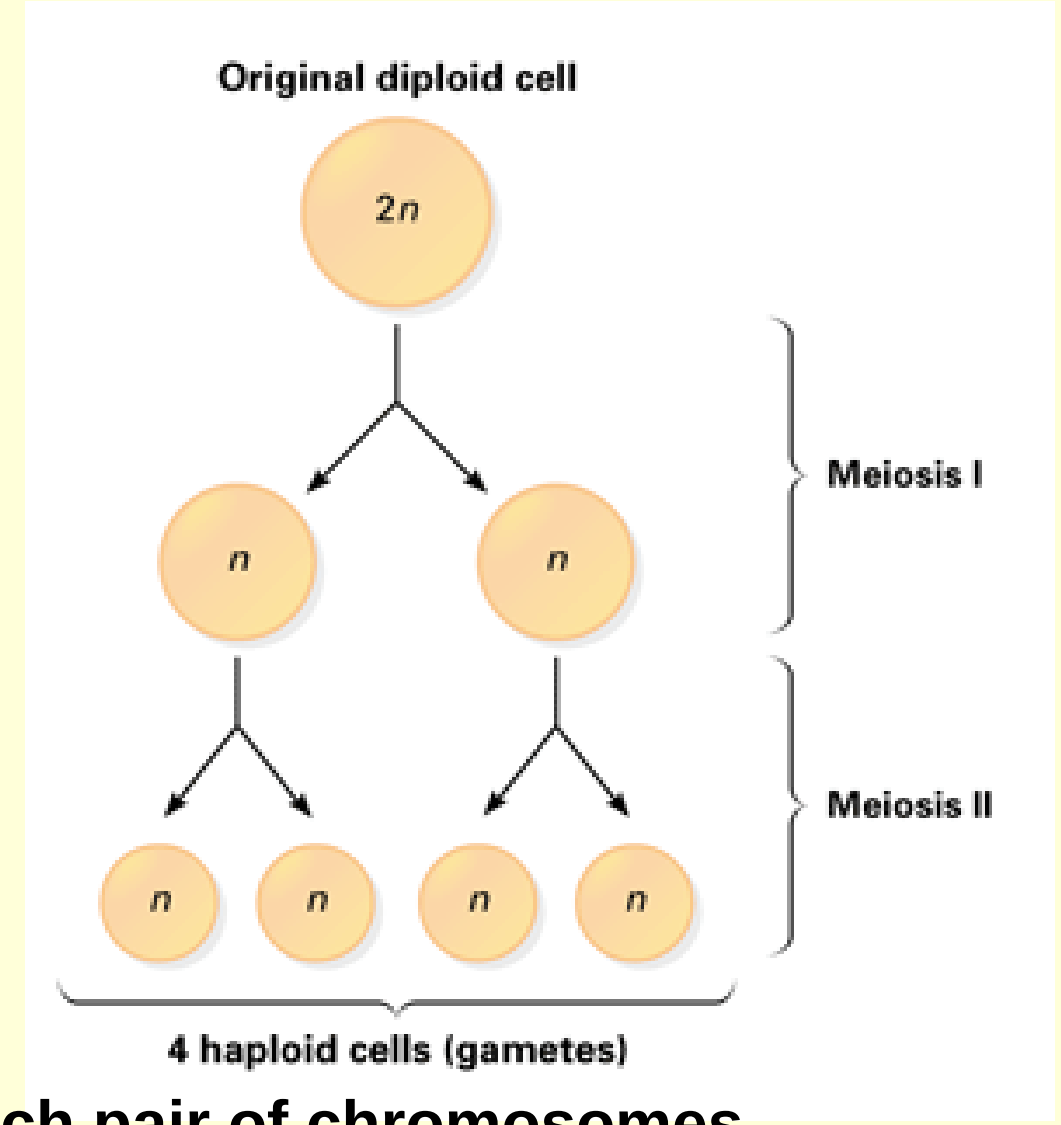
Daughter cells are genetically identical!

Meiosis makes Sex Cells (gametes)

Meiosis reduces chromosome number from (2n) to (1n)



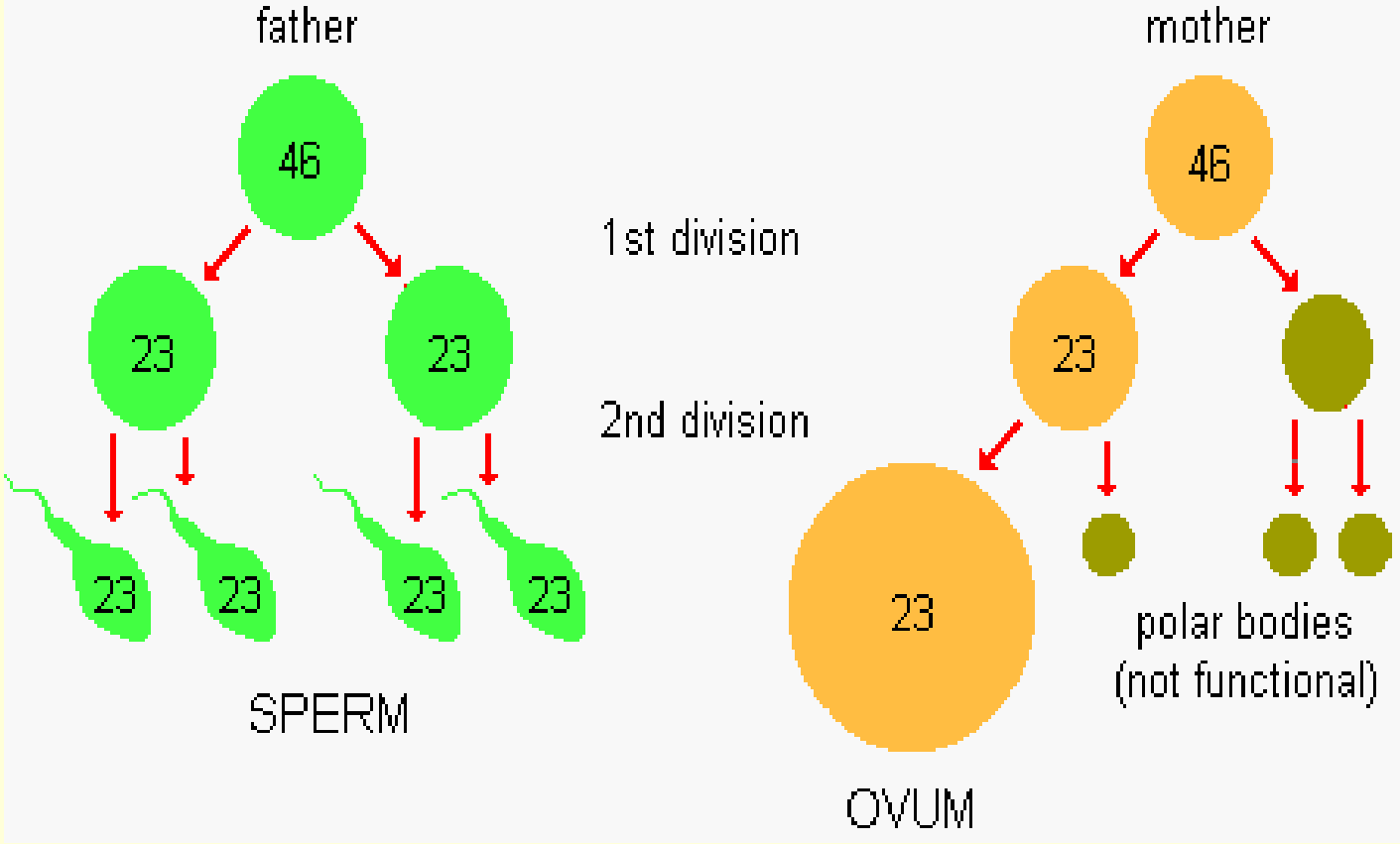
Chromosomes replicate and there is a double division in meiosis.



Gametes have one of each pair of chromosomes

Why do children look like their parents?

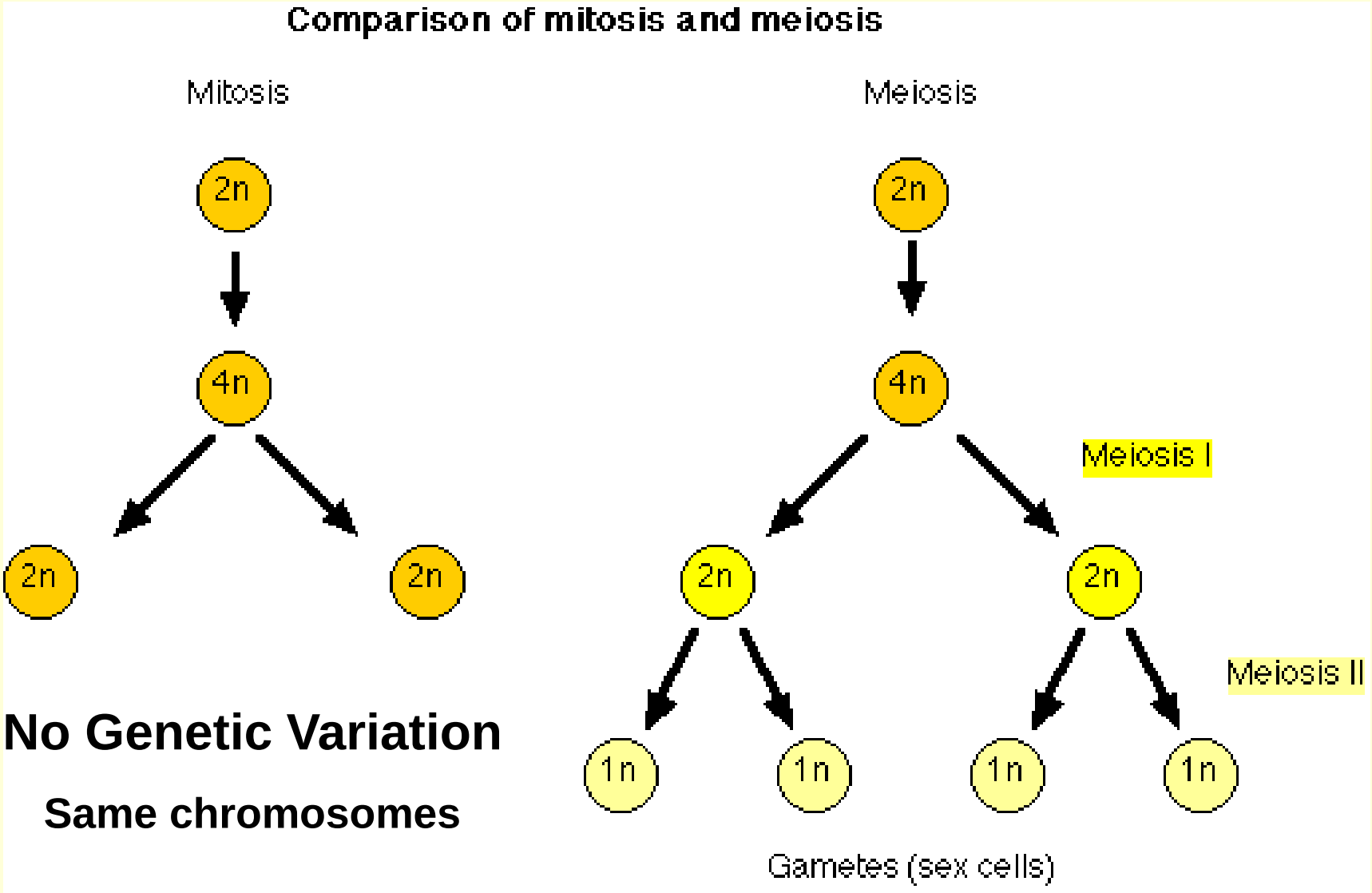
Why are they different?



Gametes carry ½ the chromosomes of body cells and are genetically different.

Recombinations occur when gametes form and at fertilization.

How does Mitosis and Meiosis compare?



No Genetic Variation

Same chromosomes

Genetic Variations

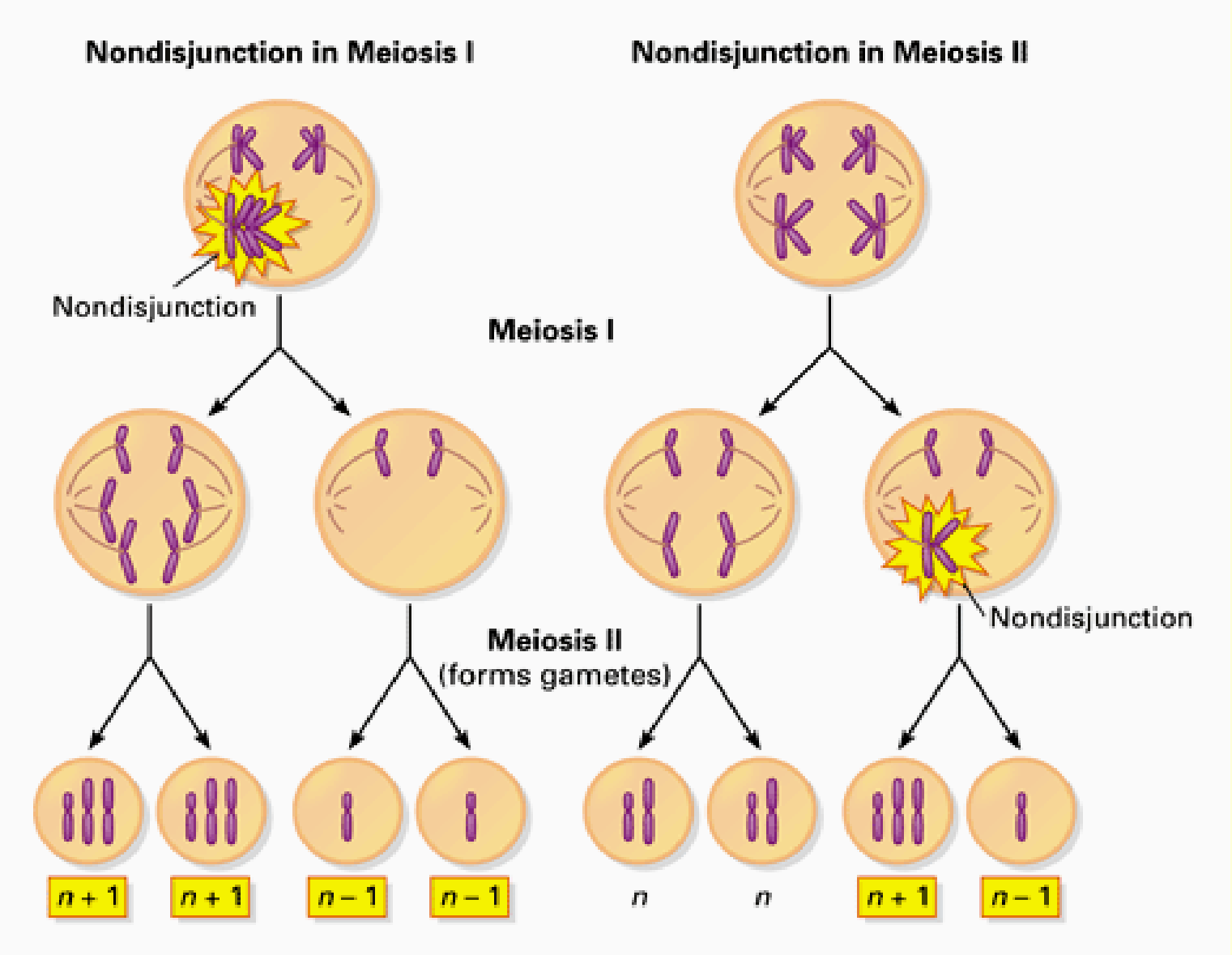
½ set of chromosomes

Mitosis vs. Meiosis

Points of Comparison	Mitosis	Meiosis
# of cell divisions		
# of functioning cells produced from the original		
Compare Genetic makeup of final cells produced		
Function of cells produced in multicellular organisms		

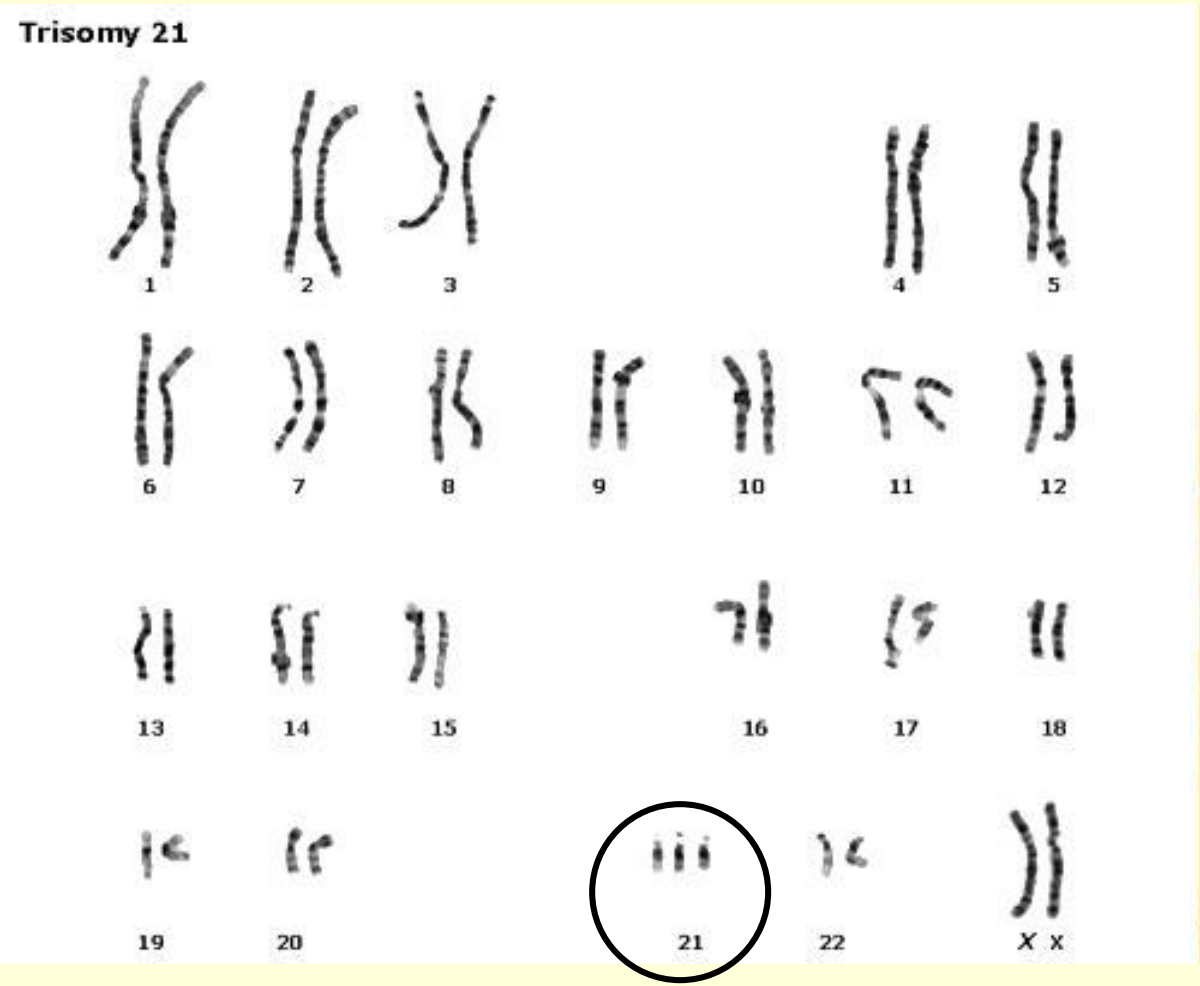
Mutations that result in an abnormal number of chromosomes

Nondisjunction occurs when chromosome fail to separate during meiosis.



Human Disorders Due to Chromosomal Alterations

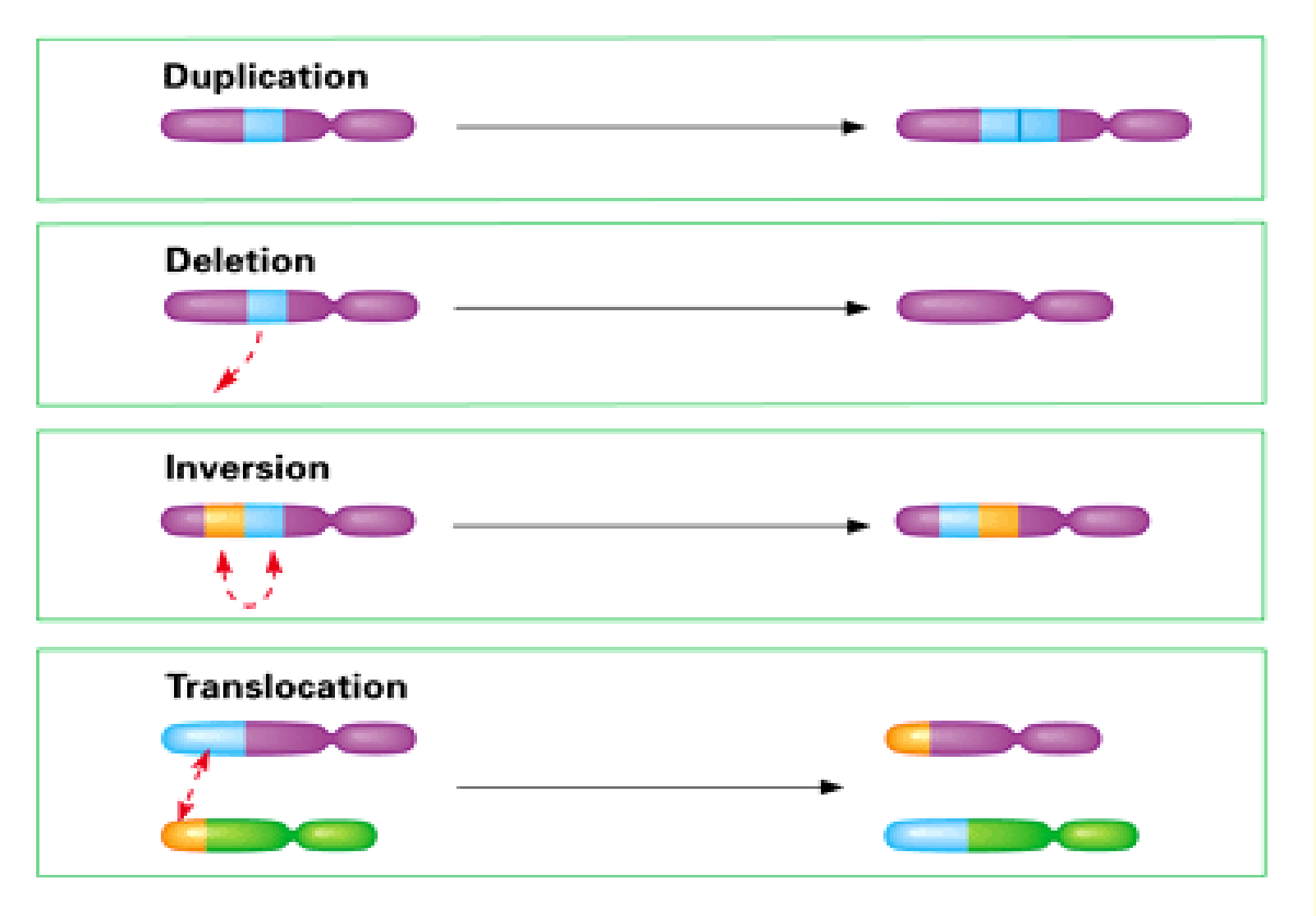
One condition, Down syndrome, affects approximately one out of every 700 children born in the United States



Extra chromosome 21

Damaged Chromosomes

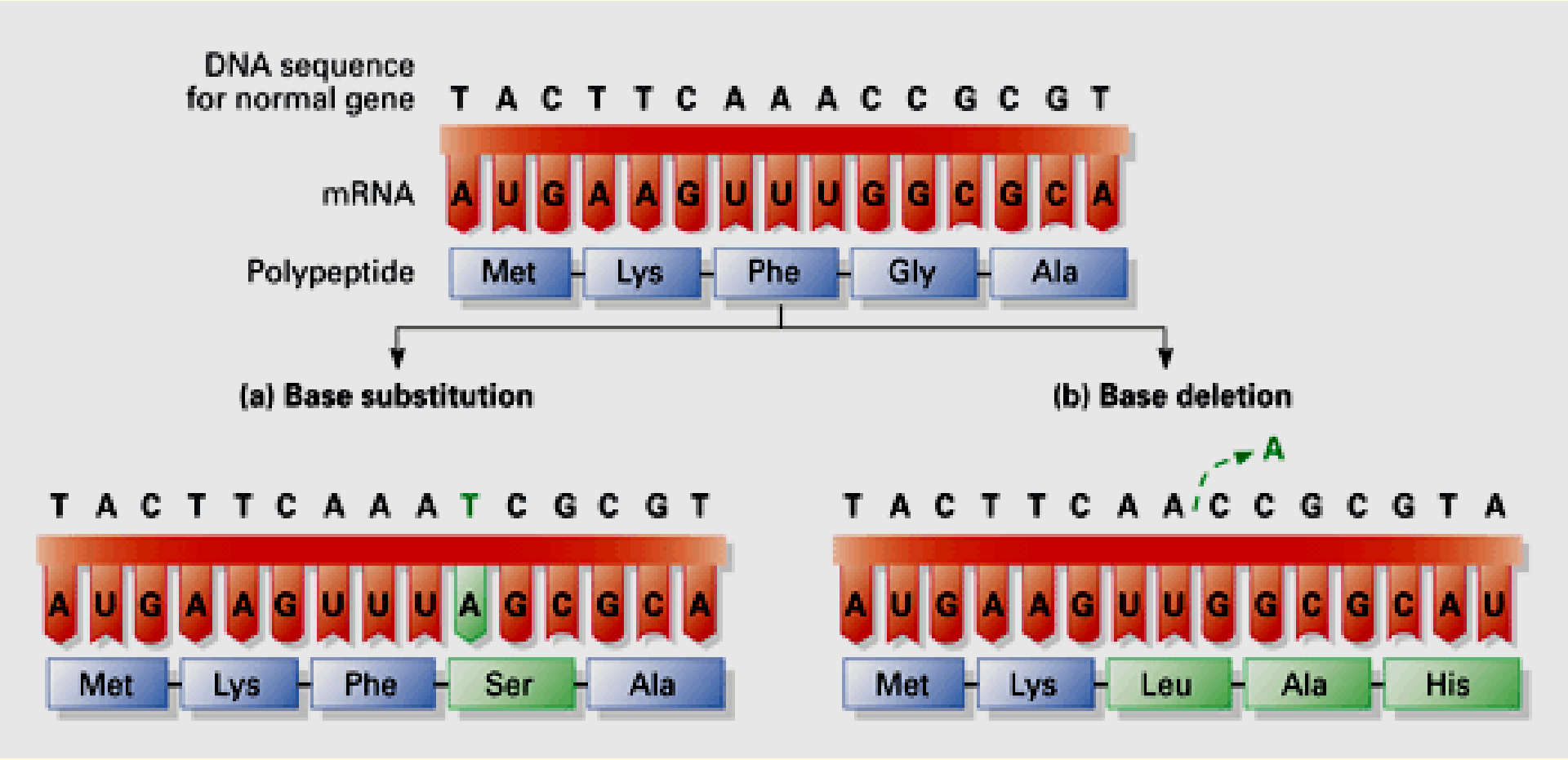
Changes in chromosome structure may also cause disorders. For example, a chromosome may break, leading to a variety of new arrangements that affect its genes.



Mutations of a gene

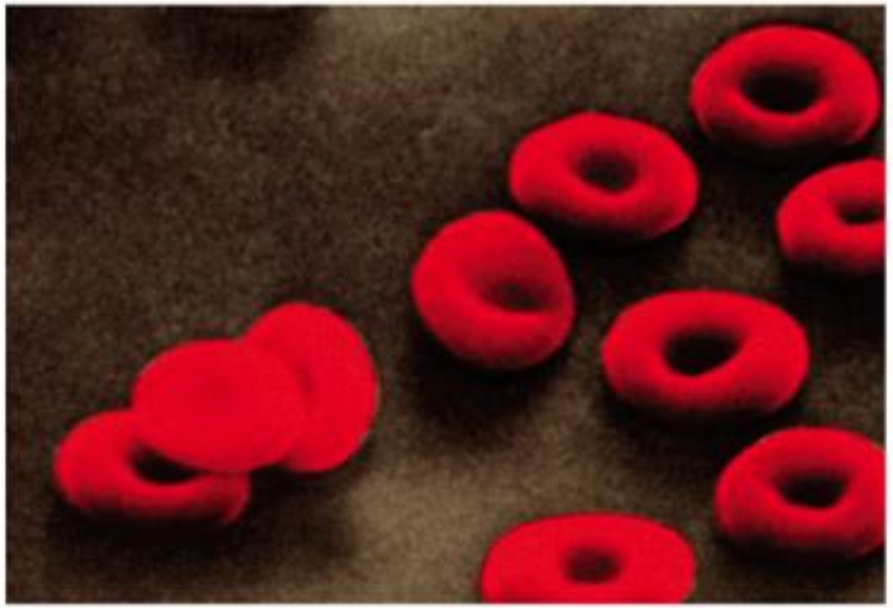
A gene mutation is a change in the nucleotide sequence of DNA.

What could this do to the code?



Alters the gene product: Altered Protein produced

A single amino acid substitution in hemoglobin causes sickle-cell disease. How does an individual get this disorder?

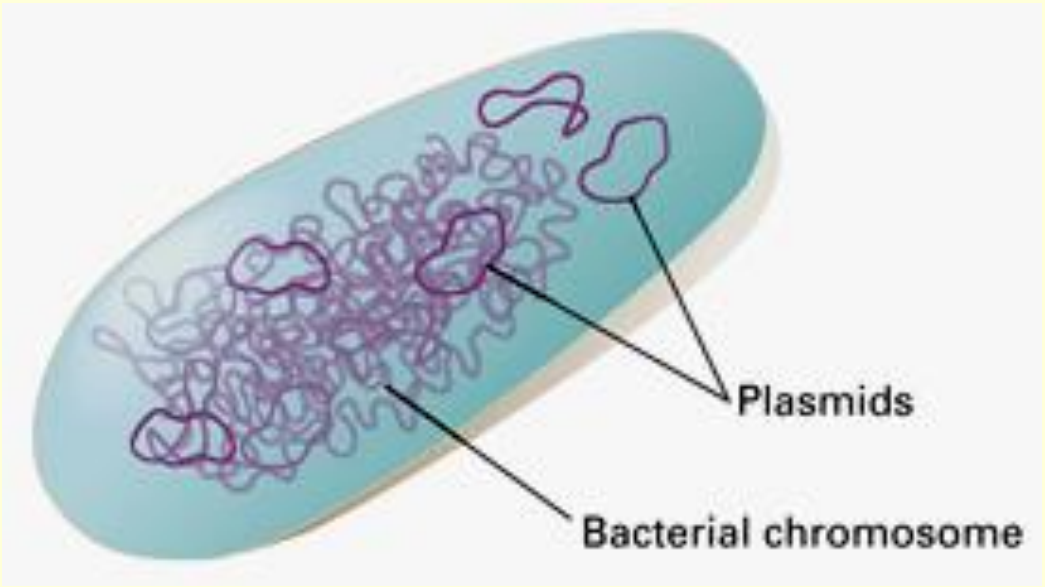


(a) Normal red blood cells and the primary structure of normal hemoglobin

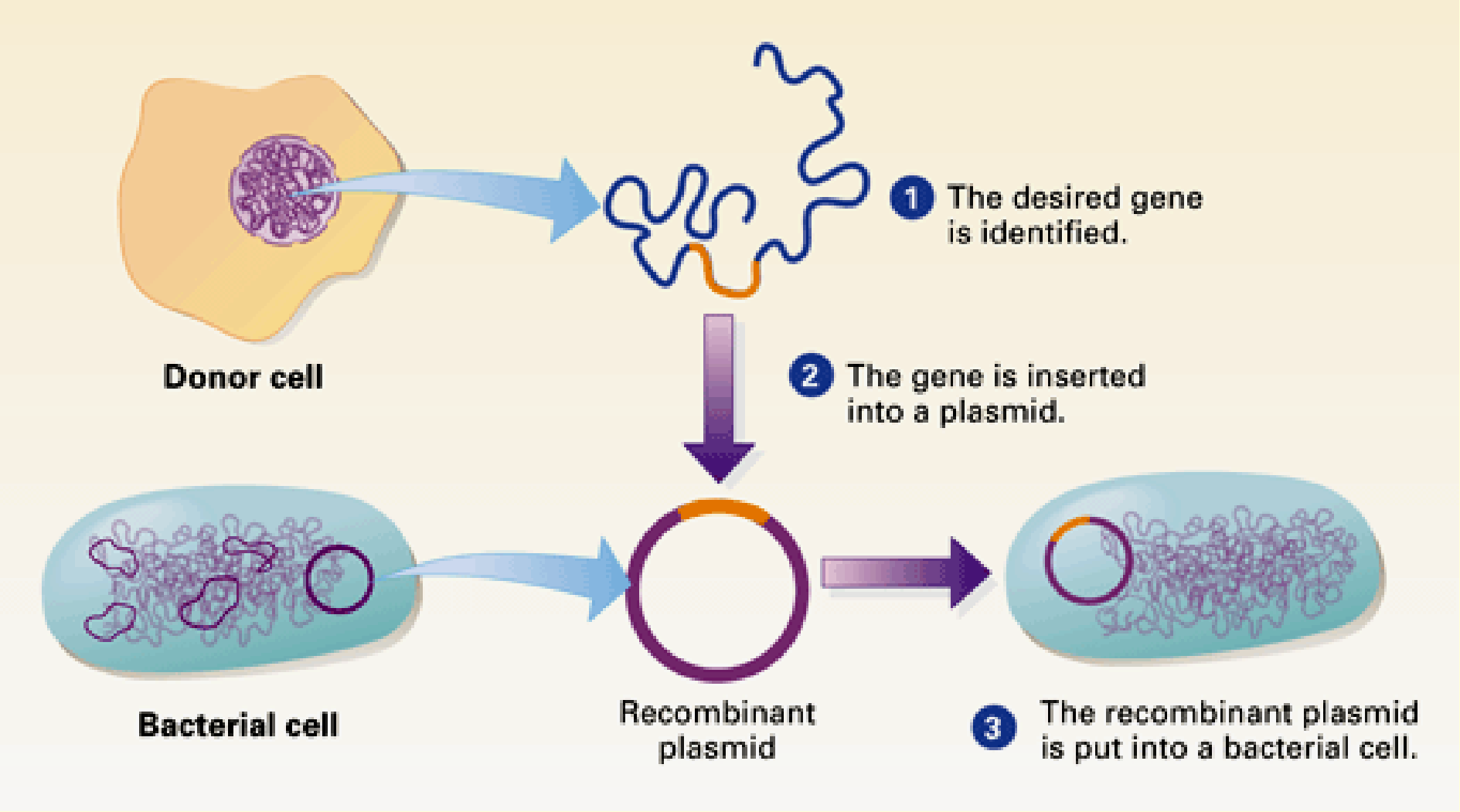
(b) Sickled red blood cells and the primar structure of sickle-cell hemoglobin

Biotechnology is the use of organisms to perform practical tasks for humans.

Scientists manipulate DNA with both breeding and biochemistry.



Recombinant DNA Technology

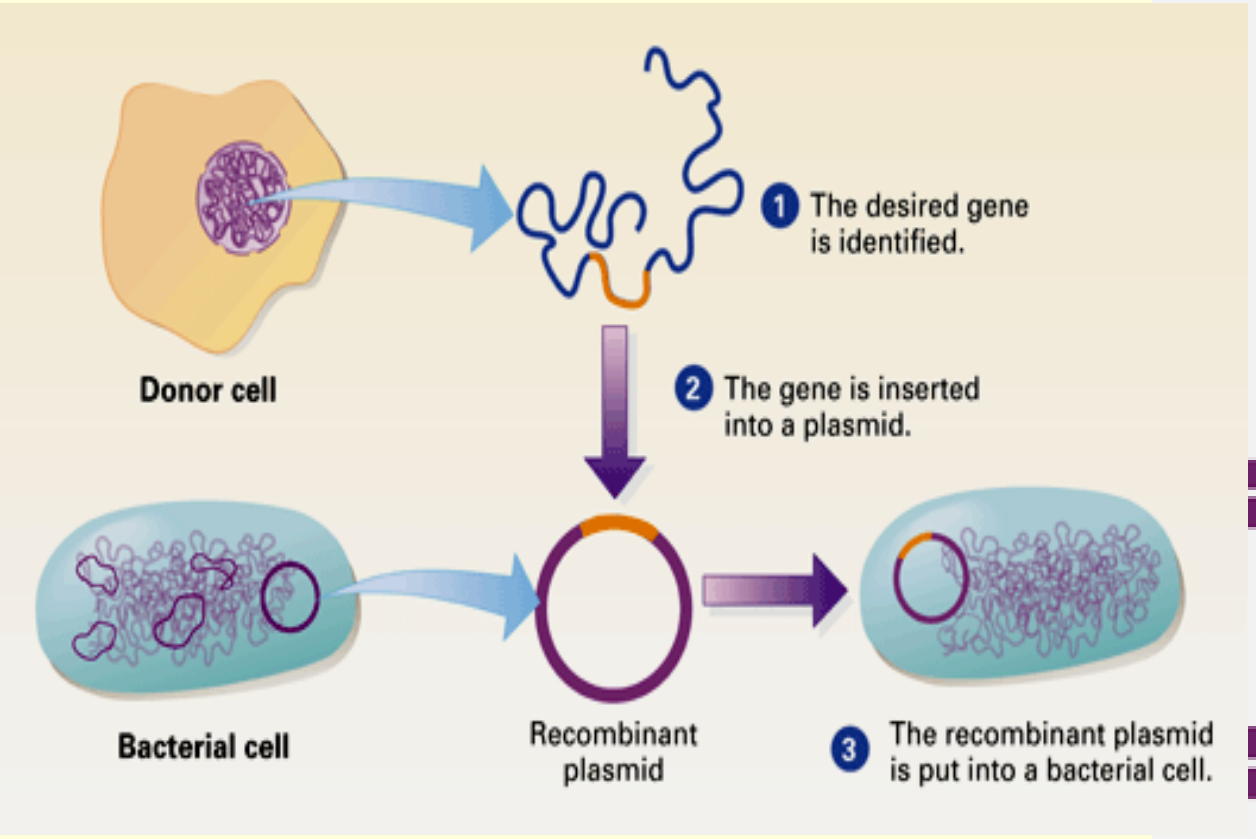


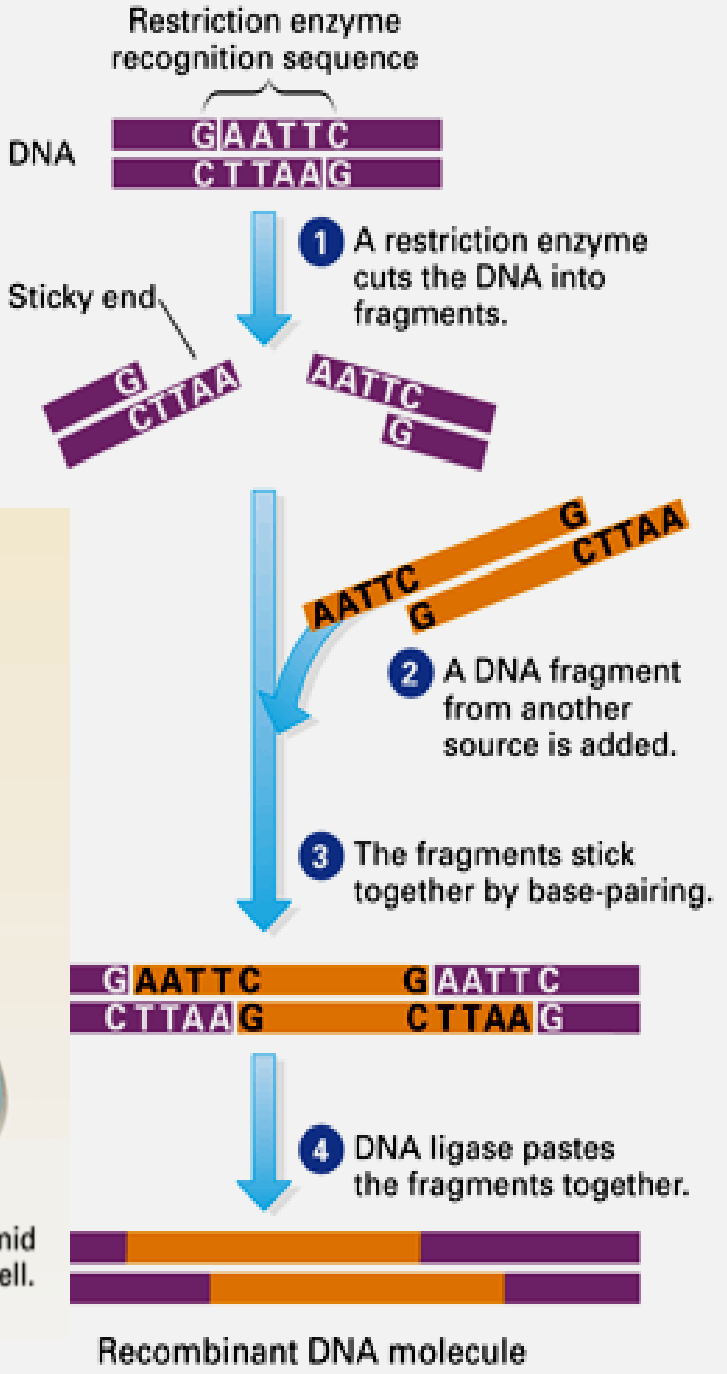
Bacteria are genetically engineered by inserting DNA from another source.

How is Recombinant DNA made?

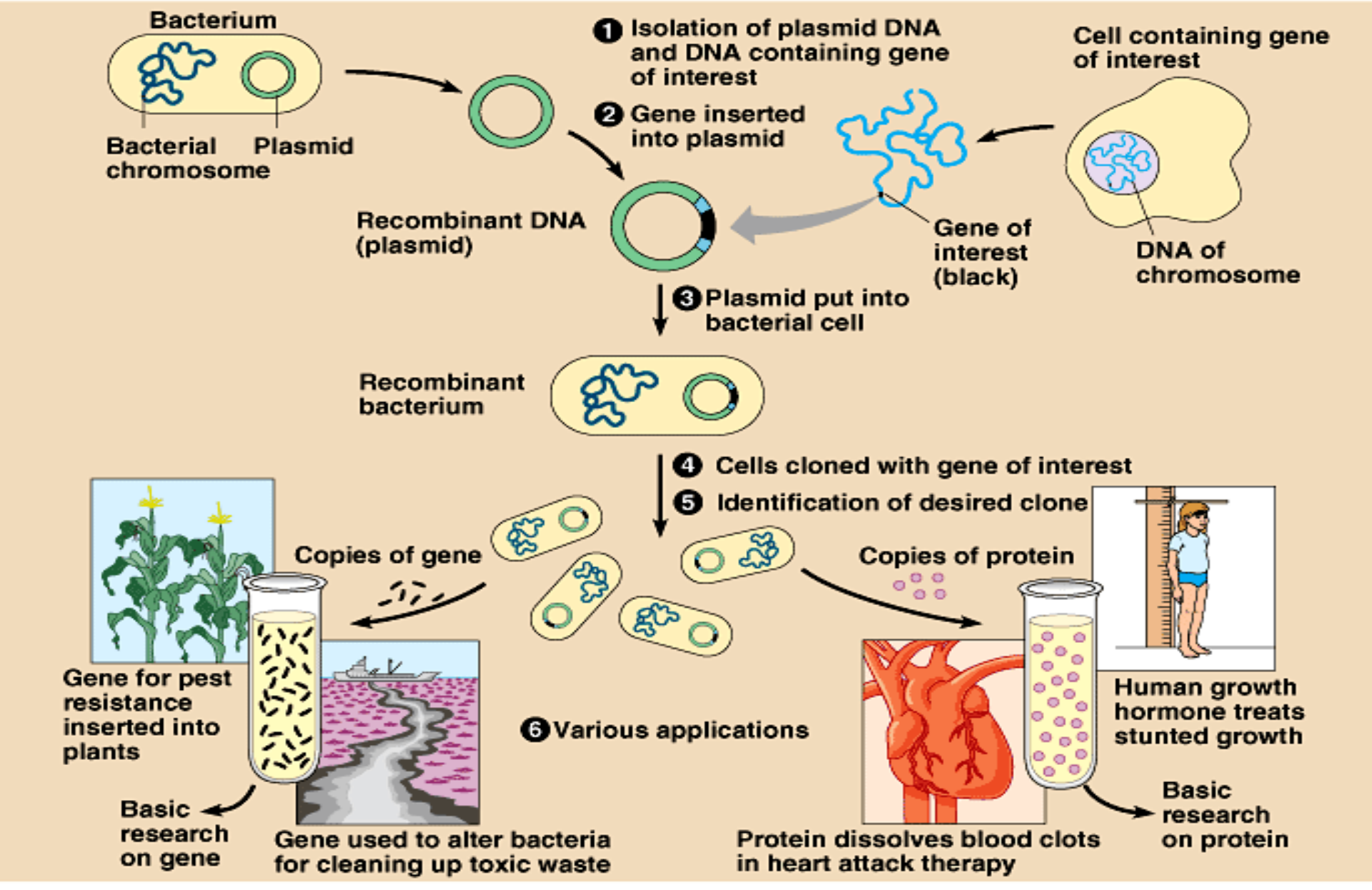
DNA containing the desired gene must be "cut" out of a much longer DNA molecule.

DNA is cut with **restriction enzymes**.



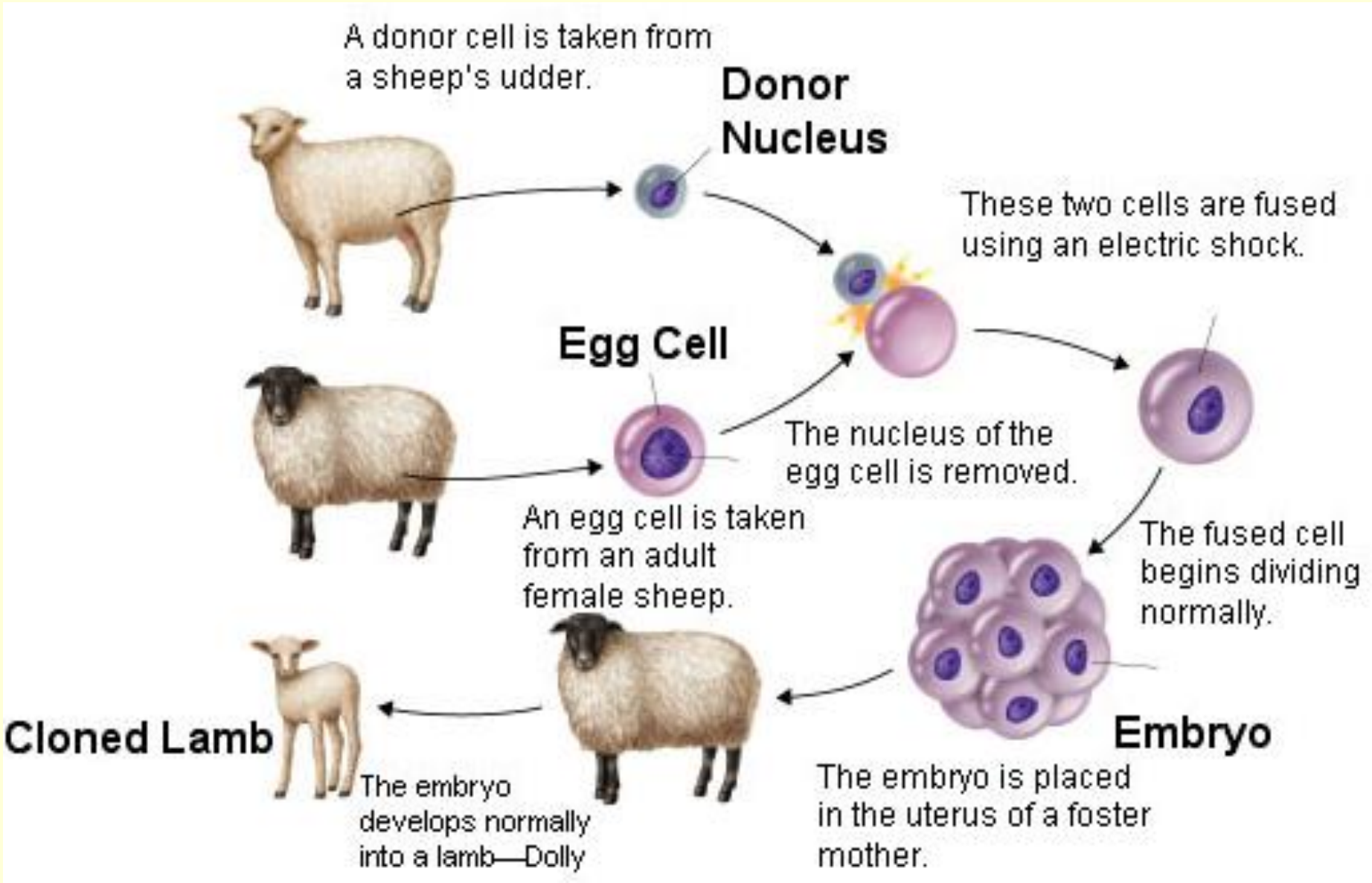


Recombinant DNA is used to make chemicals humans may be missing: (insulin, growth hormone)



Cloning makes identical genetic copies

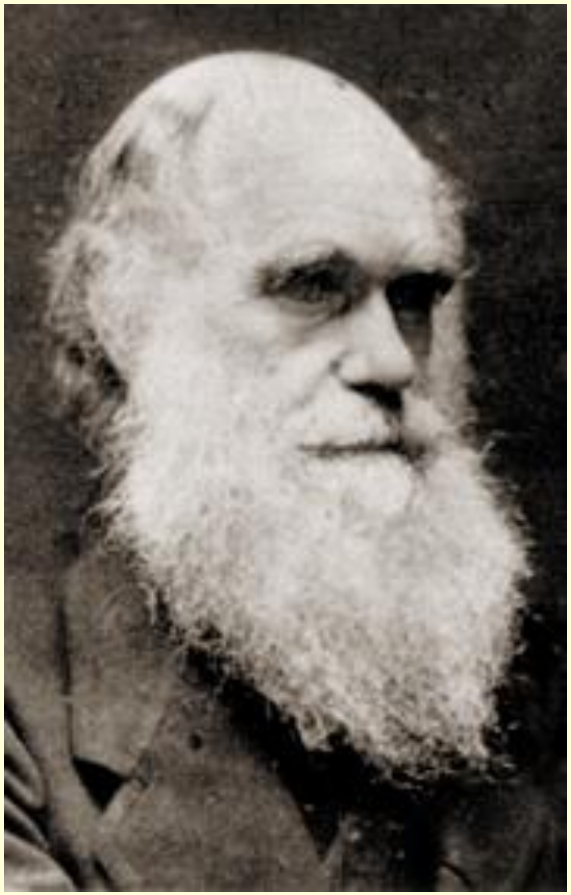
Nuclear Transplant Technology

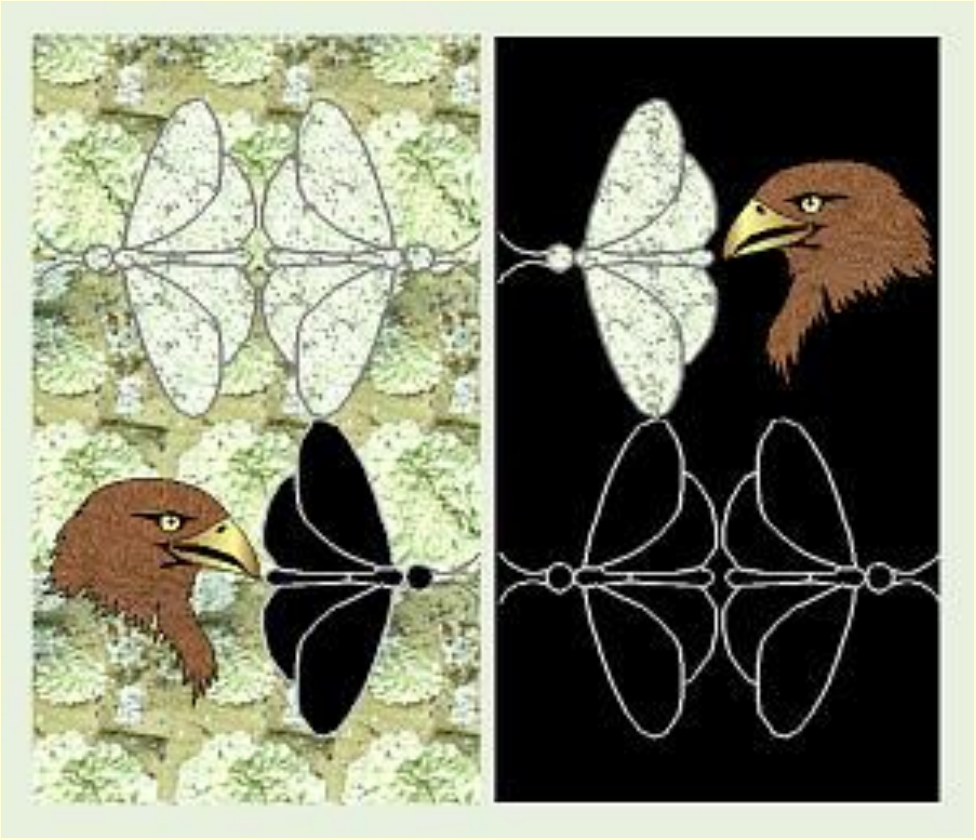


Evolution: The change in species over time

Key Idea 3:

Individual organisms and species change over time.

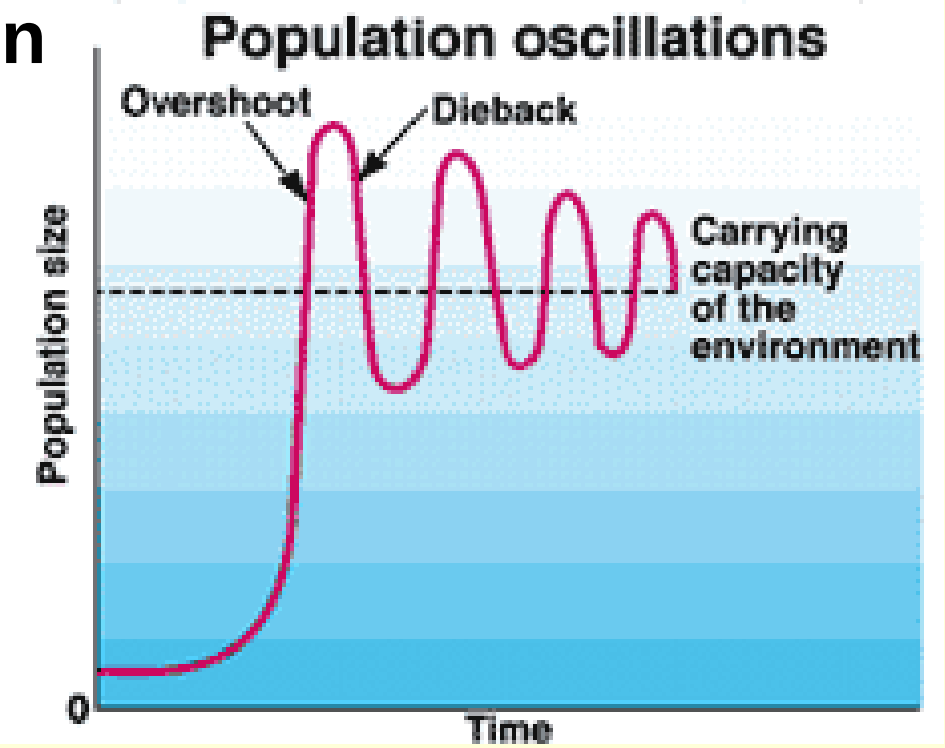




Charles Darwin: Theory of Natural Selection

Theory of Natural Selection

- **Overproduction of offspring**: species produce far more offspring than are needed.

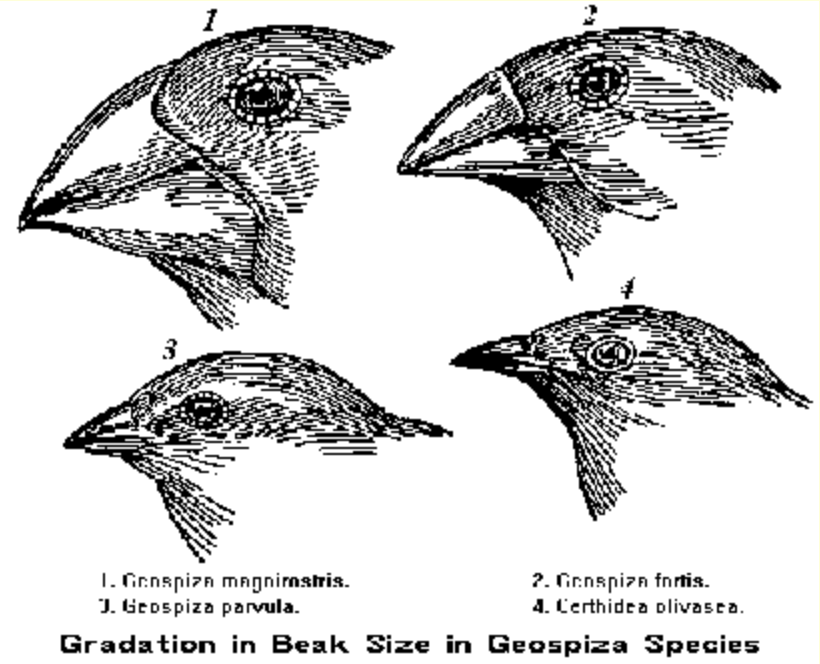


- **Competition**: space and food are limited so competition occurs for resources. Only fraction can survive

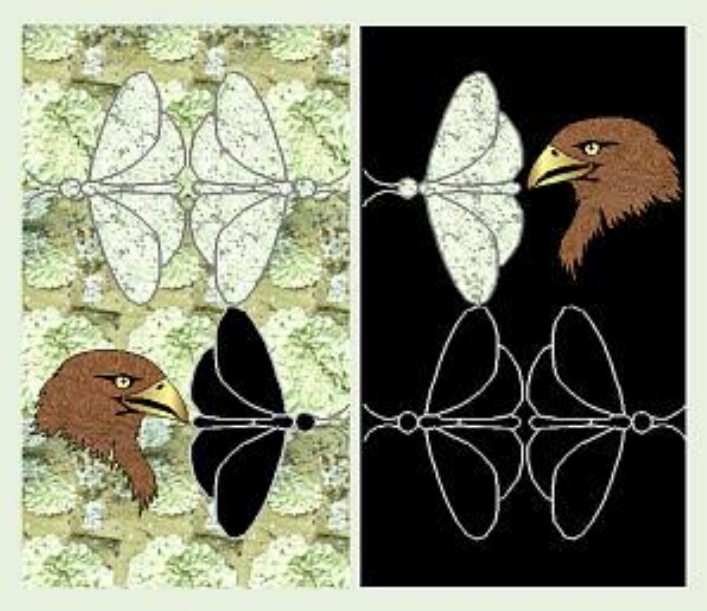
- **Variation among offspring**: individuals in a species vary and these are inheritable

Theory of Natural Selection

- **Struggle for survival:** result of competiton
- **Adaptations** due to variations, some individuals are better adapted to survive and reproduce.
- **Natural Selection**: environmental factors will select the optimal traits. The “best fit” will survive and reproduce.
- **Speciation**: Over many generations, favorable adaptations accumulate and many changes lead to new species.



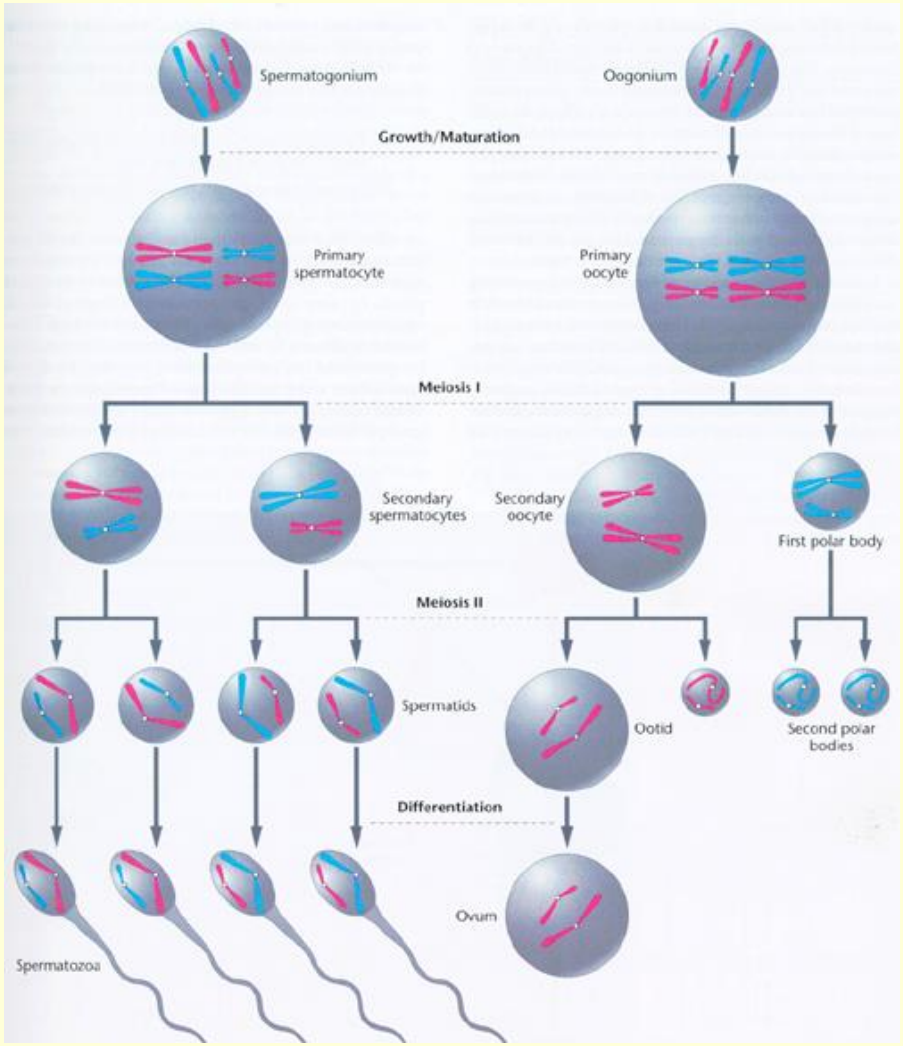
Gradation in Beak Size in Geospiza Species

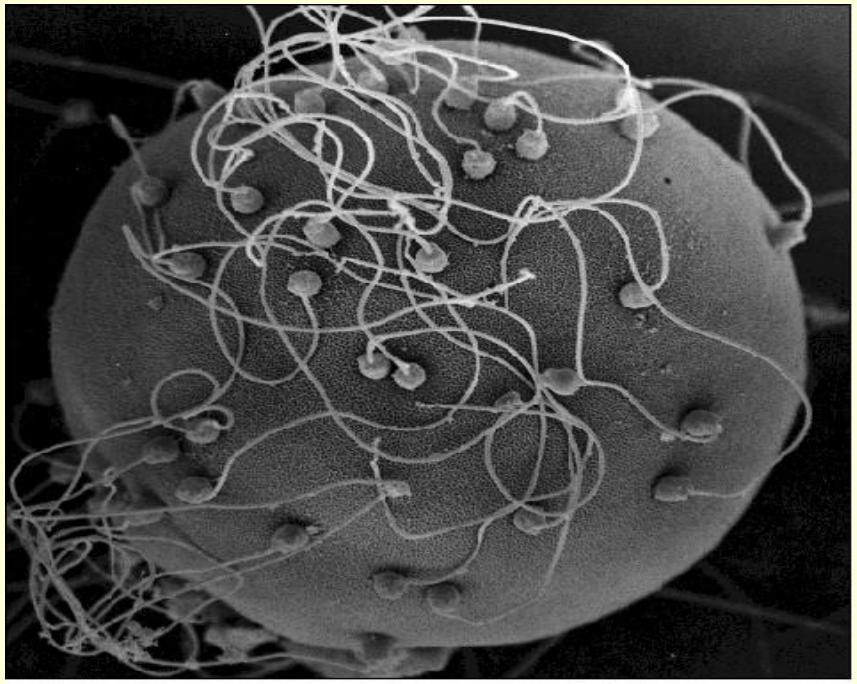


What is the source of Variation?

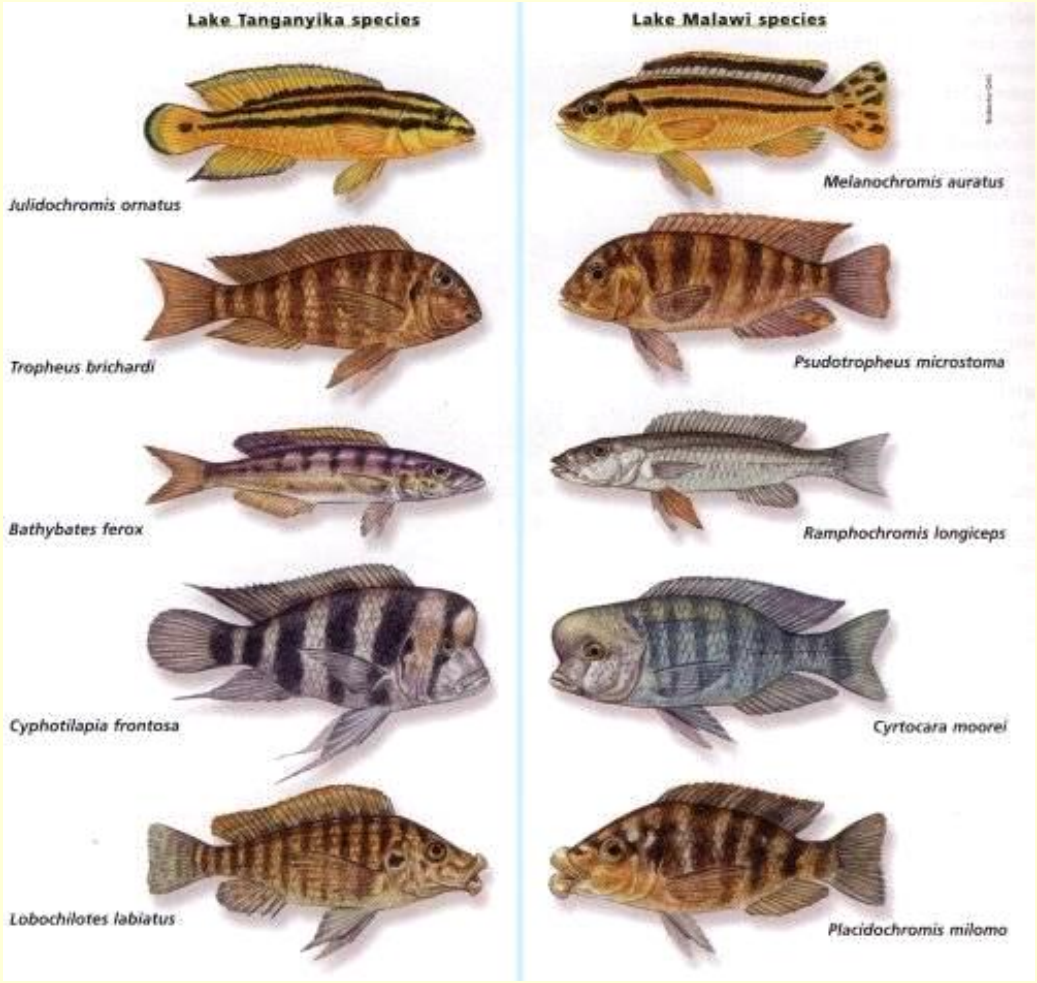
Mutations: Changes in the DNA

Sexual Reproduction: Recombination of chromosomes





Why is variation important to evolution?

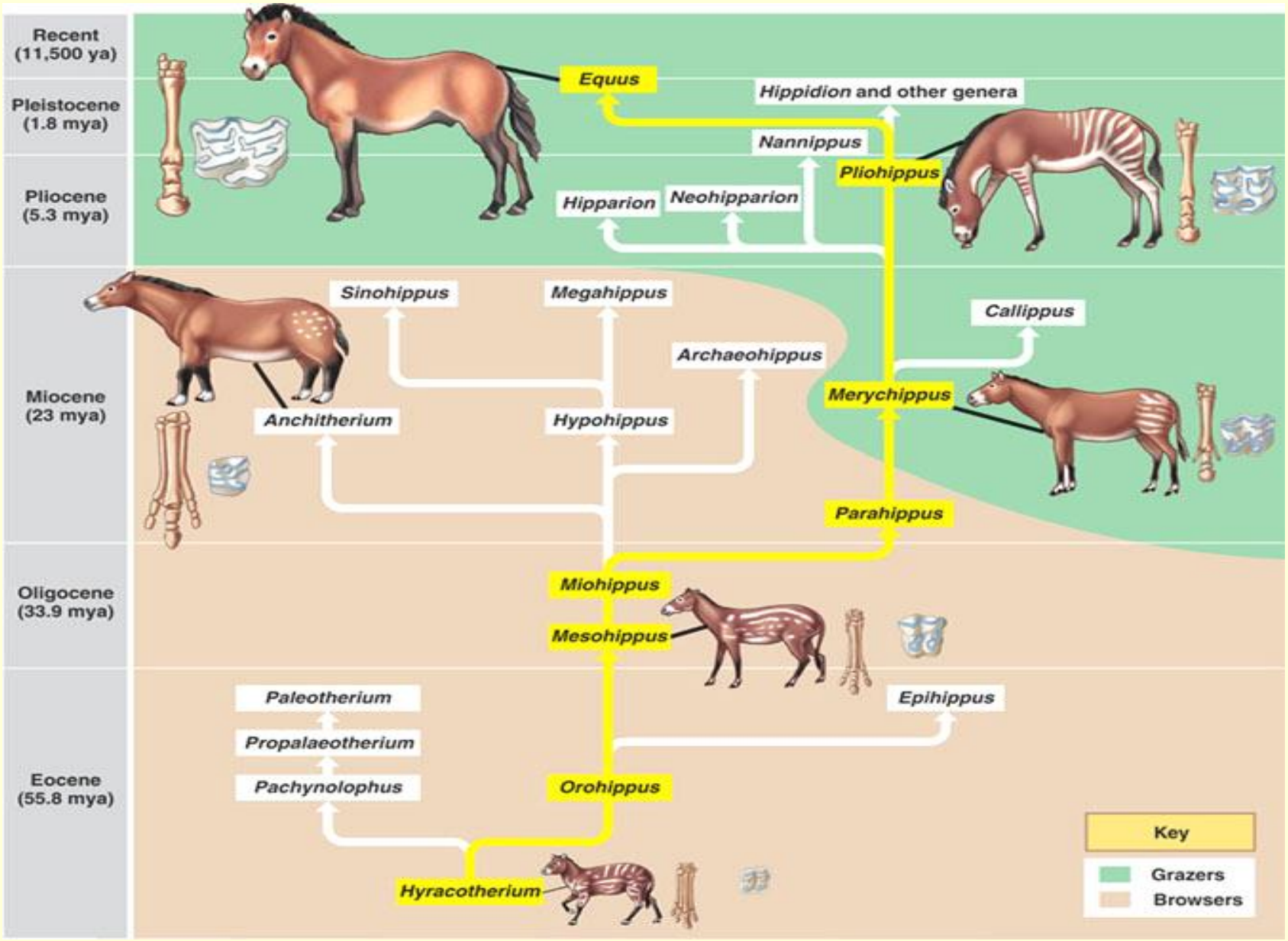


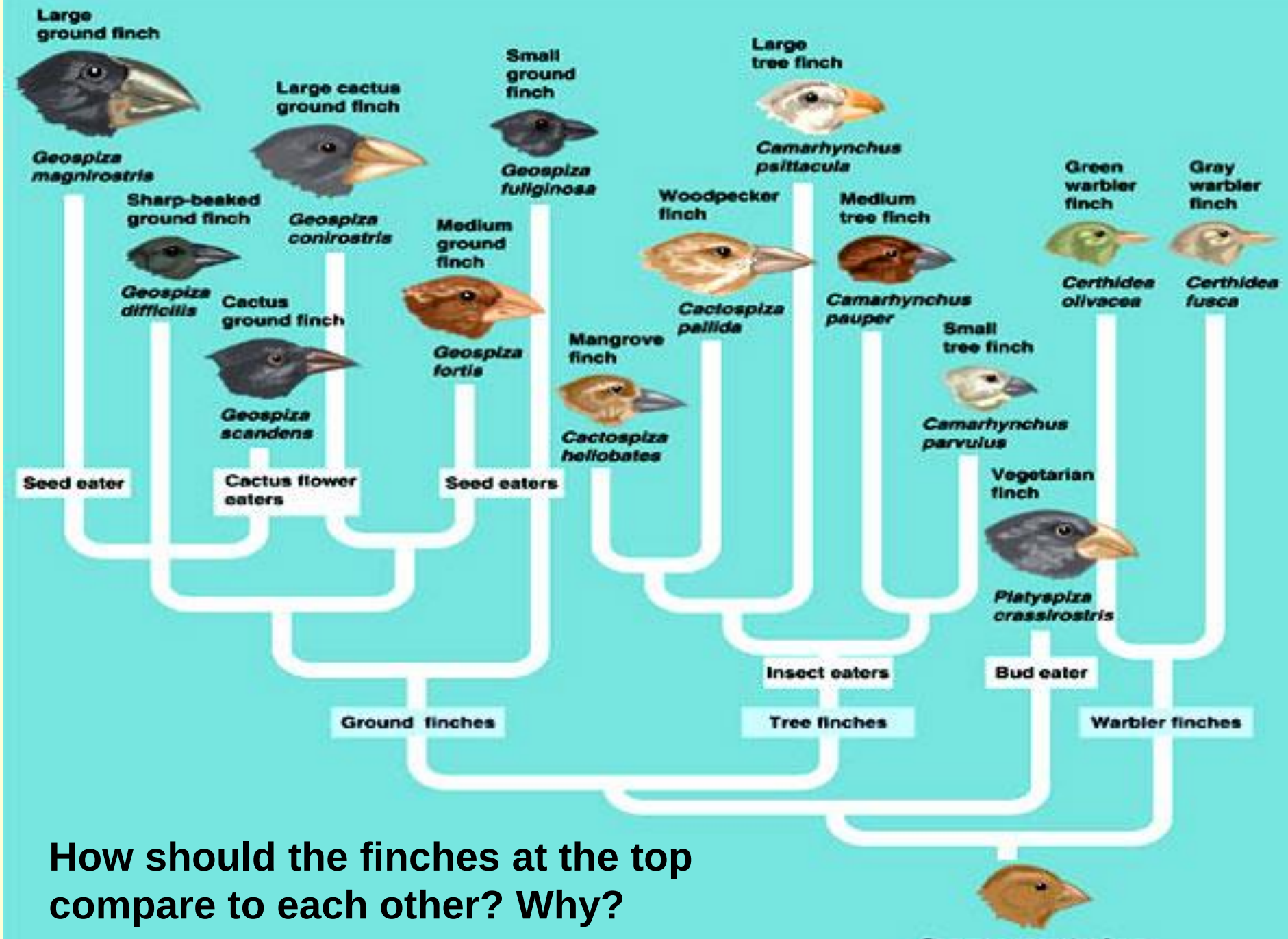
cichlid fish

Variations within a species increases the chance of survival when conditions change.

Fossil Evidence shows Evolutions progresses without set direction.

What does it indicate when branches end?





How should the finches at the top compare to each other? Why?

Observed Natural Selection

- Insect resistance to insecticides
- Bacterial resistance to antibiotics

Explain how this occurs?

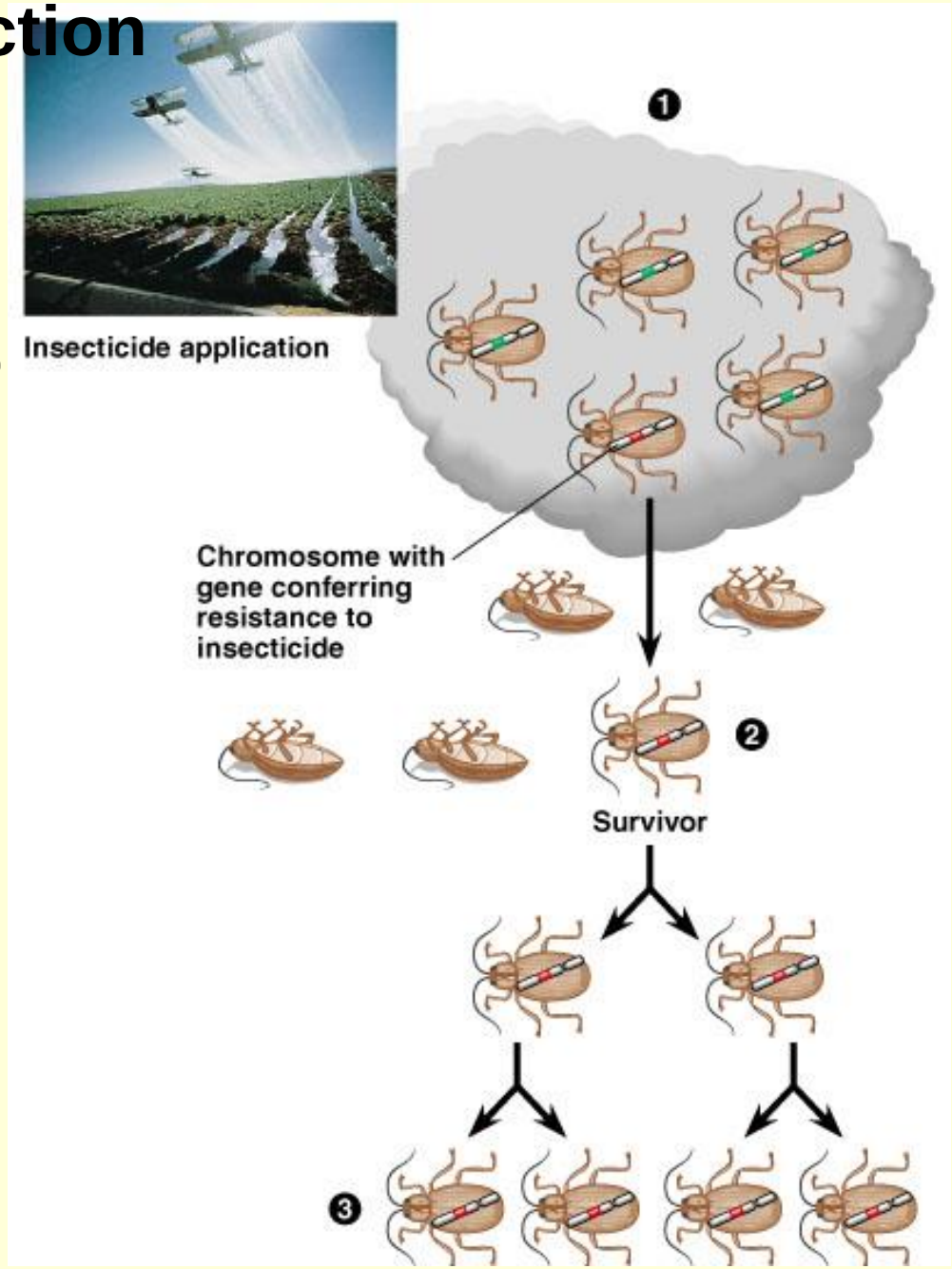
Variation (mutation)

Environmental factor (pesticide)

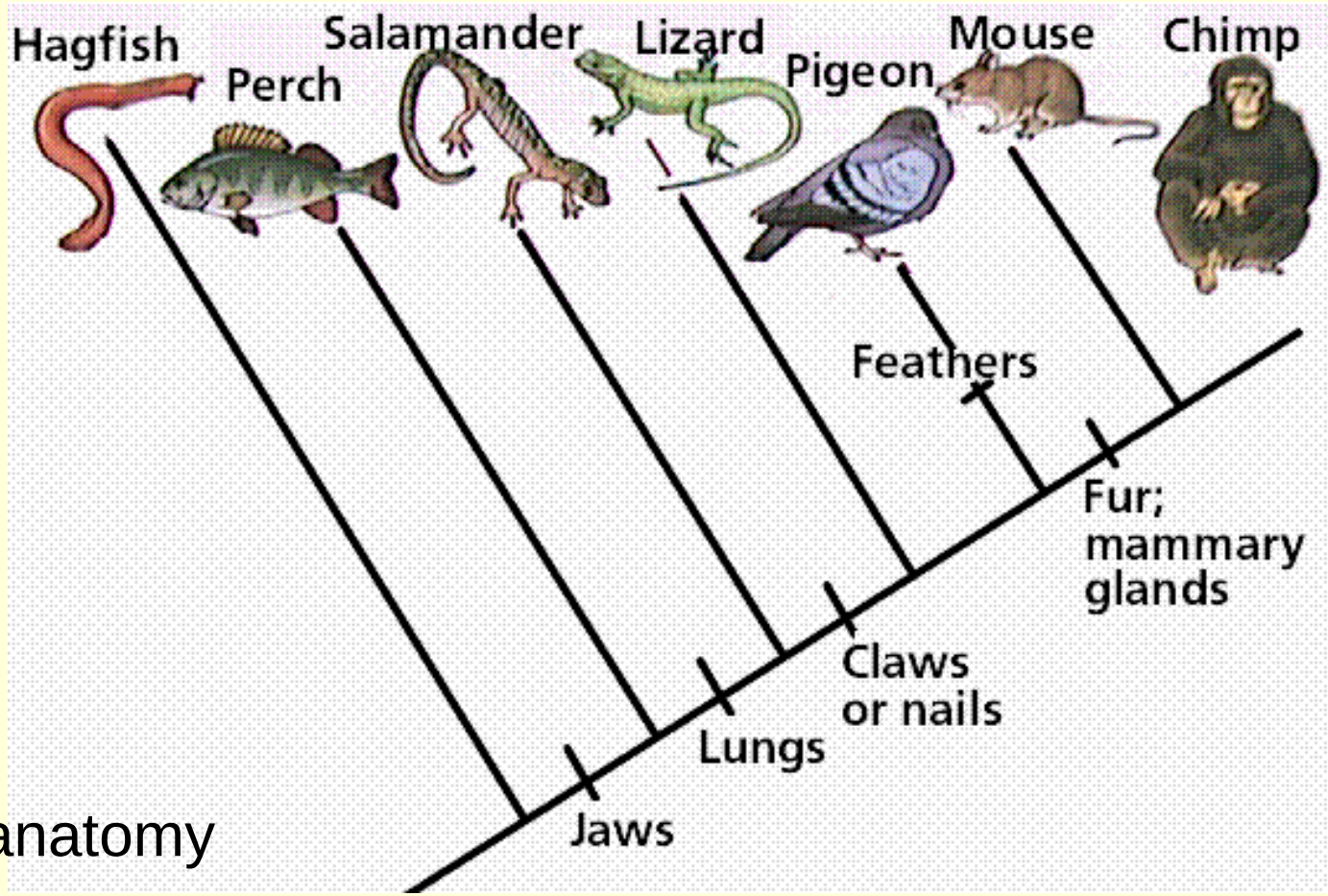
Reproductive success

Survival of Fittest

Population changes



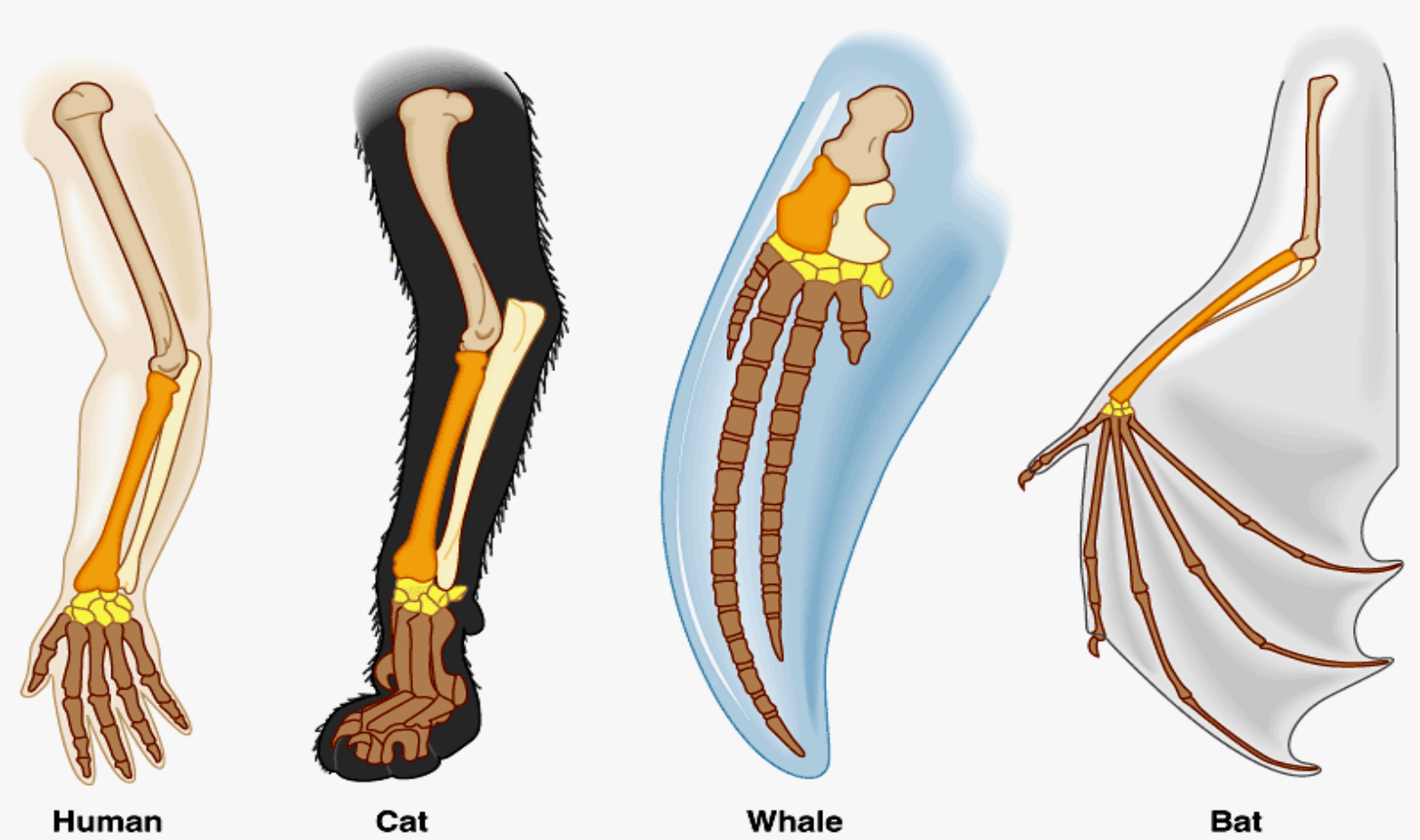
How do we determine which organisms are more closely related?



- Compare anatomy
- Compare development
- Compare biochemistry
- Compare cells

Similarity implies relationship!

Homologous <u>structures</u> are a clues to determine evolutionary relationships.



What could be the reason for similarity in structure?

<u>Molecular data</u> is the best way to compare organisms to relatedness. Compare genes, proteins,

Hemoglobin Comparisons Between Humans and Other Vertebrates

Species	Human	Gorilla	Rhesus monkey	Mouse	Chicken	Frog
Number of Amino Acids That Differ From a Human Hemoglobin Chain*	0	1	8	27	45	67

*Total chain length = 146 amino acids

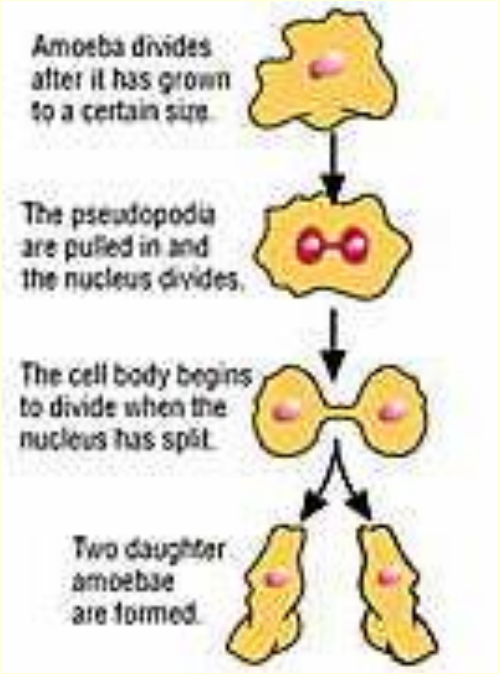
Which animal is most and least related to the human?

Reproduction and Development

Reproduction is necessary for the continuation of a species.

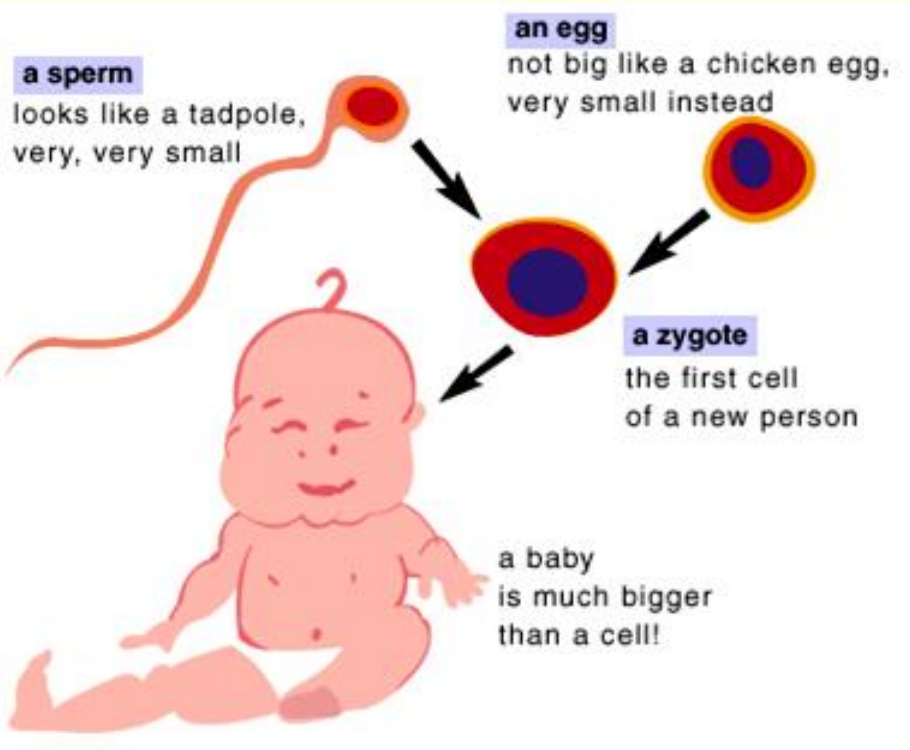
Asexual Reproduction is the production of offspring with genes all from one individual, without the fusion of gametes.

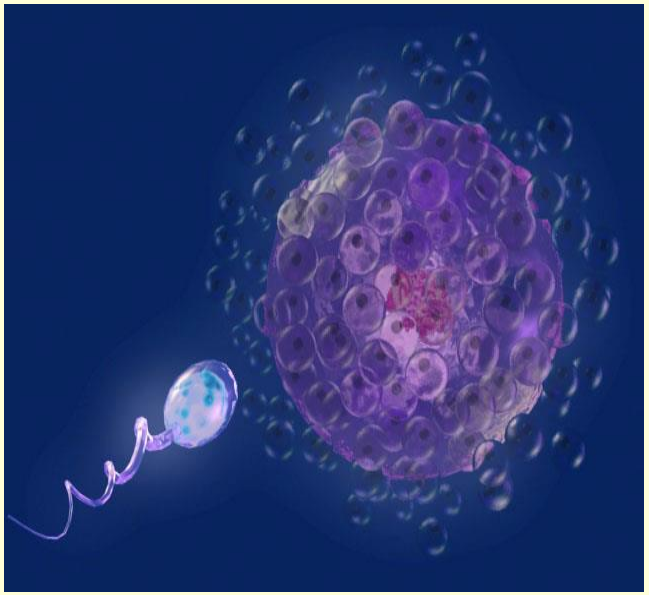
Offspring are genetically identical. No variation



Cloning produces identical copies

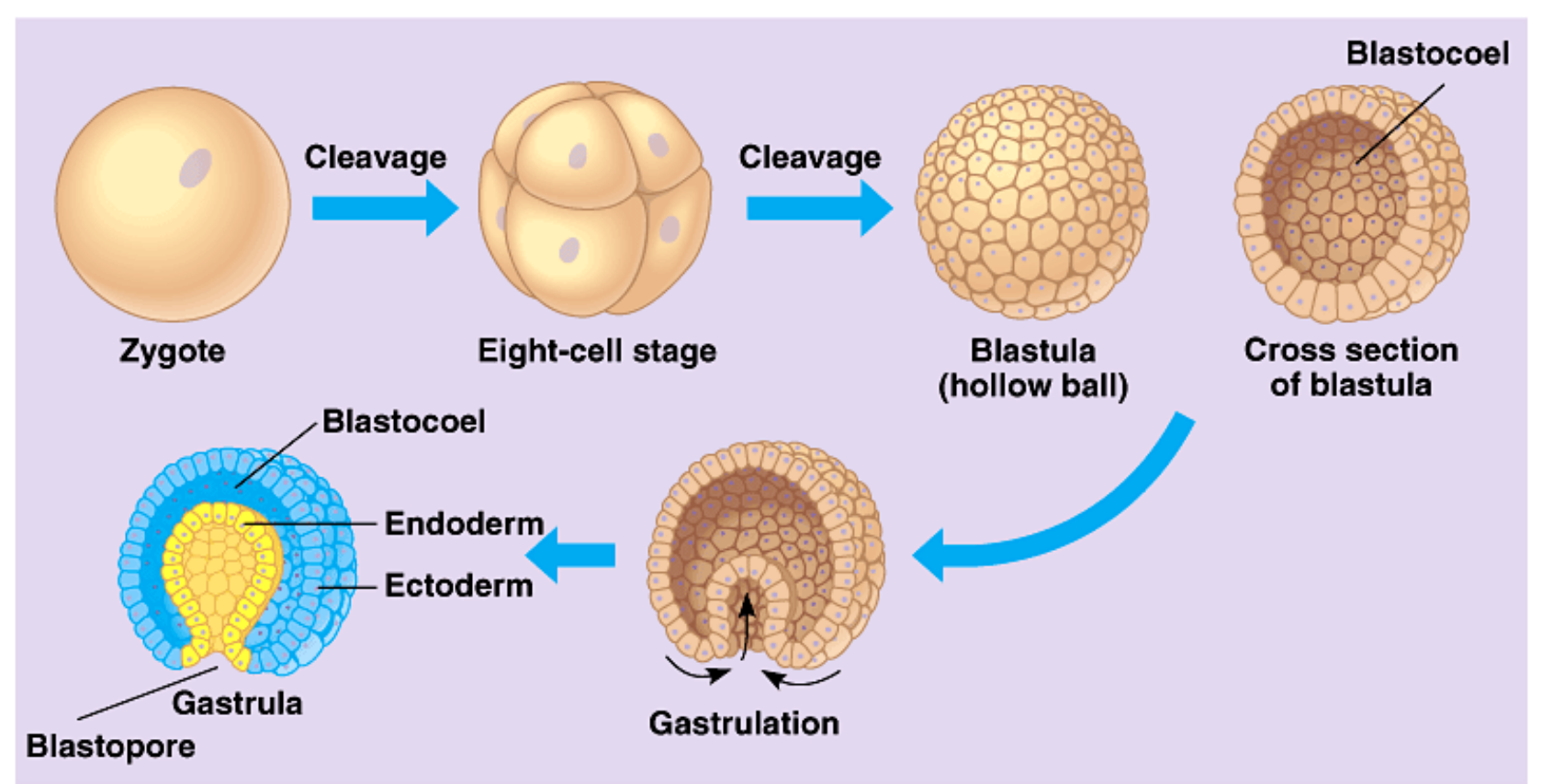
Sexual Reproduction involves the combining of gametes





Variation due to recombination of chromosomes and gametes

Development: Changes that occur as the zygote through steps to form and embryo and fetus.

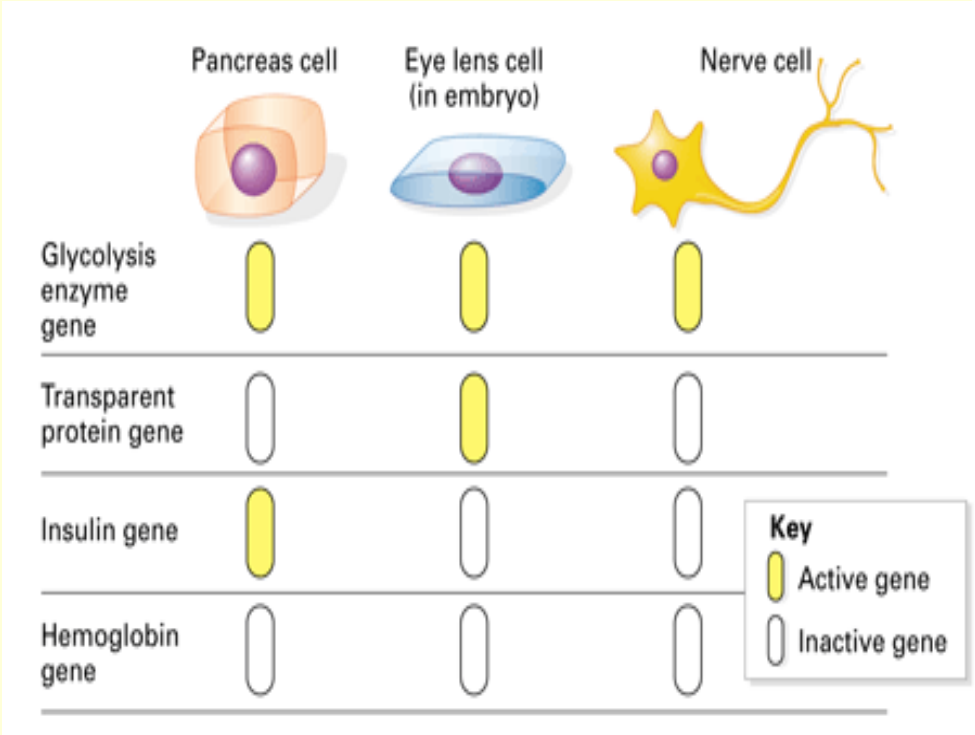


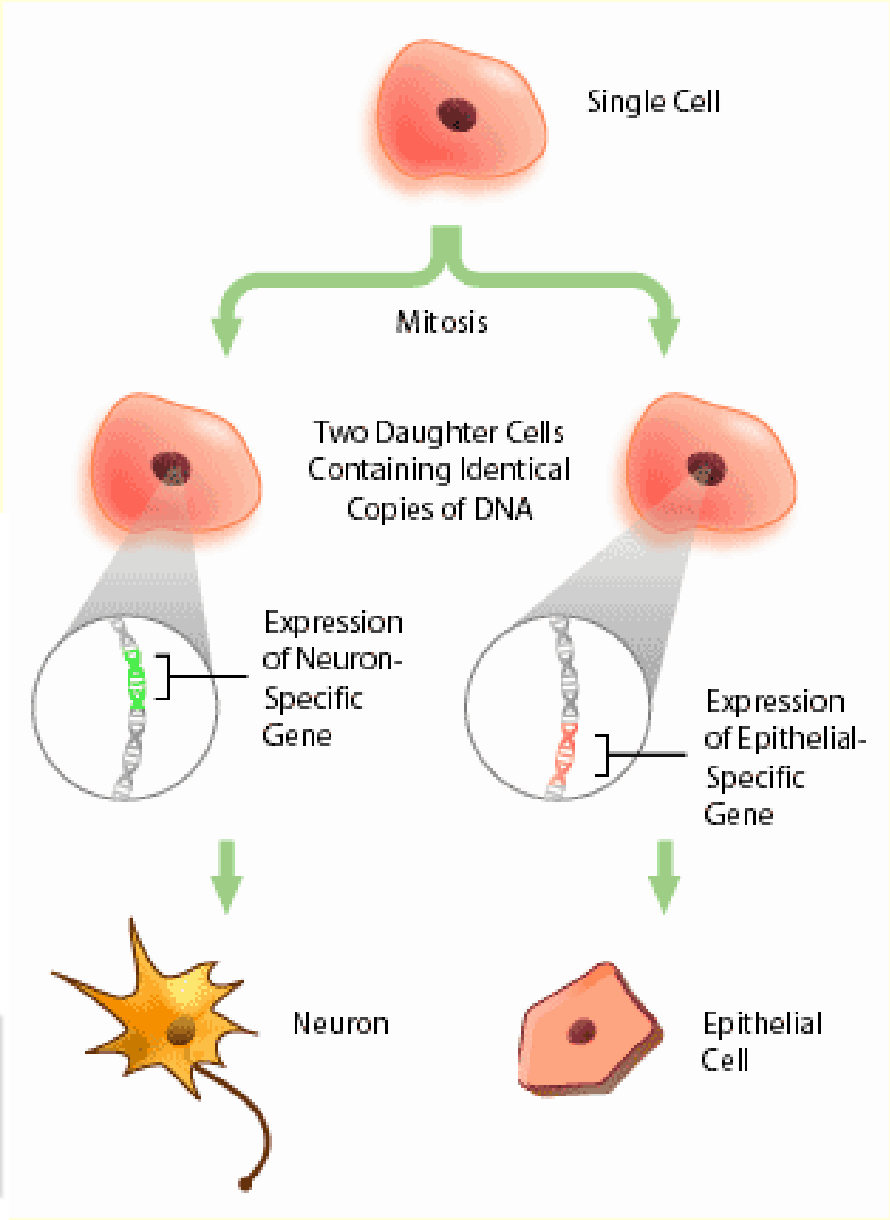
Zygote divides many times by mitosis and differentiates to form specialized cells, tissues and organs.

Differentiation causes cells to specialize.

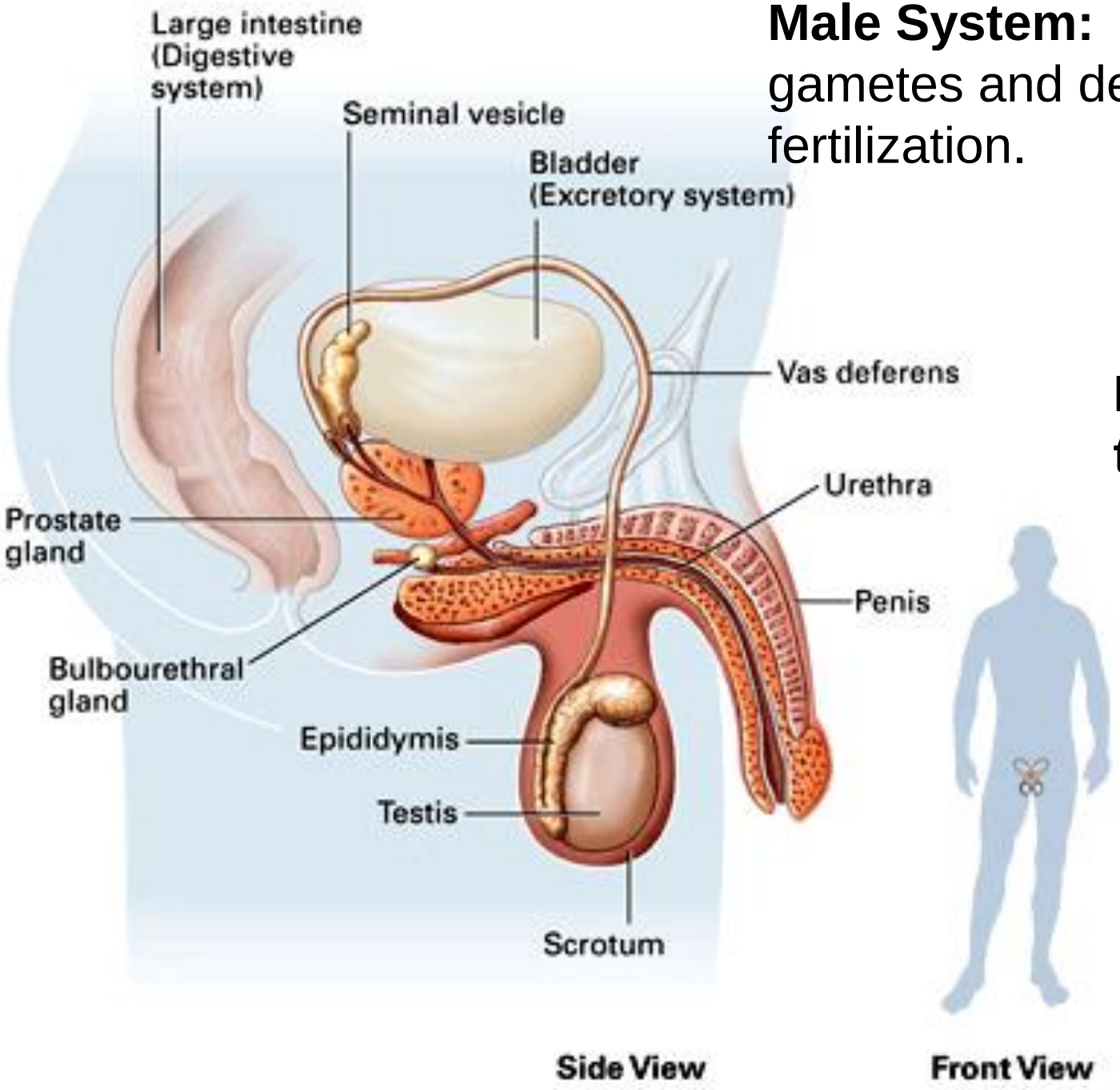
All genes of the genome are present in every type of cell.

Only a specific fraction of these genes are actually expressed in each type of cell.



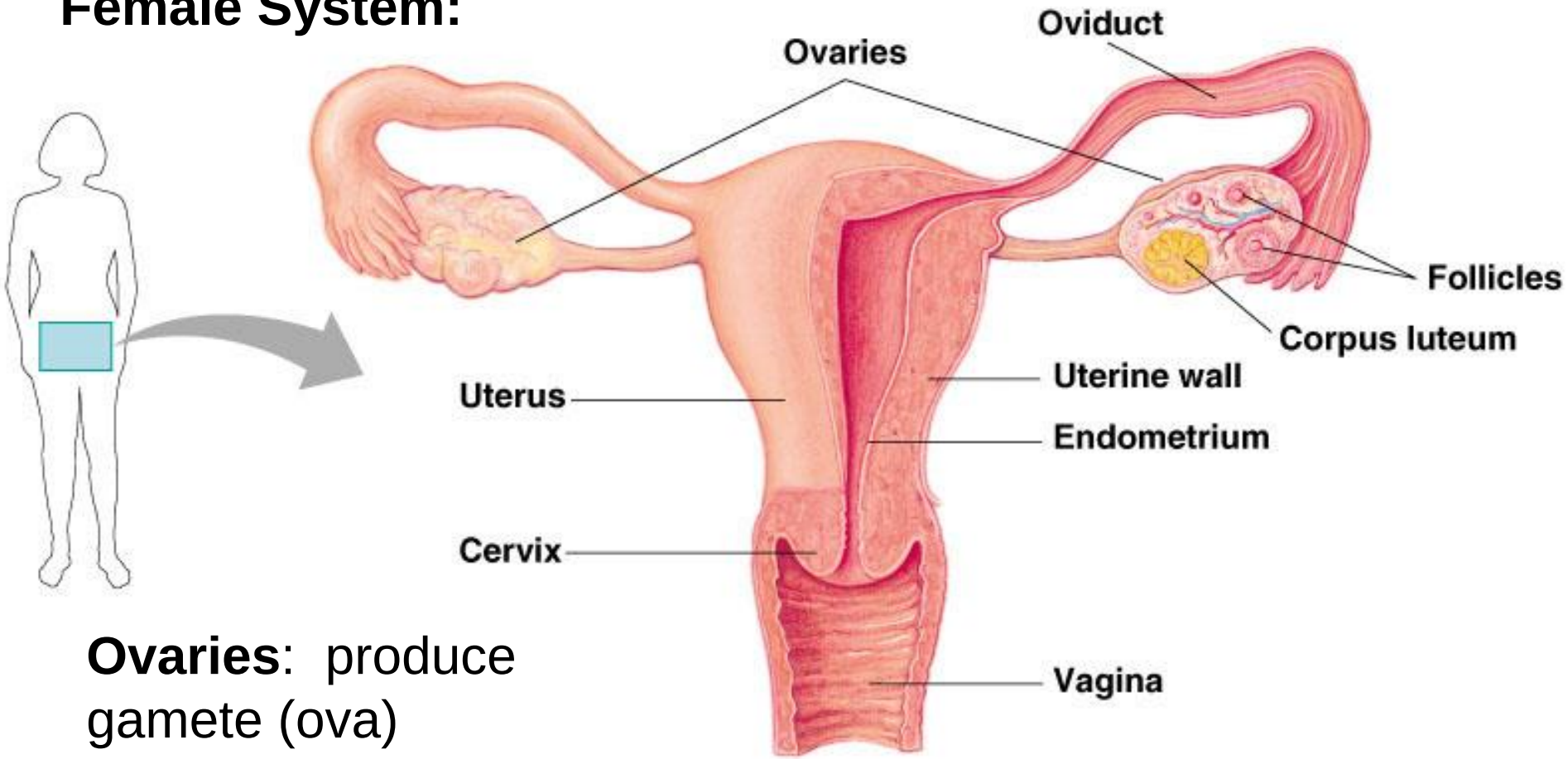


Male System: produces gametes and deliver sperm for fertilization.



Hormone testosterone

Female System:



Ovaries: produce gamete (ova)

Internal Fertilization in **Oviduct**

Internal Development in **Uterus**

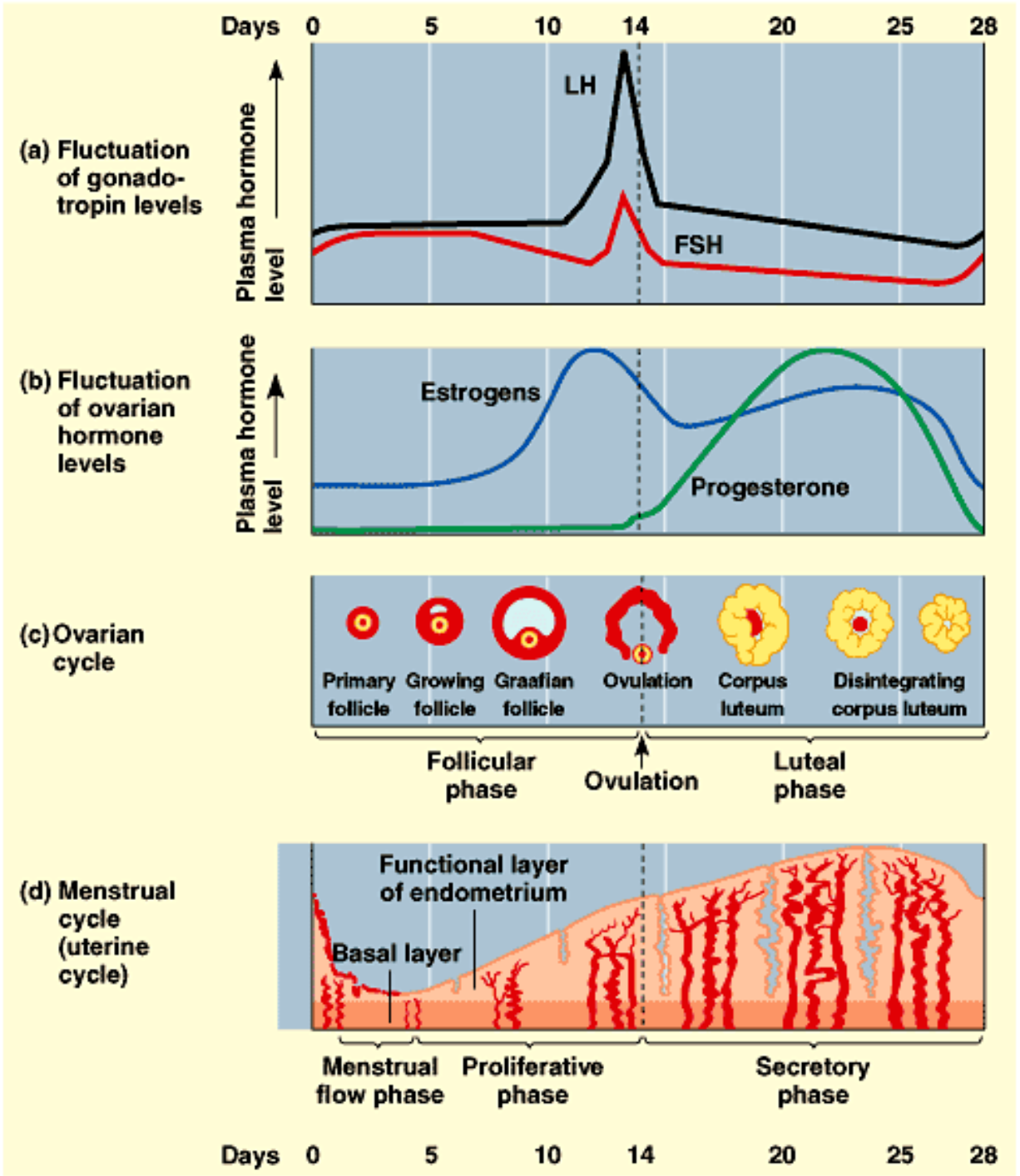
Hormones:
Estrogen
Progesterone

Menstrual Cycle

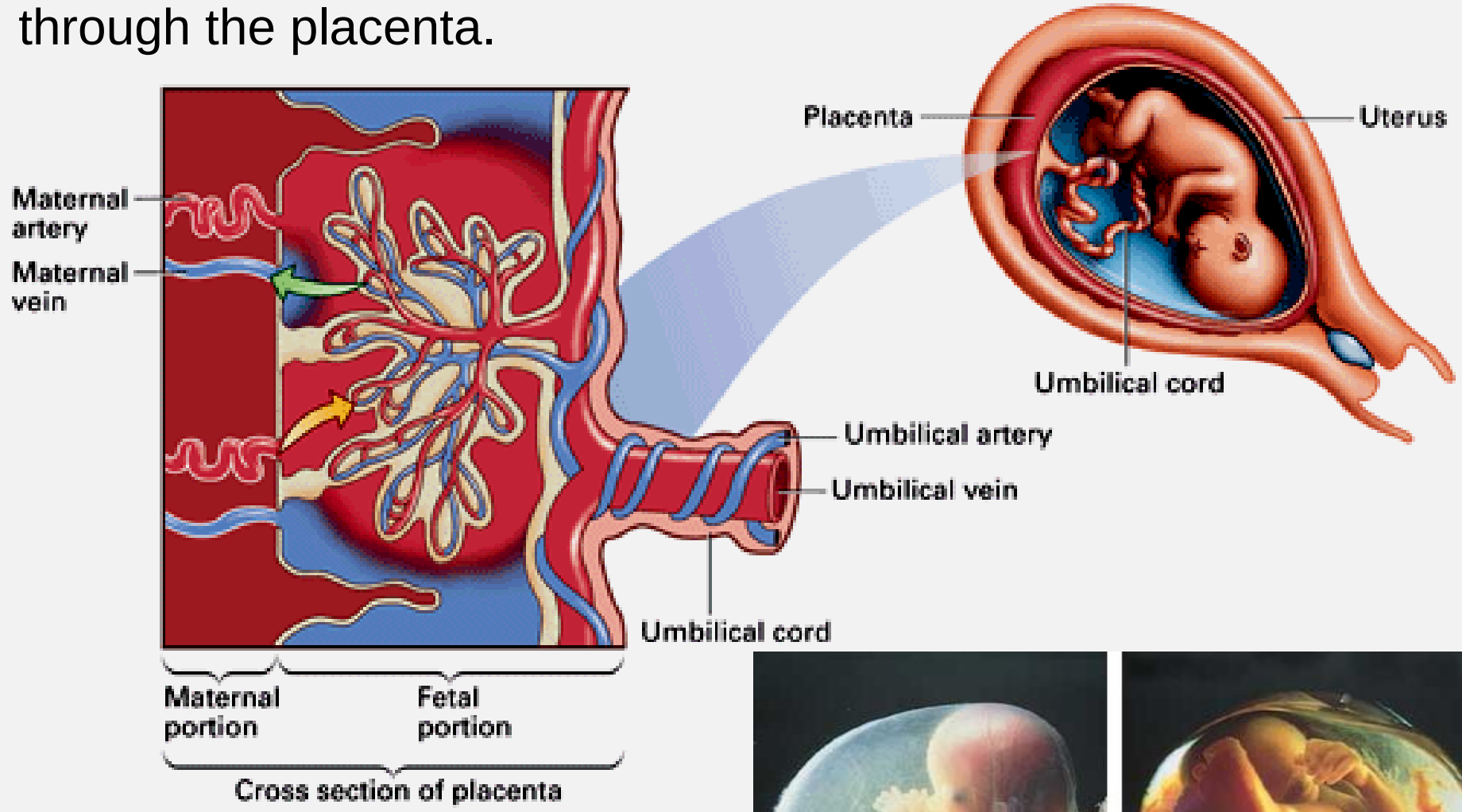
Regulated by hormones

Estrogen

Progesterone



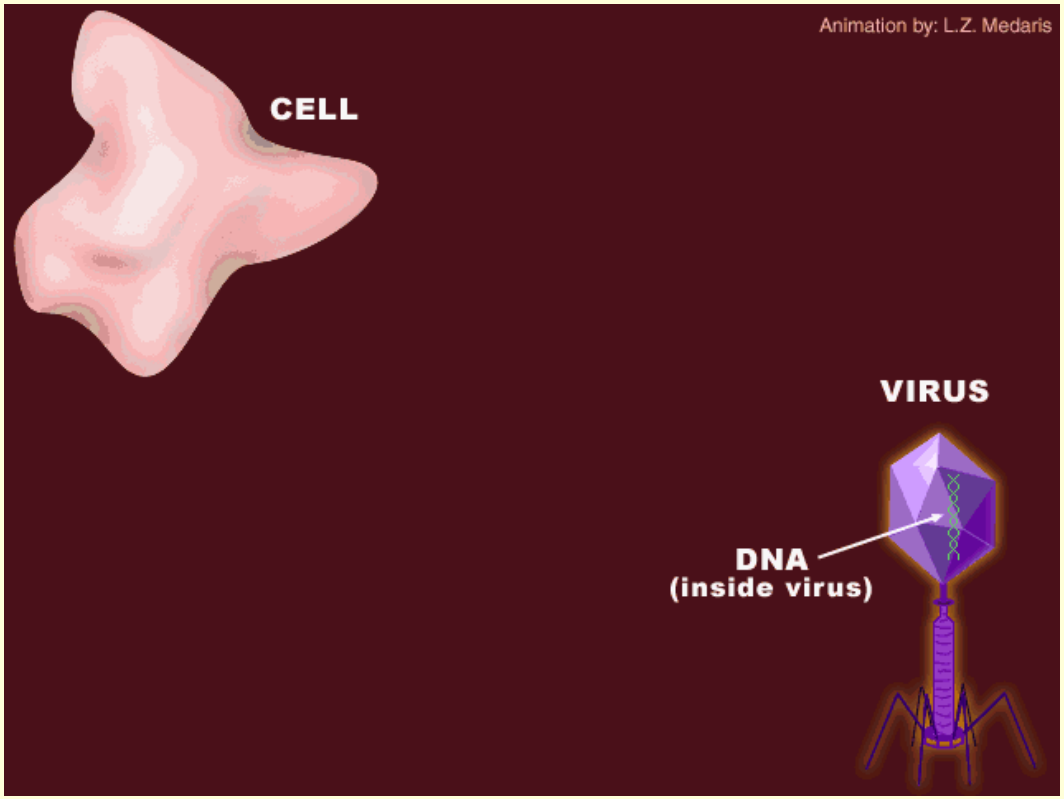
Internal Development occurs in the uterus with nourishment through the placenta.

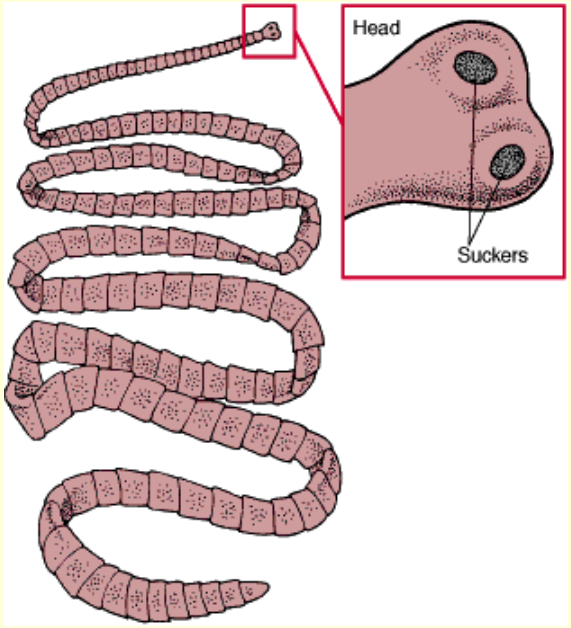


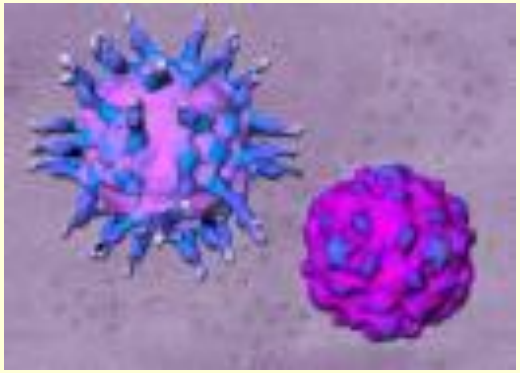
Amnion protects the embryo

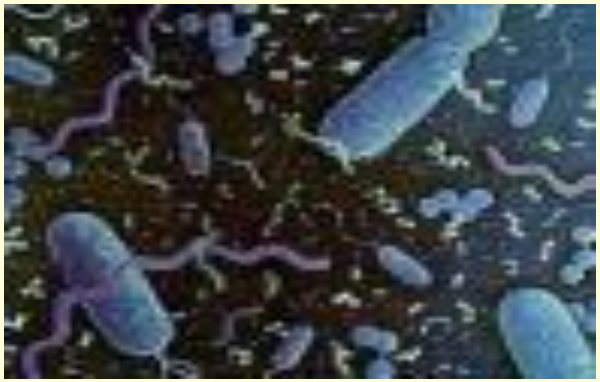
Disease is a failure of Homeostasis

Virus, bacteria, fungi, and parasites may cause infections





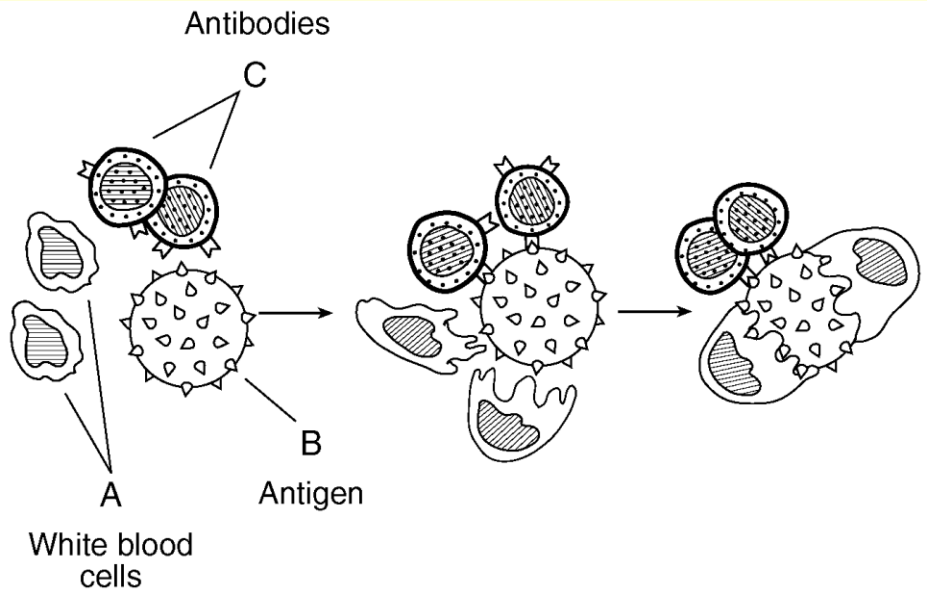




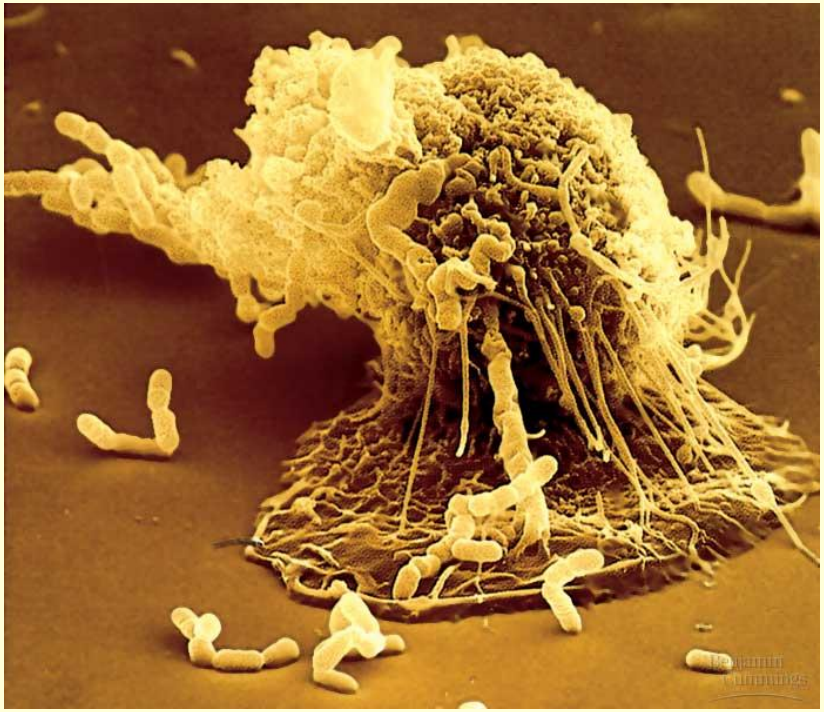
Immune system from foreign substances and pathogenic organisms

Antigens: factors the body "sees" as foreign

Pathogenic Organisms: cause disease

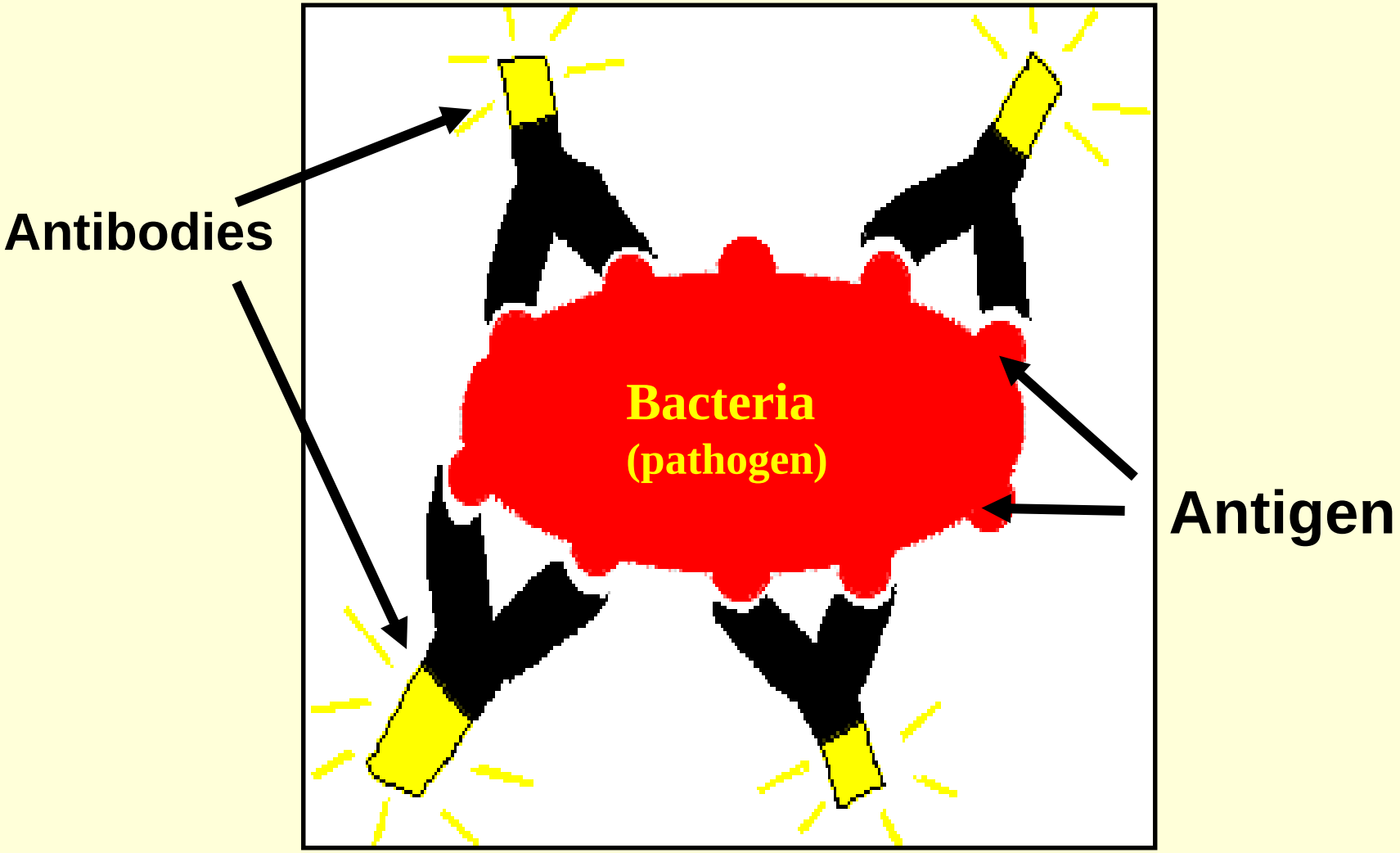


Antibody-antigen interaction

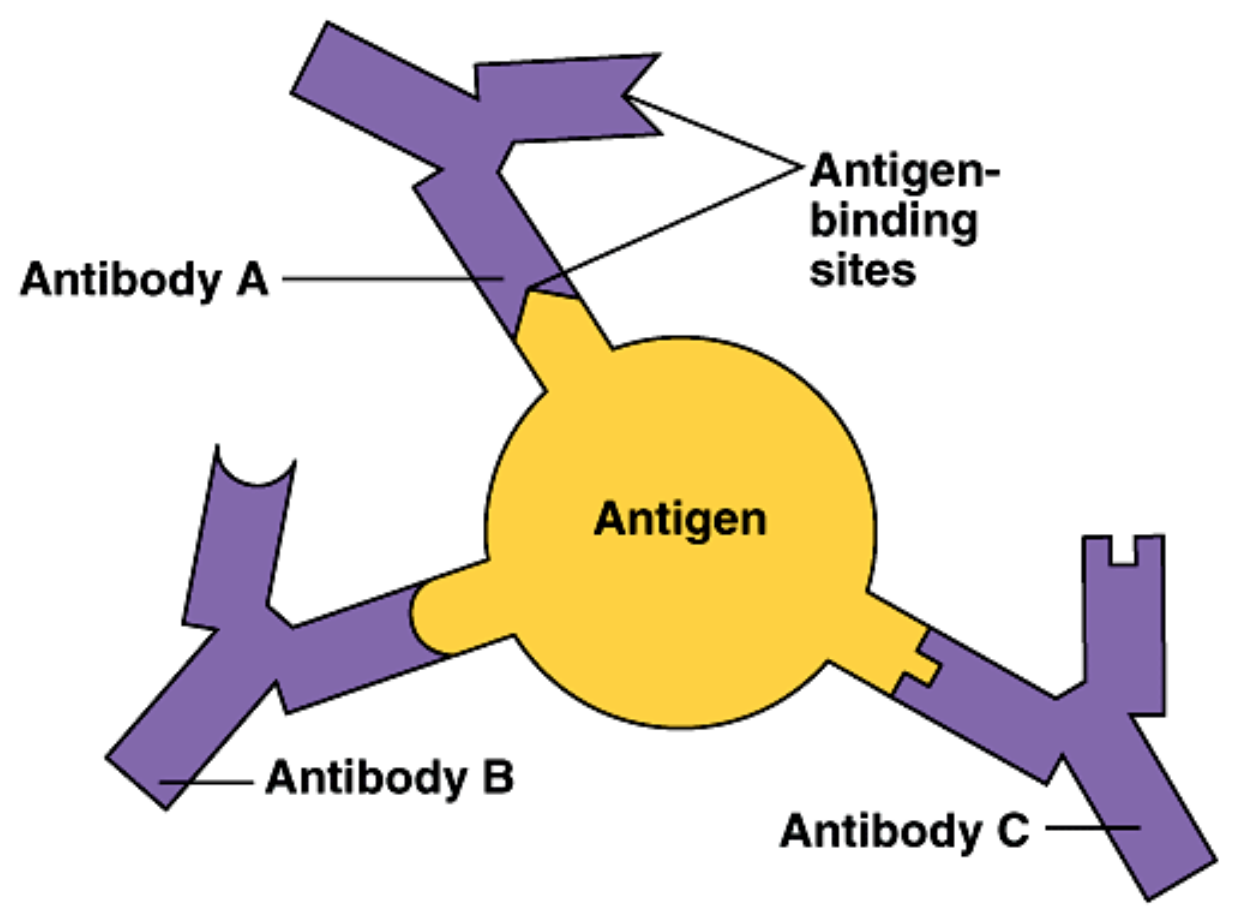


Engulfing White Blood Cell

Special white blood cells make antibodies that mark the pathogen for destruction by other cells.

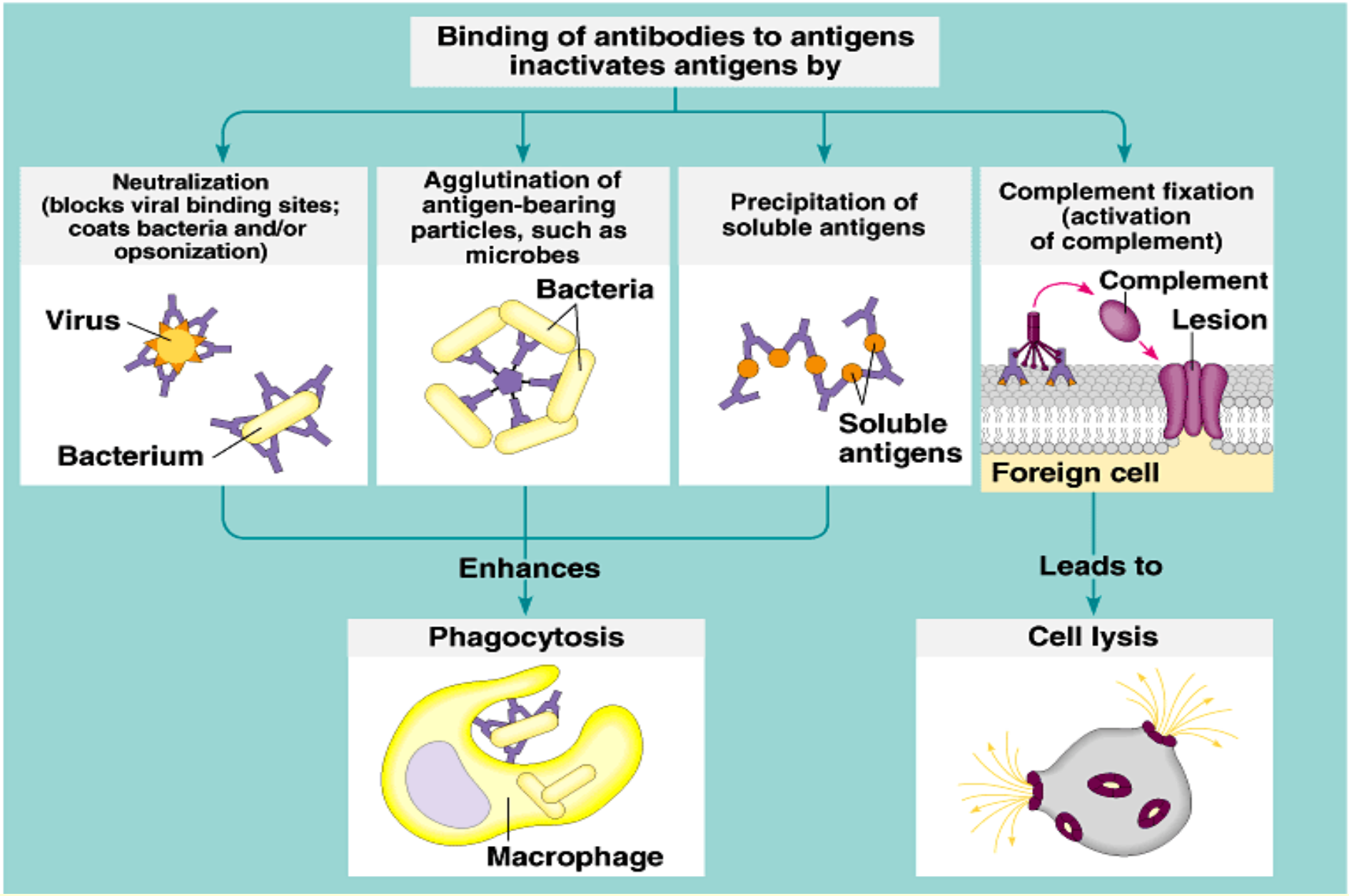


Antibodies are structure specific to the antigen



Due to their protein nature, antibody shape “fits” binding sites on the antigens.

Antibodies inactivates antigens several ways

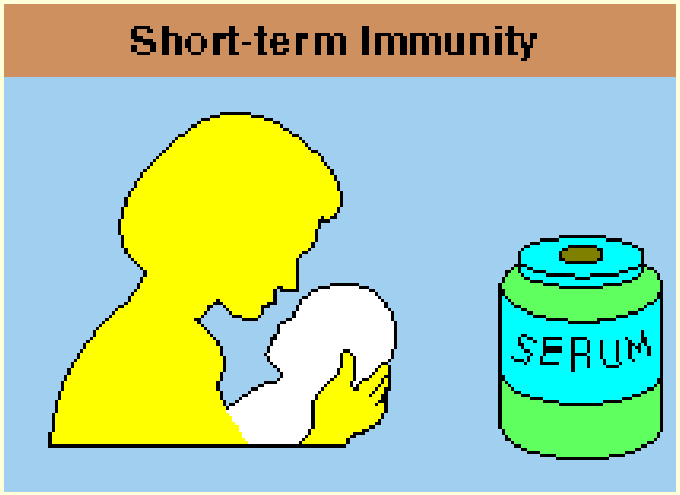


Immunity can occur naturally or artificially

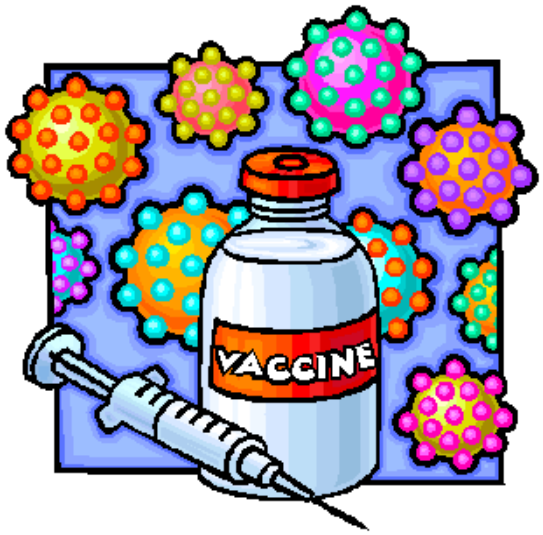
1. **Active Immunity:** stimulates the infected person's immune system
    a. Immunization by vaccination give the person a weakened, dead, fragment of the pathogen
    b. Recover from the infection

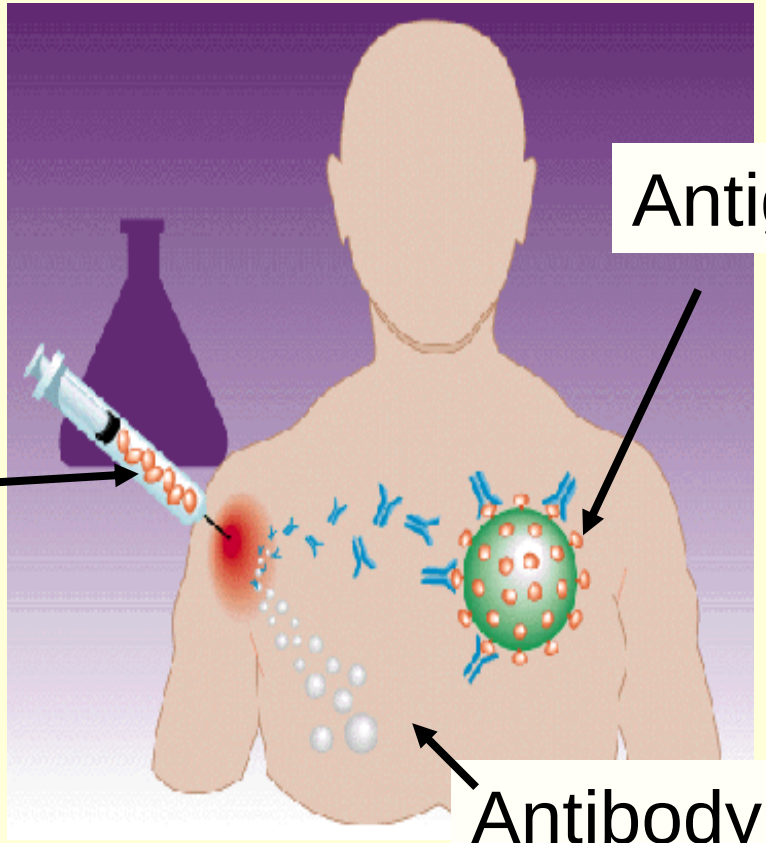
2. **Passive Immunity:** person receives antibodies only so it is temporary

a. Maternal immunity occurs when antibodies pass from mother to baby through placenta and breast milk
b. Artificial injection of antibodies gives short term immunity



Vaccinations: Patient receive weakened versions of pathogen to stimulate the immune system





Antigen

Weakened Pathogen

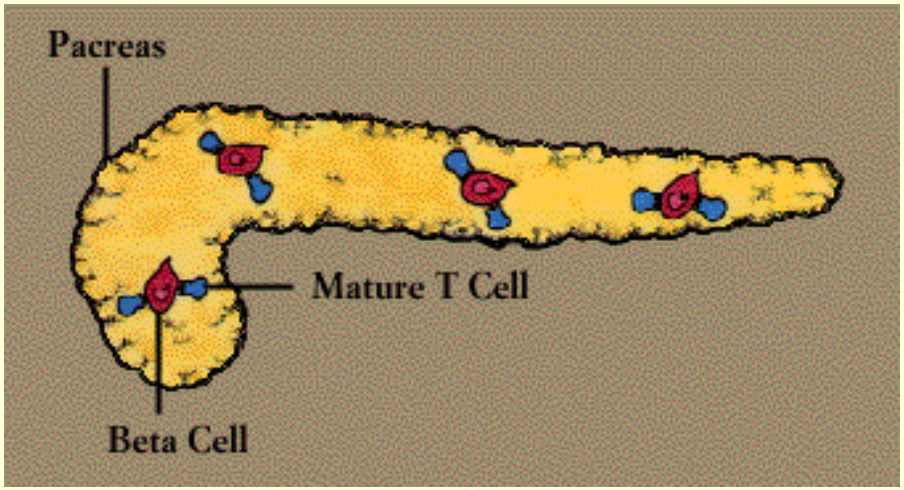
Antibody

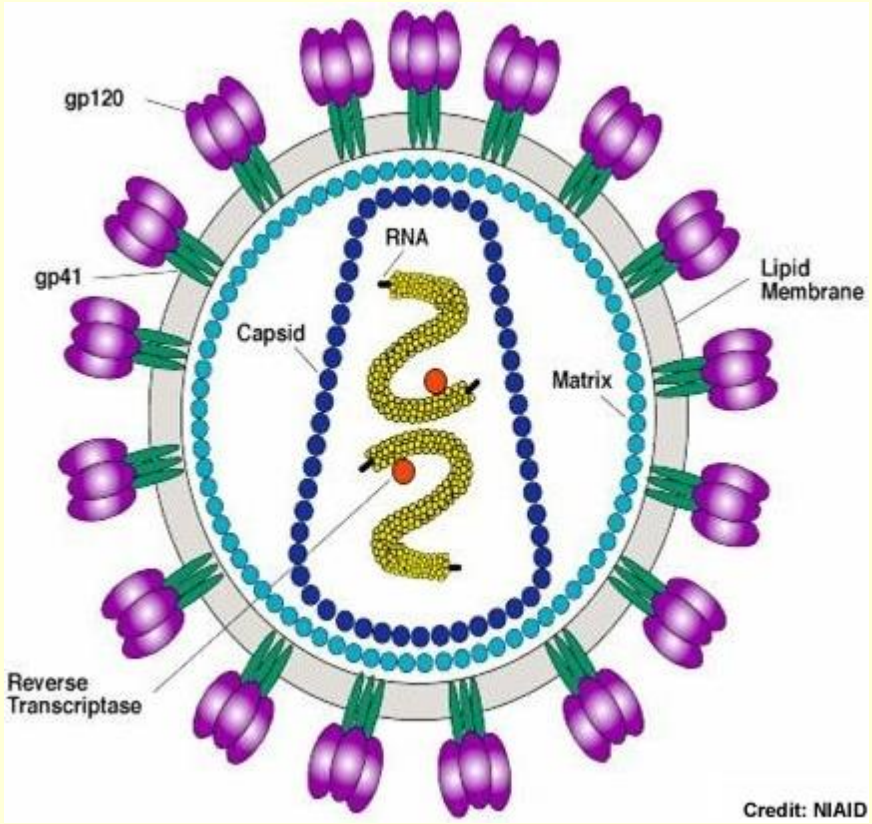
Vaccines movie

Immune System Failures

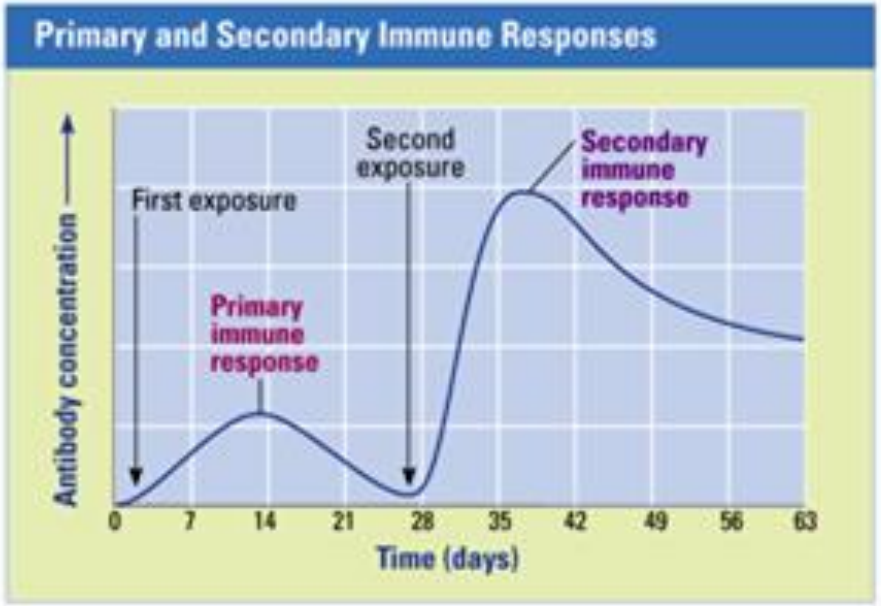
Autoimmune diseases: immune system destroys body cells, type I diabetes, multiple sclerosis, rheumatoid arthritis

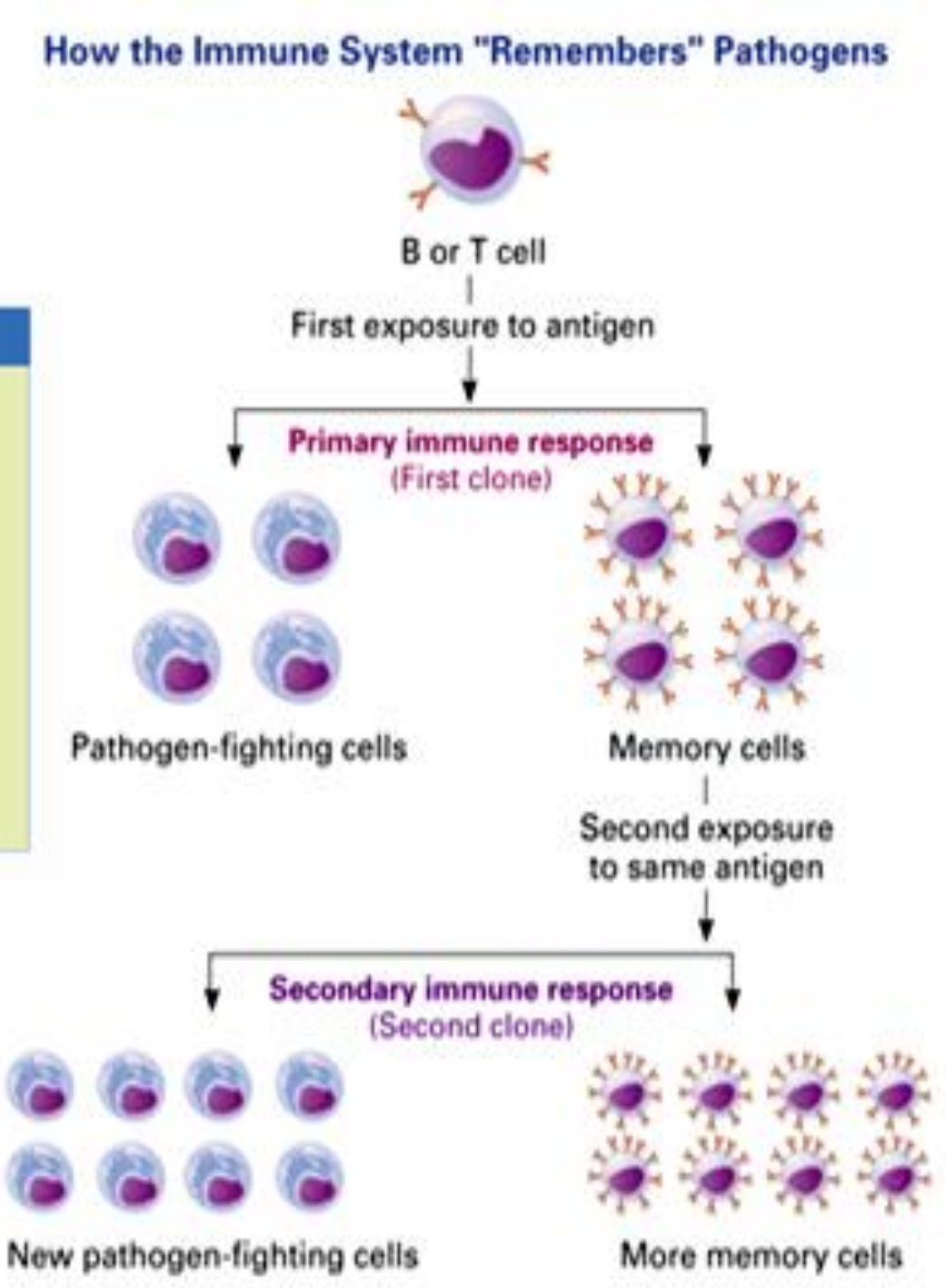
AIDS: Acquired Immune Deficiency Disease





Primary and Secondary Immune Responses

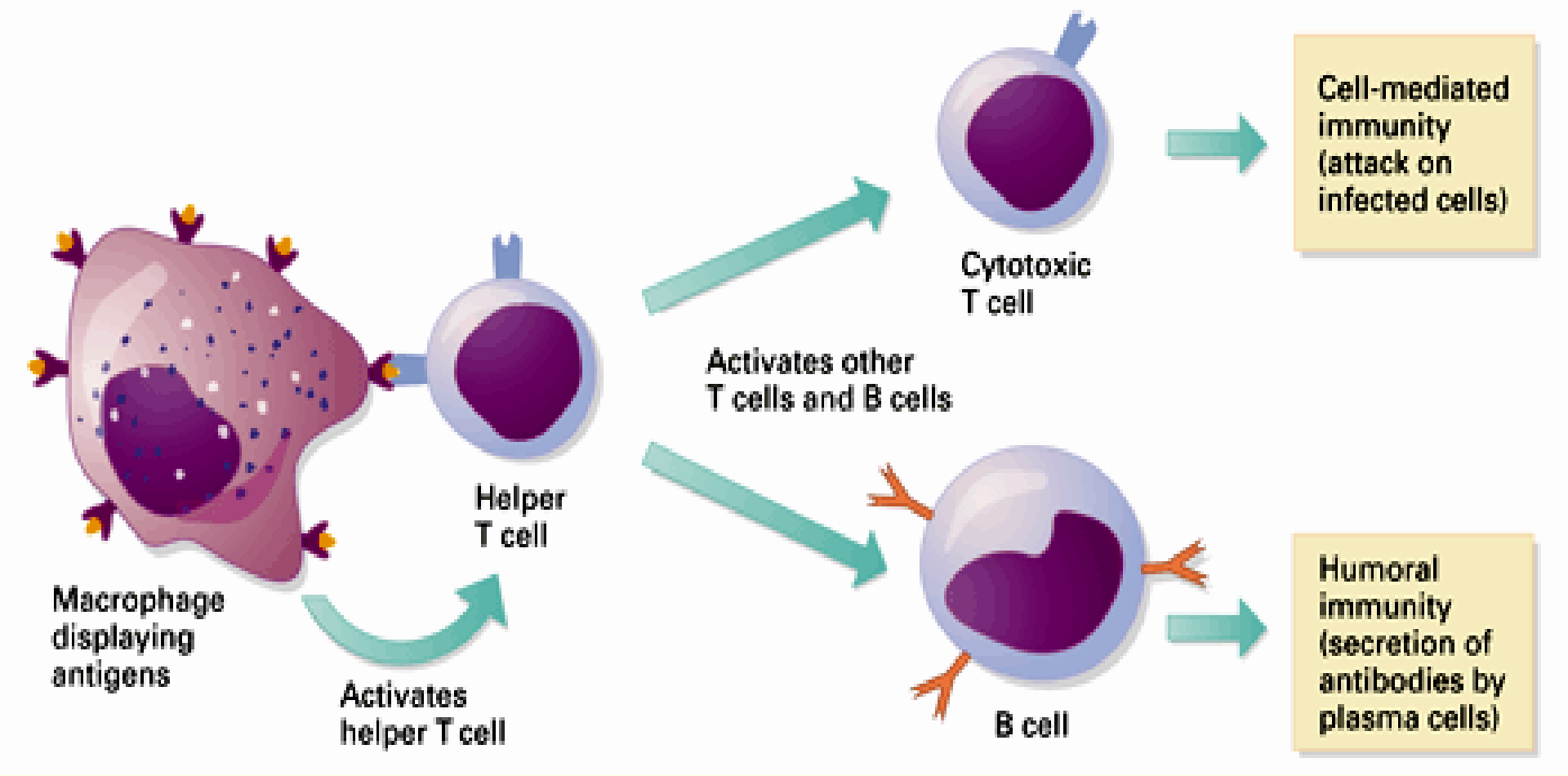




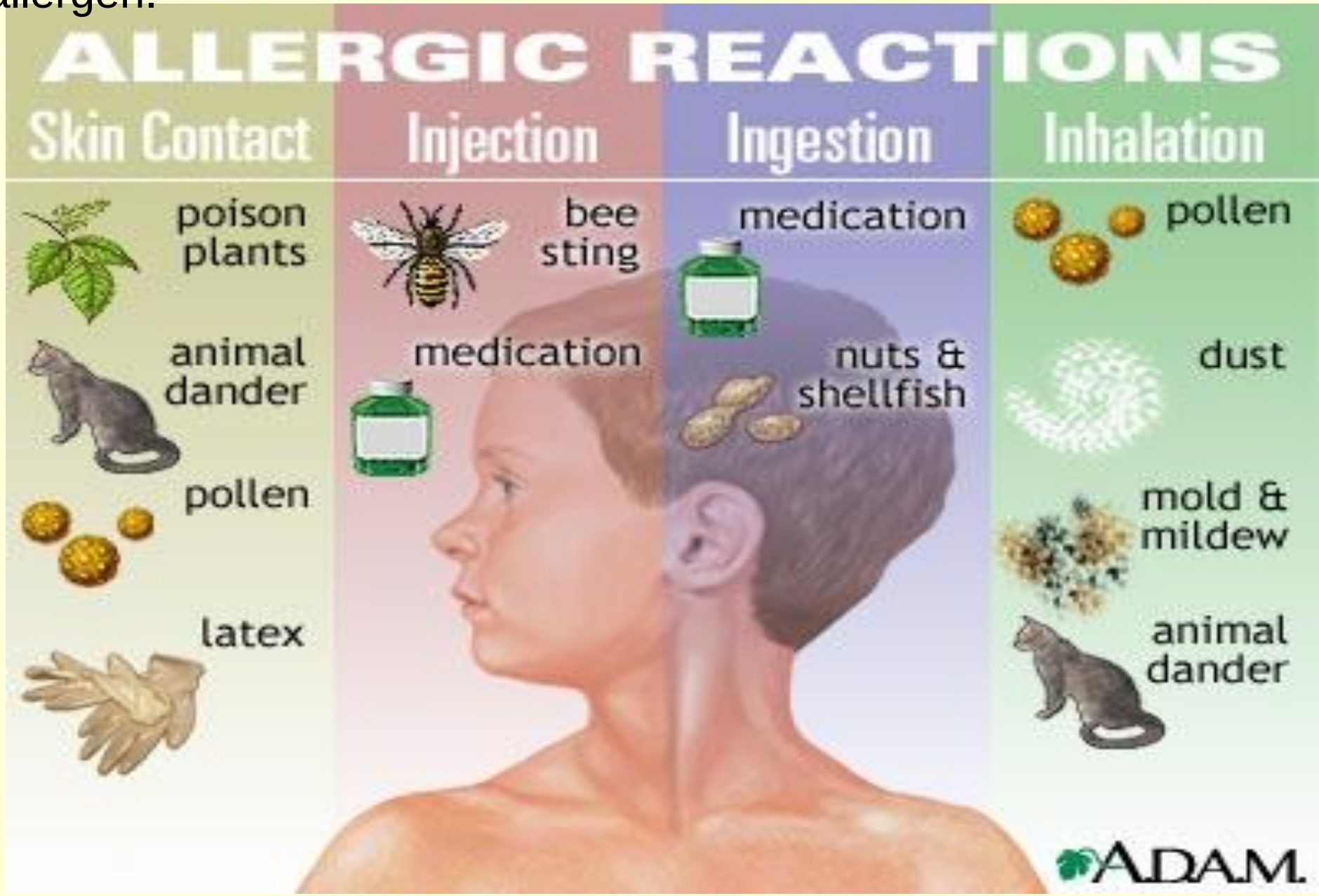
The first exposure to a pathogen memory cells specific to that pathogen. A second exposure activates those memory cells.

Large White Blood Cells engulf pathogens. They display antigens and activates helper T cells. The helper T cells stimulate other T cells and B cells.

HIV virus kills Helper T cells.



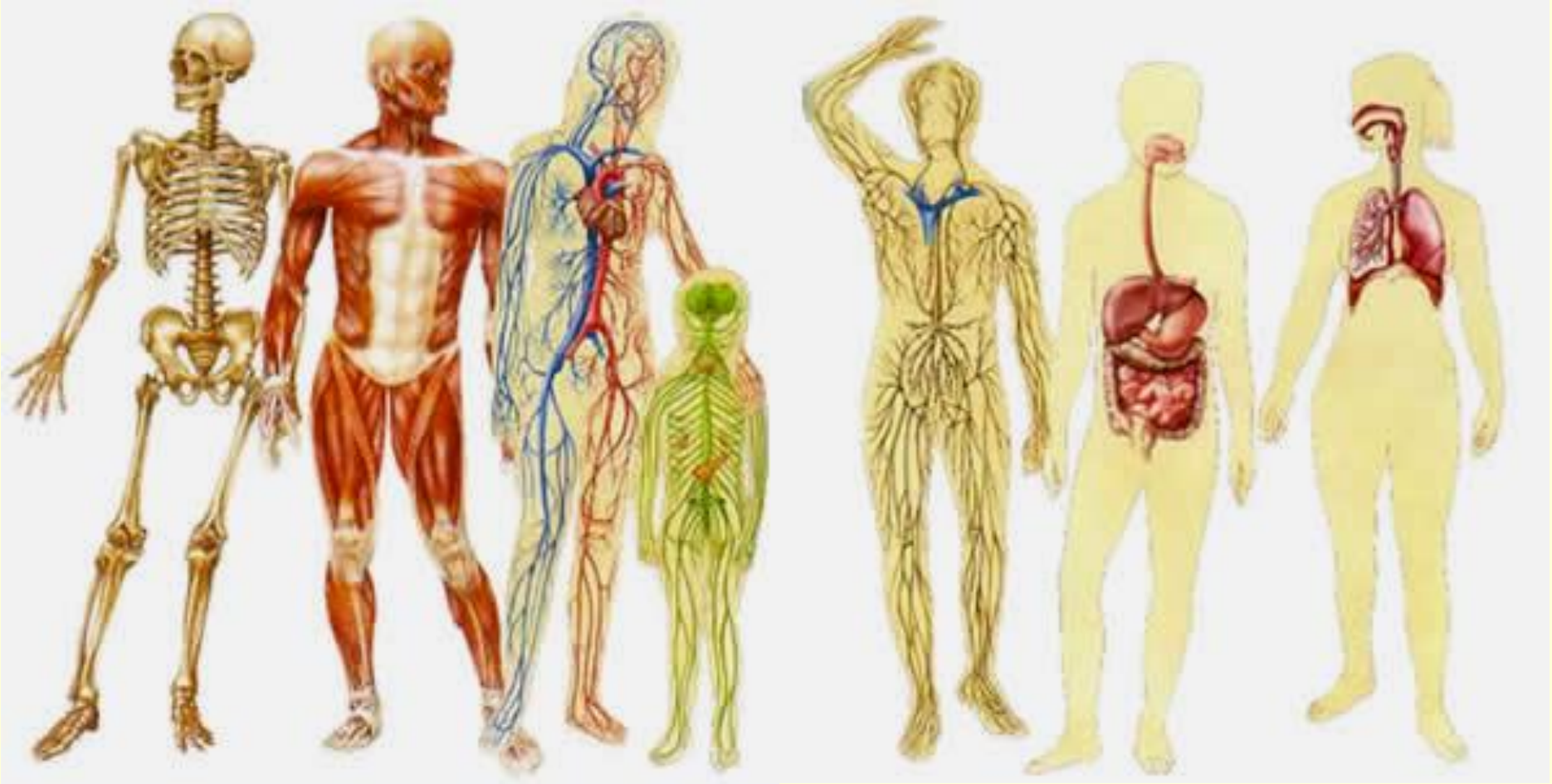
Allergies: immune reaction involving histamines to a “harmless” allergen.



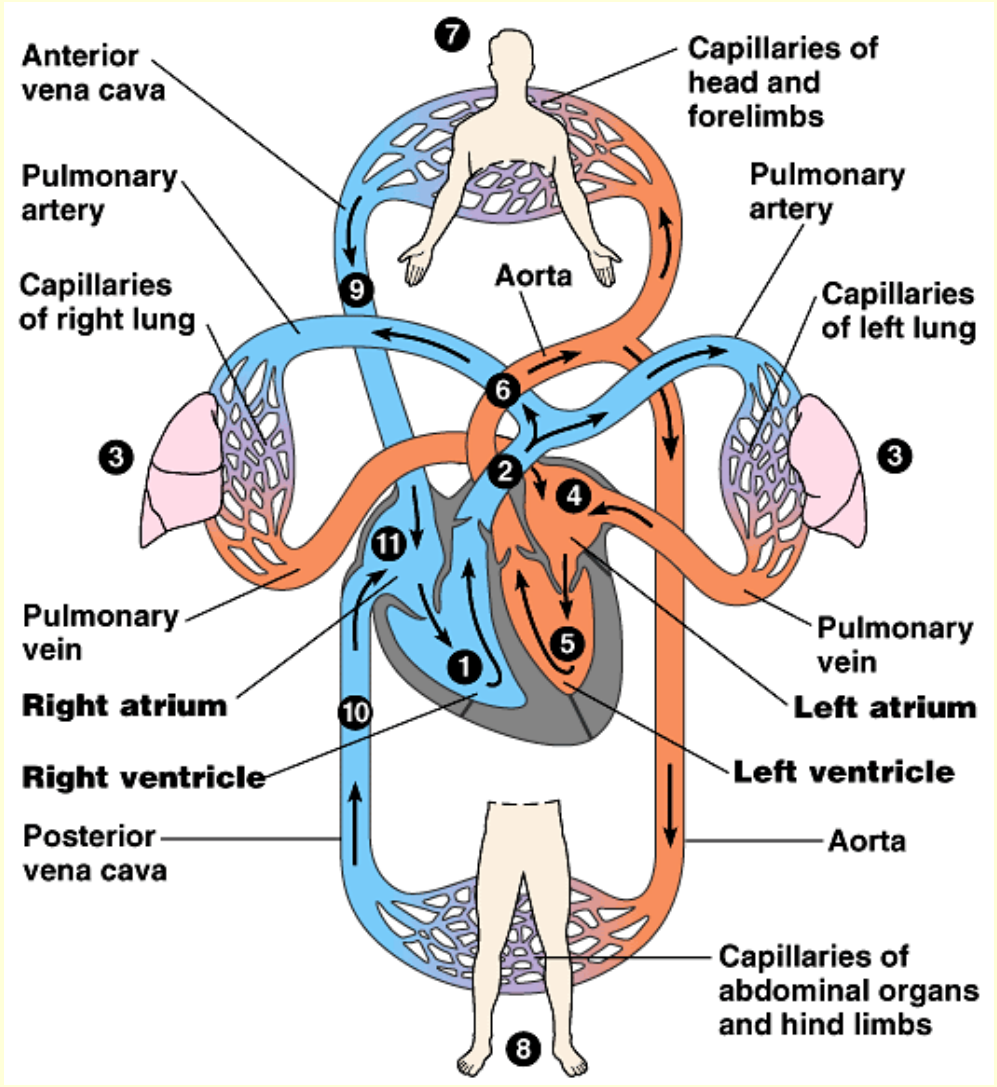
Human Systems

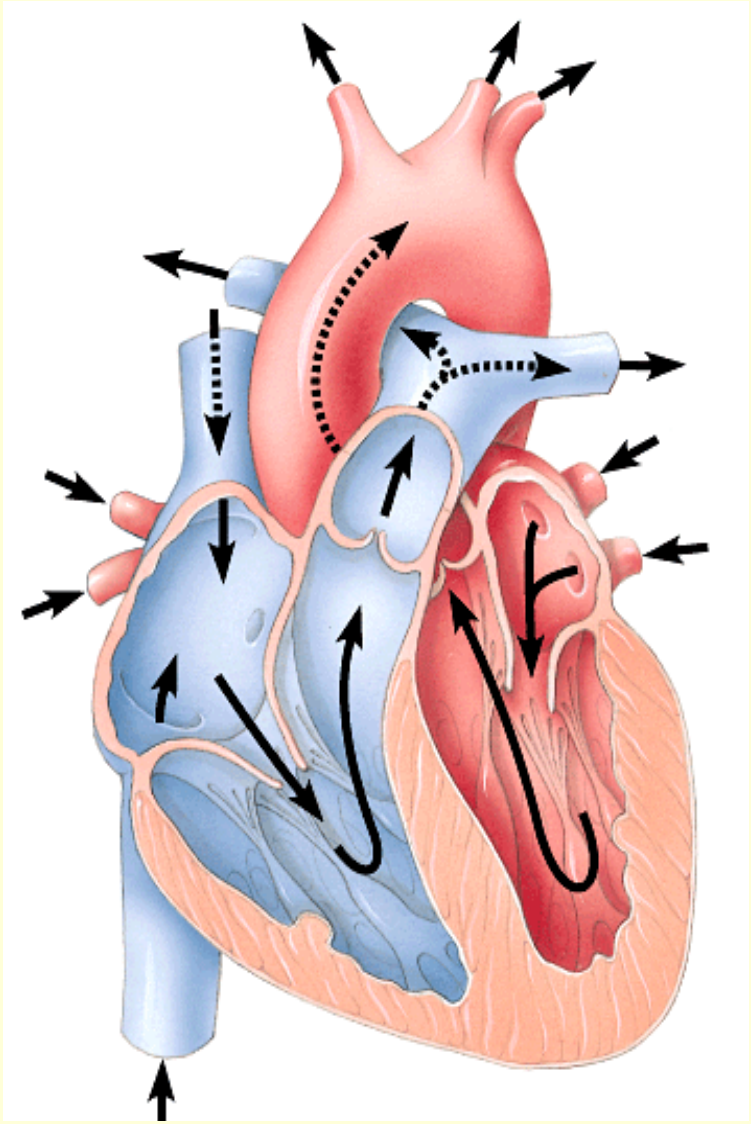
Humans are complex organisms with multiple systems.

The systems interact to perform life functions.

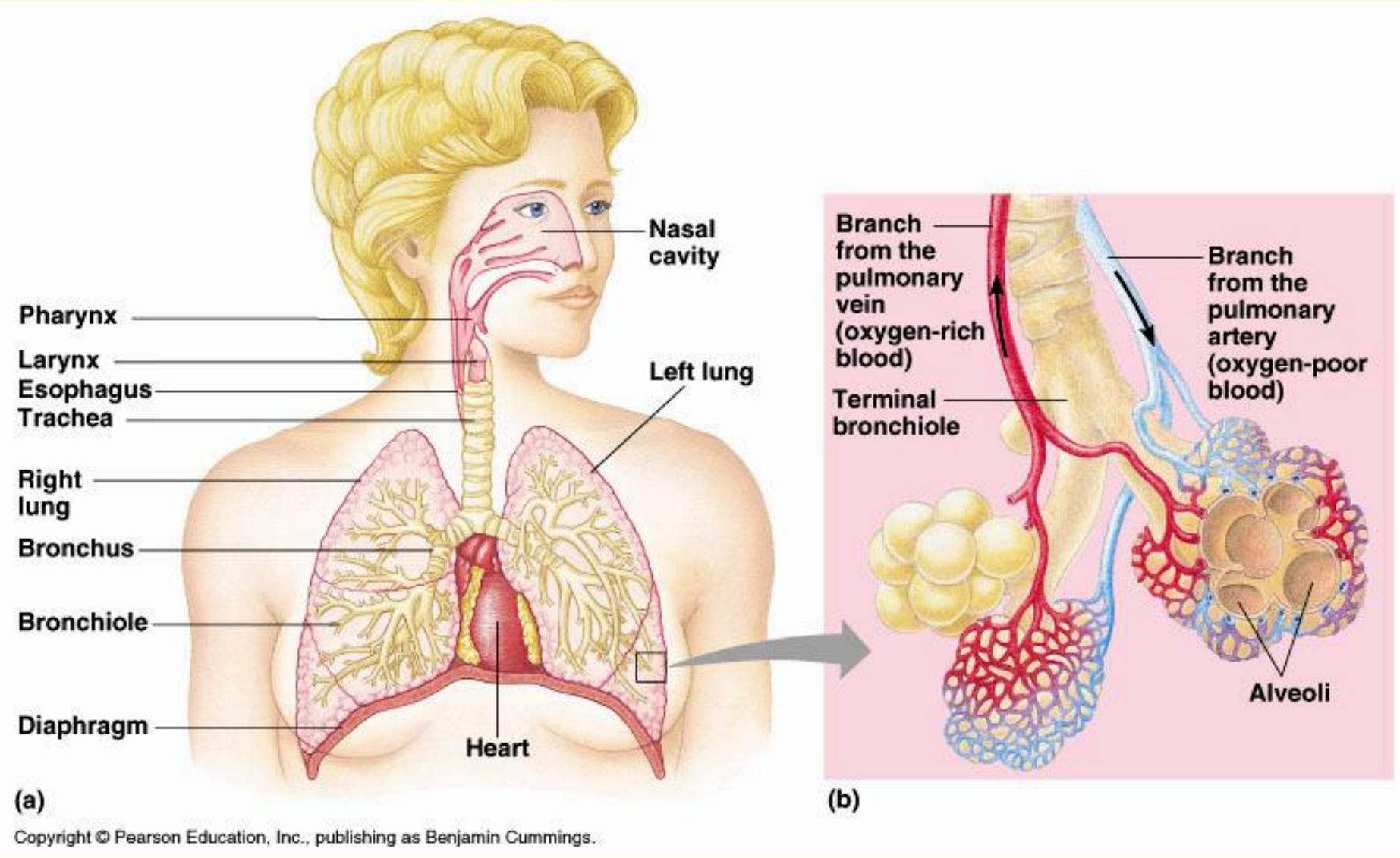


Transport System: provides for the circulation and distribution of materials to the cells.

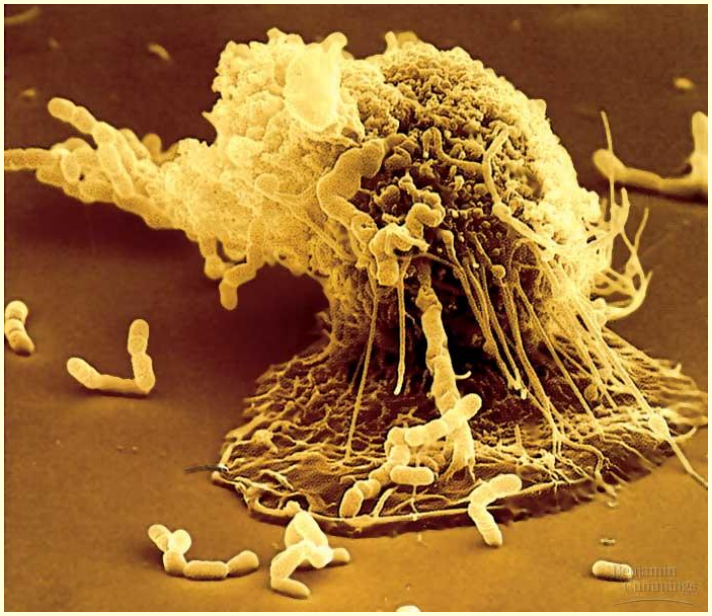


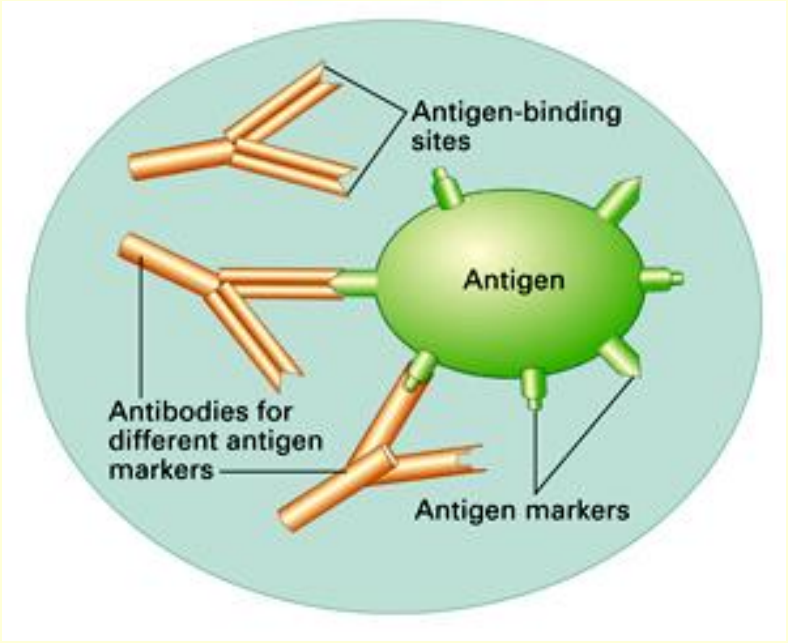


Respiratory System: provides for gas exchange to supply the cells with O_2 and removal of CO_2.

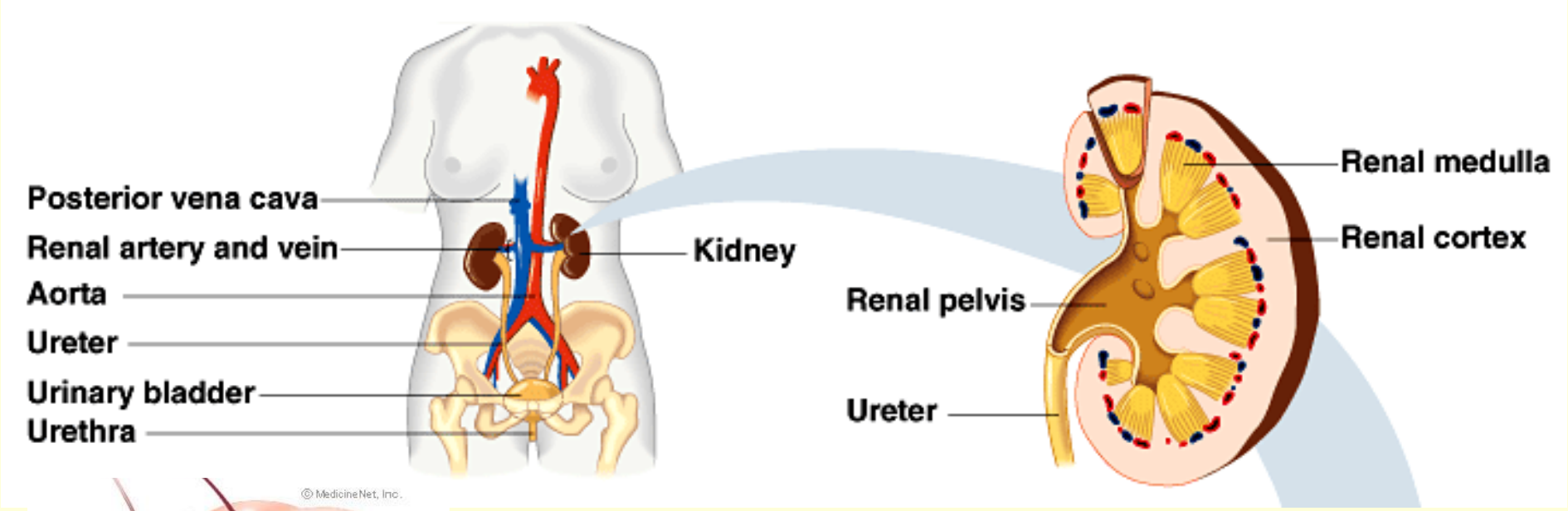


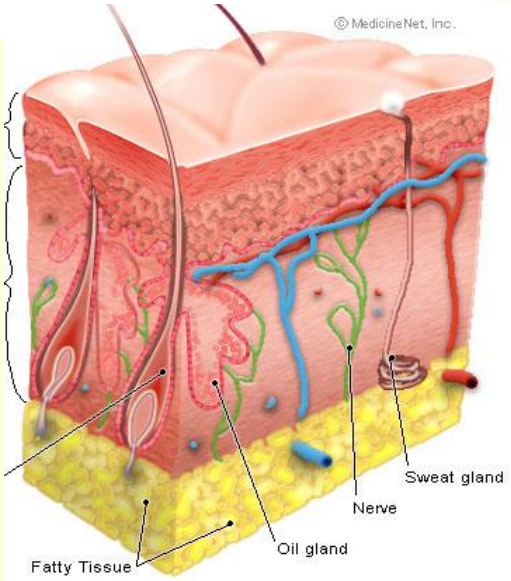
Immunity: provides for protection from pathogens



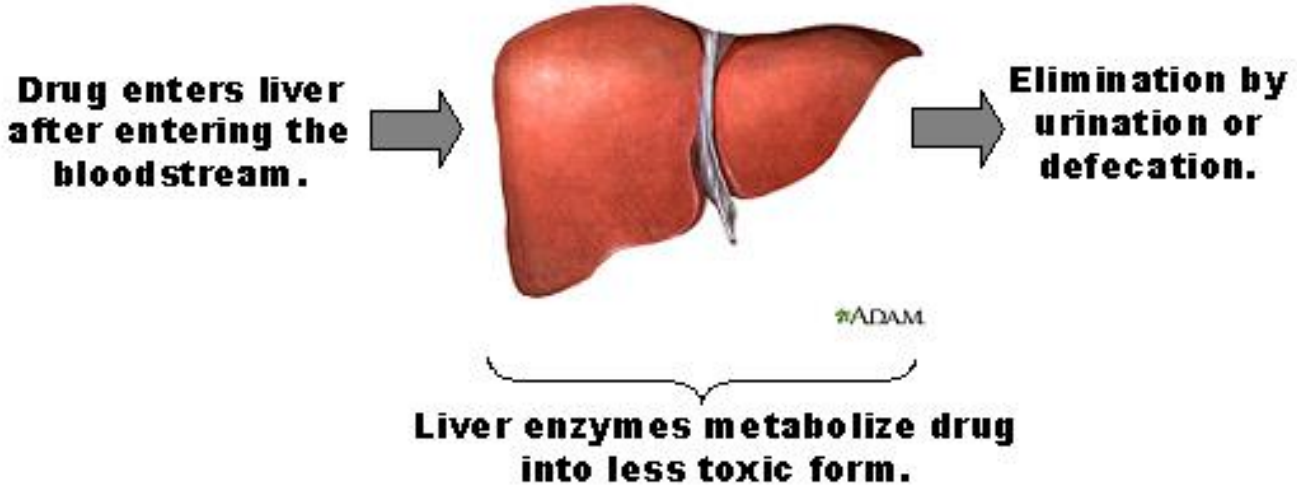


Excretion: provides for the elimination of metabolic wastes
Many organs help with excretion: Skin, kidneys, lungs, liver





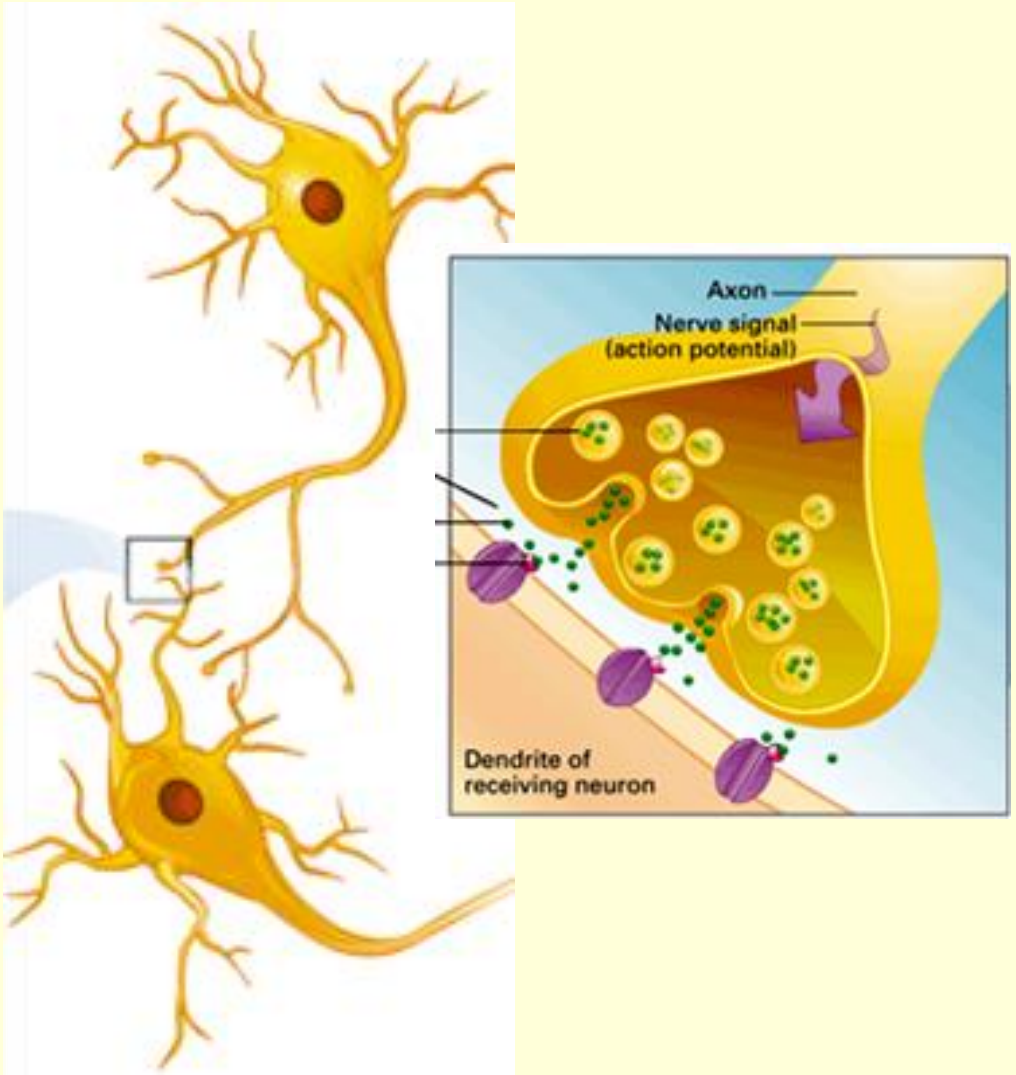
Normal Skin



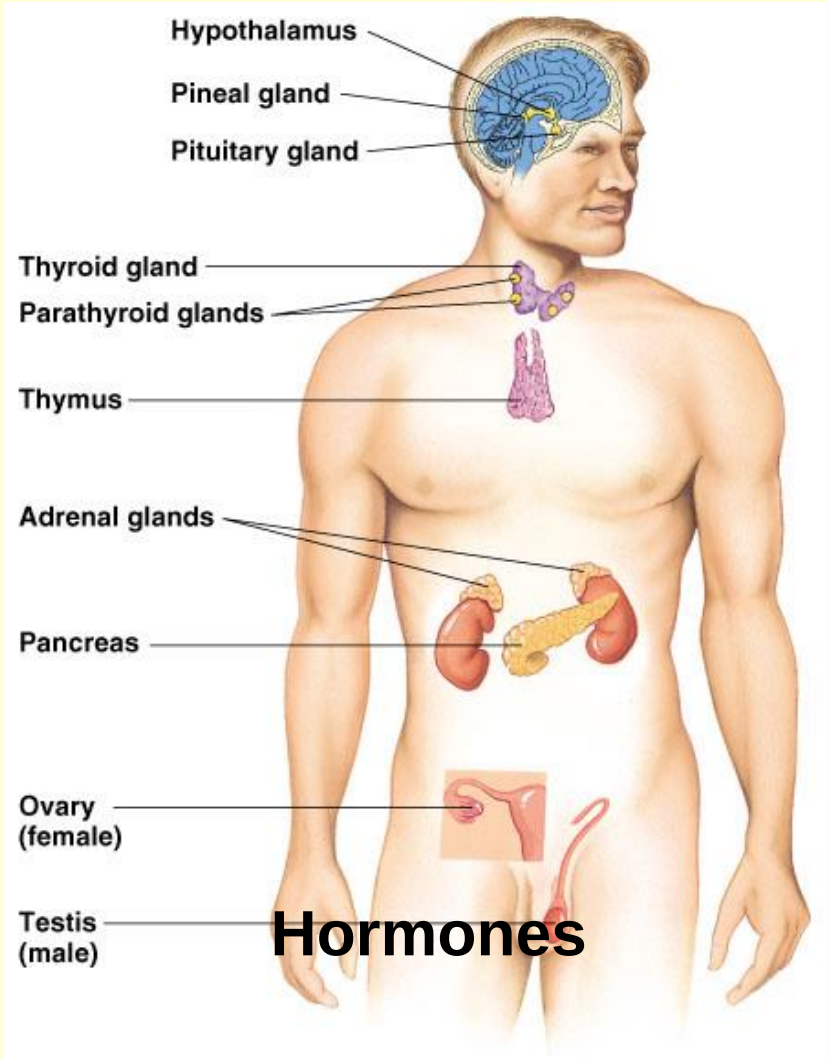
Coordination of the cells is provided by the regulatory systems of Nerves and Glands

Chemical regulating molecules are produced.

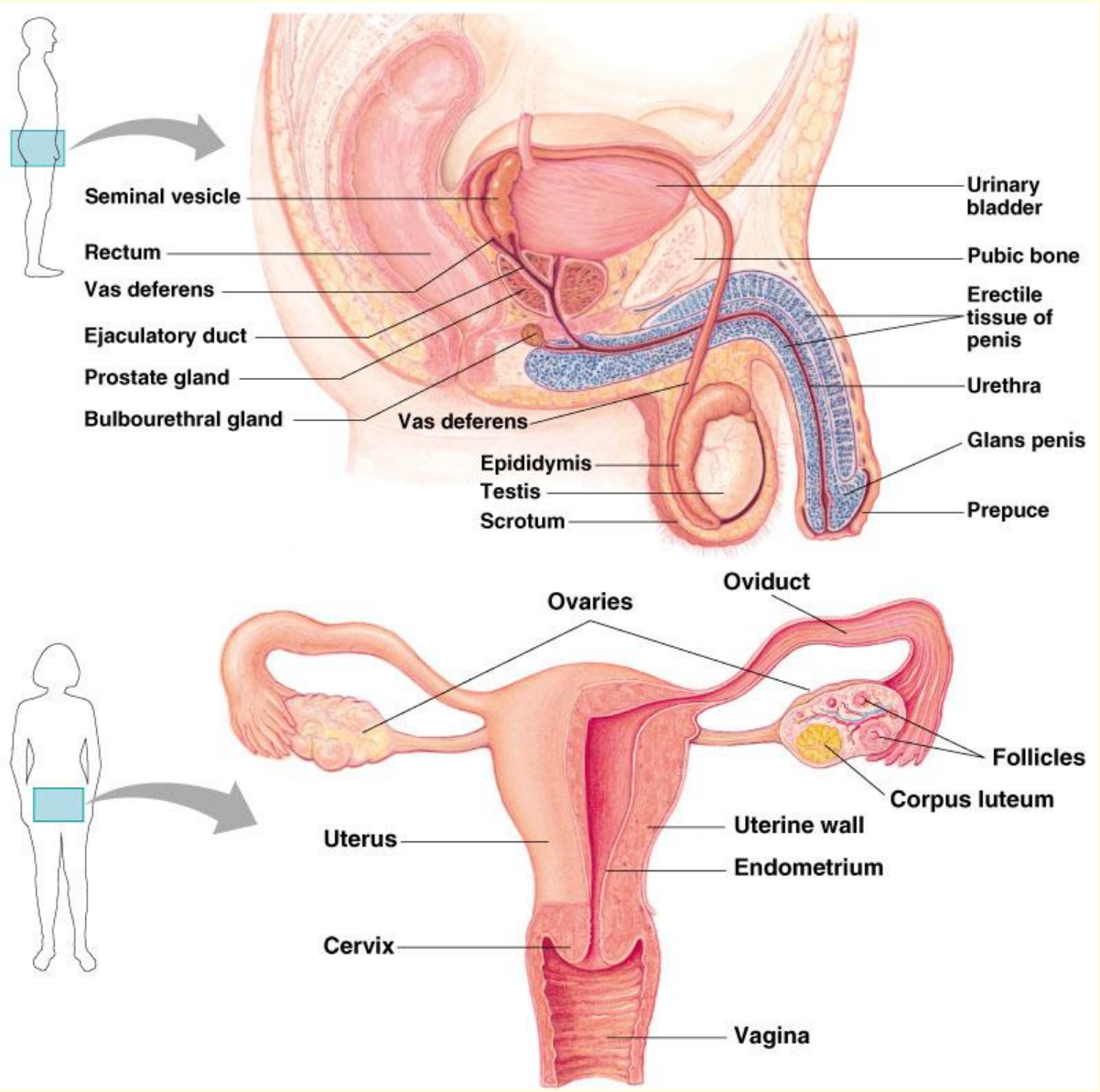
Nerves



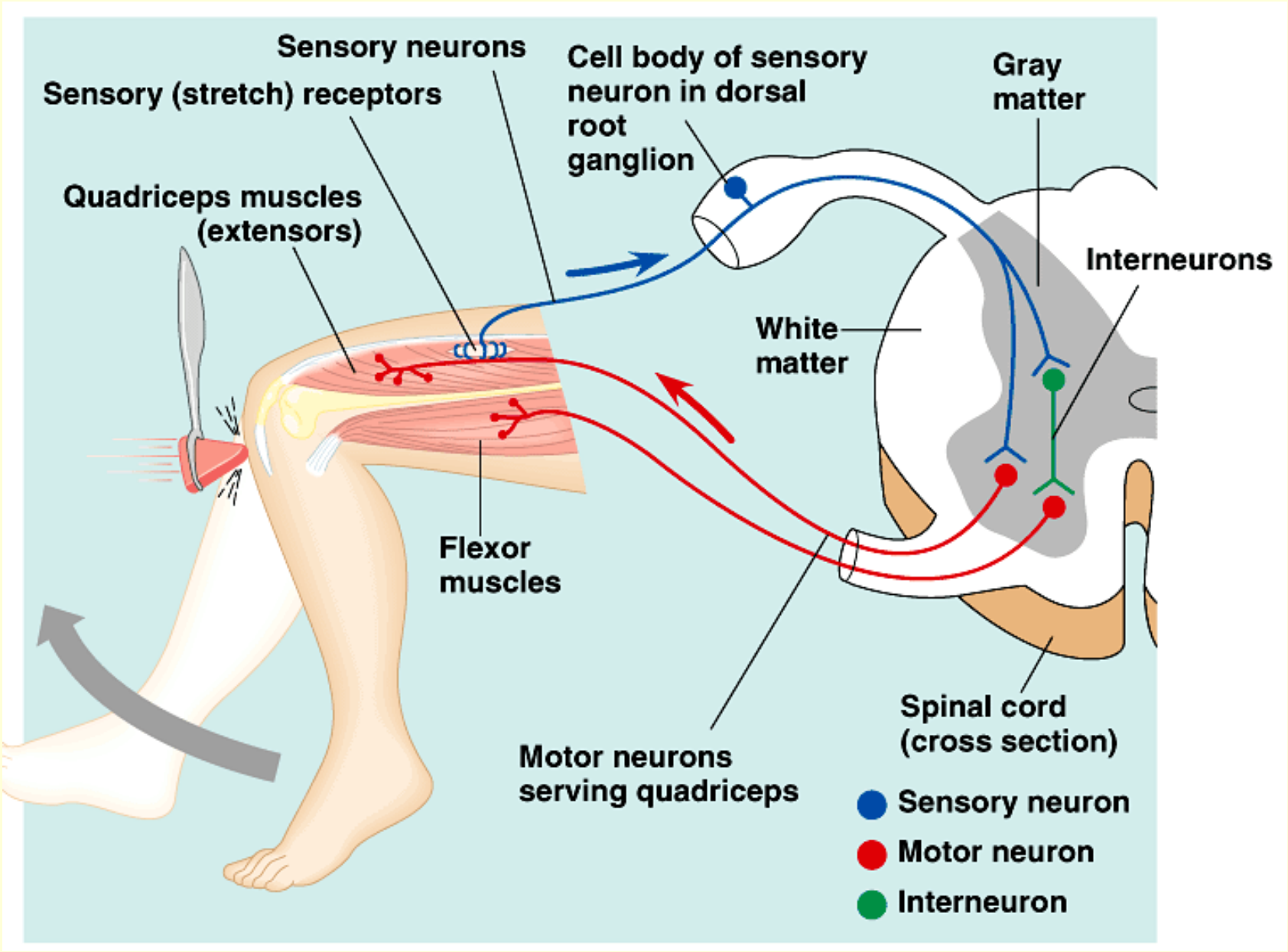
Endocrine System



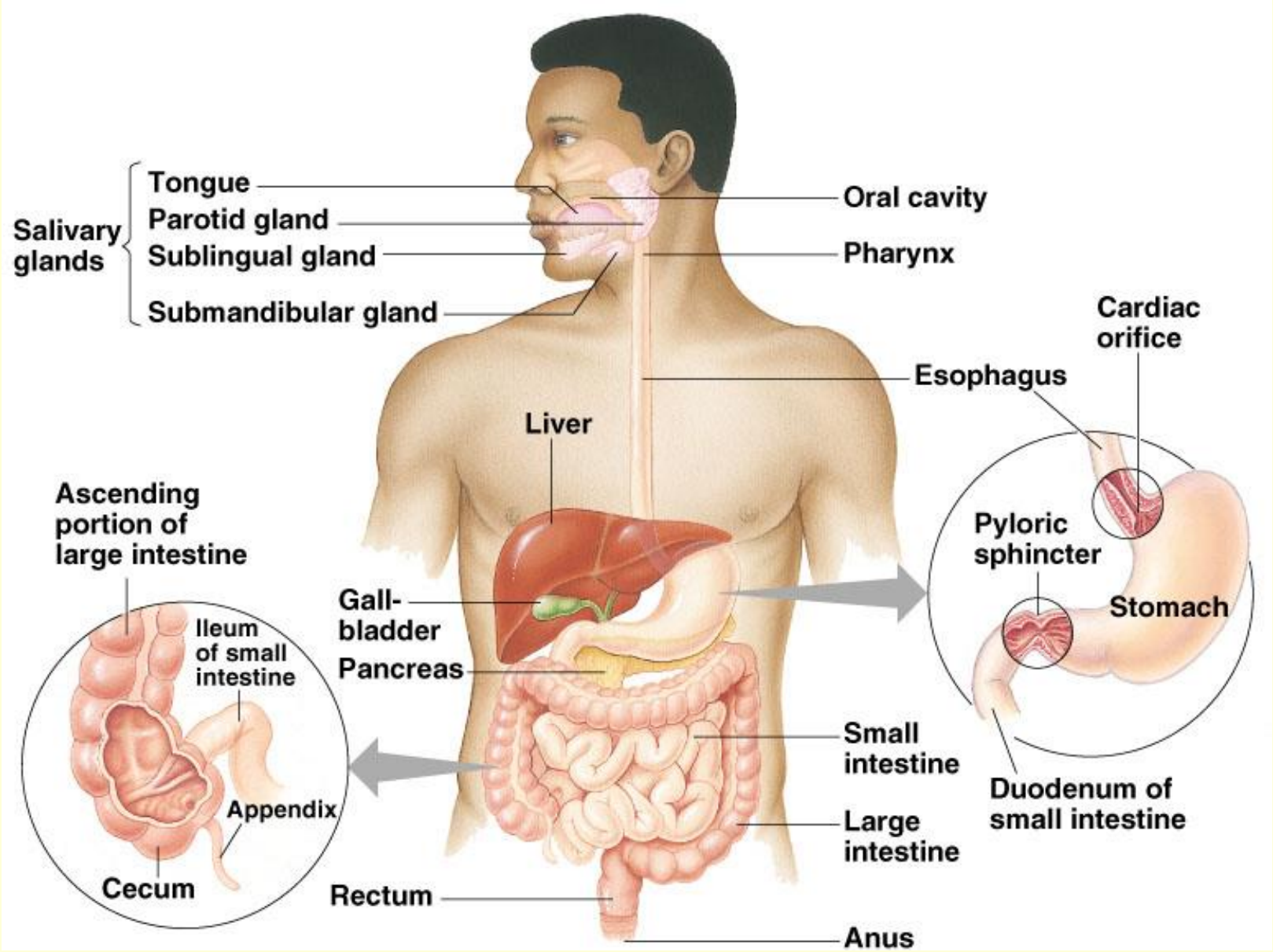
Reproduction: producing offspring is necessary for survival of the species



Movement is provided by a system of muscles and skeleton
Control is provided by the nervous system

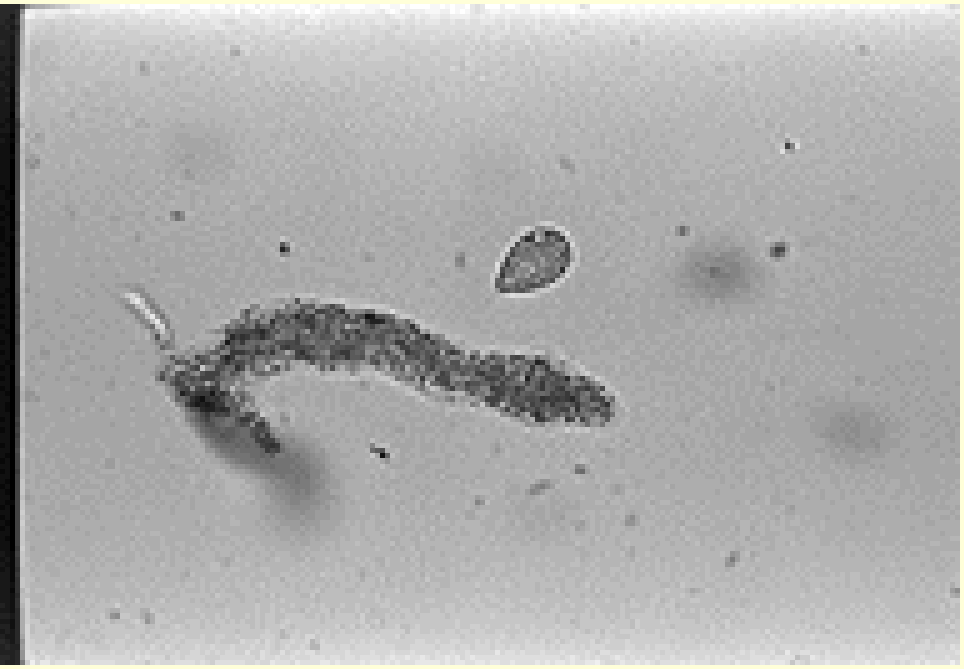


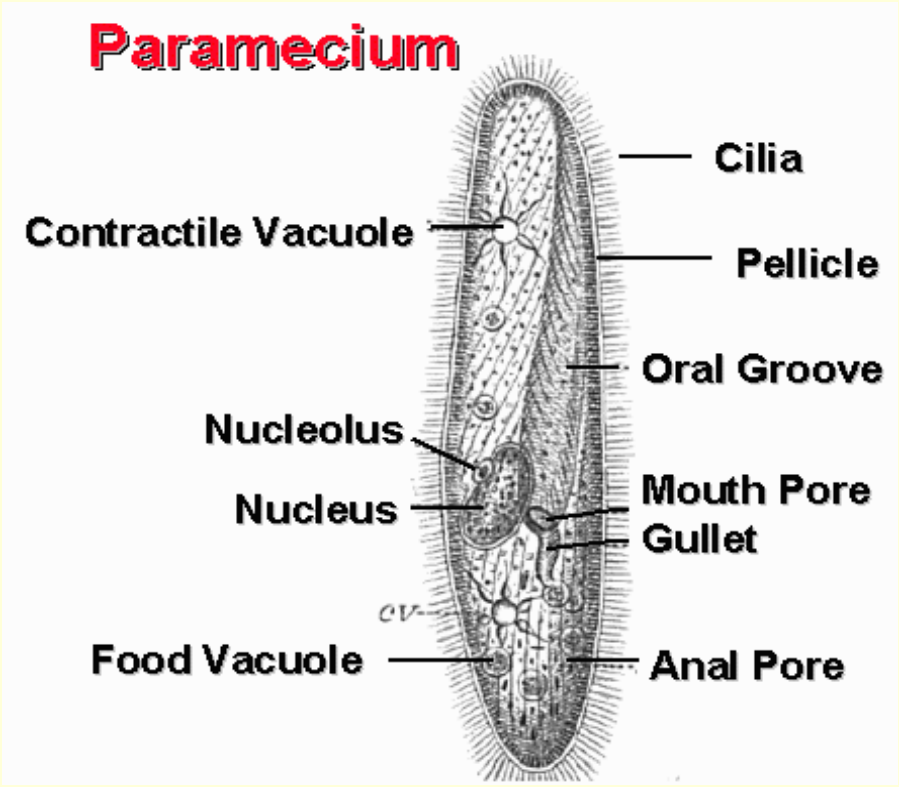
Digestive System: Consumption and digestion of food provides nutrients to the cells



One-celled organisms function without the levels of the organization in complex organisms.

Their organelles act like the systems in multicellular organisms.





Gas Exchange
Circulation
Digestion

Movement
Coordination
Excretion

?

One-celled organisms function without the levels of the organization in complex organisms.

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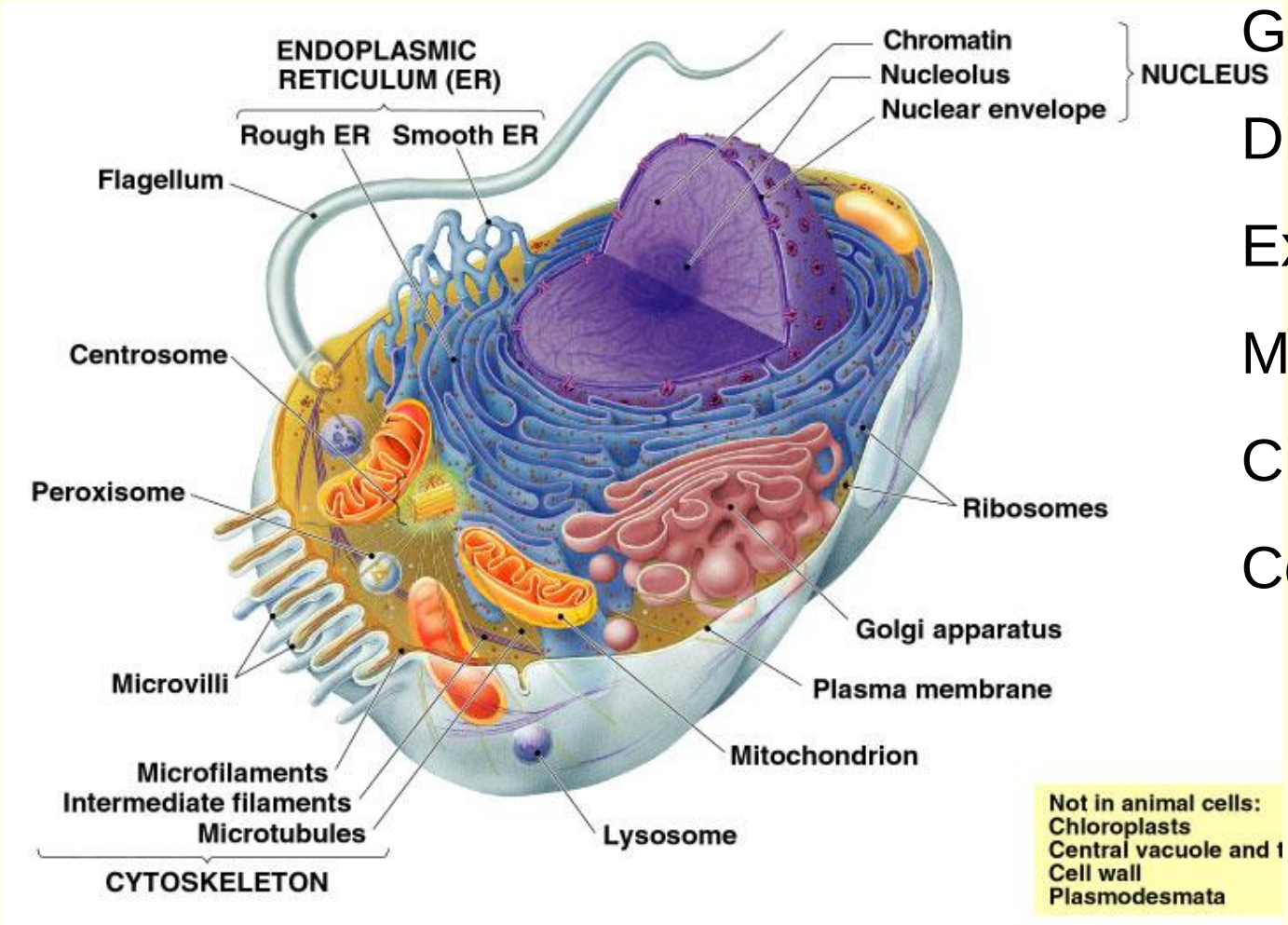


Gas Exchange

Digestion

Excretion

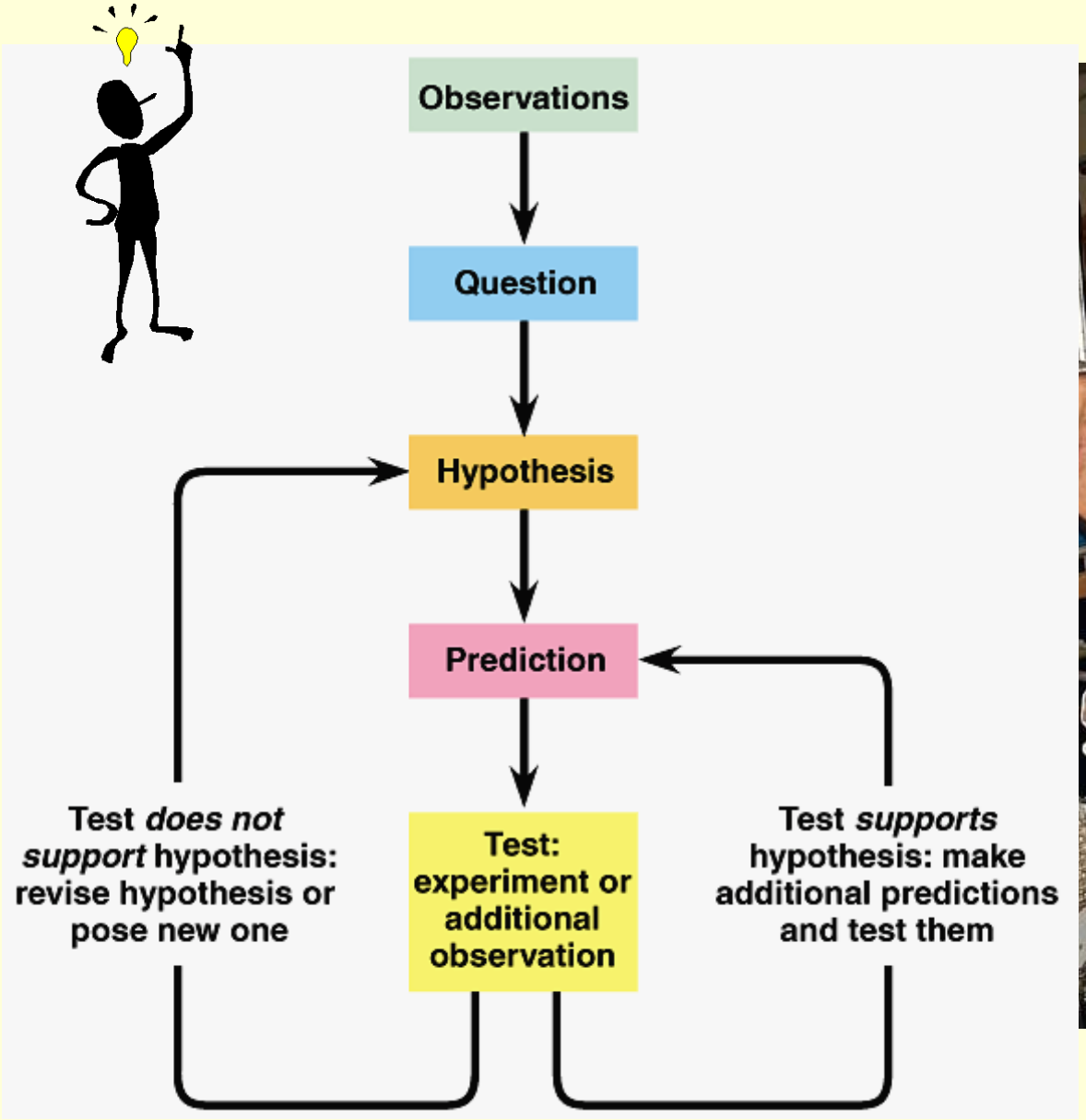
Movement

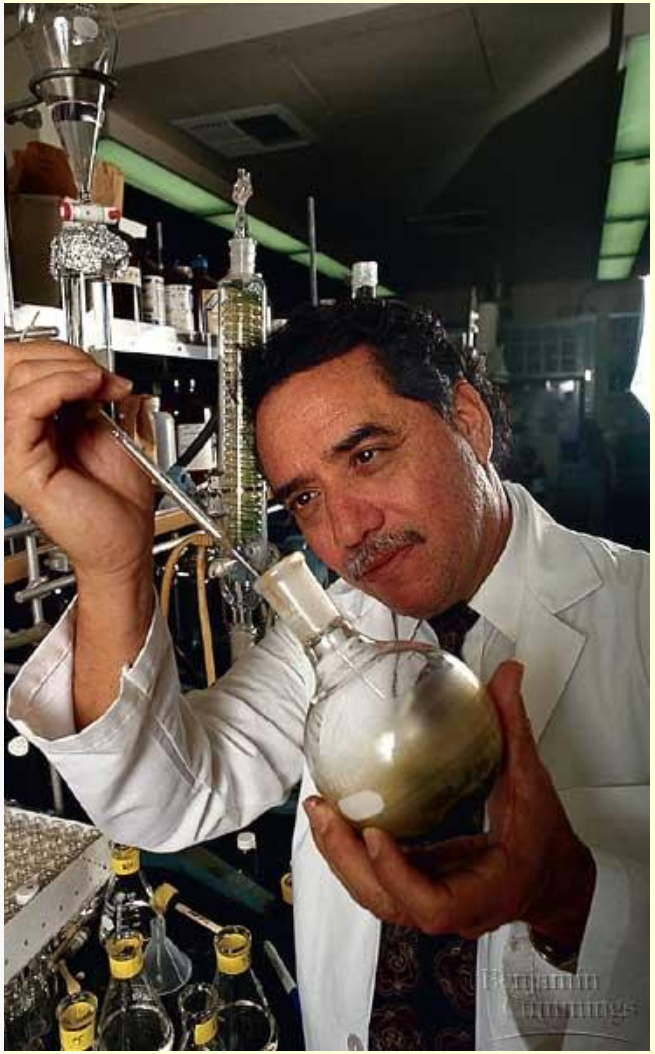
Circulation

Coordination

?

Science is a process of inquiry that includes repeatable observations and testable hypotheses





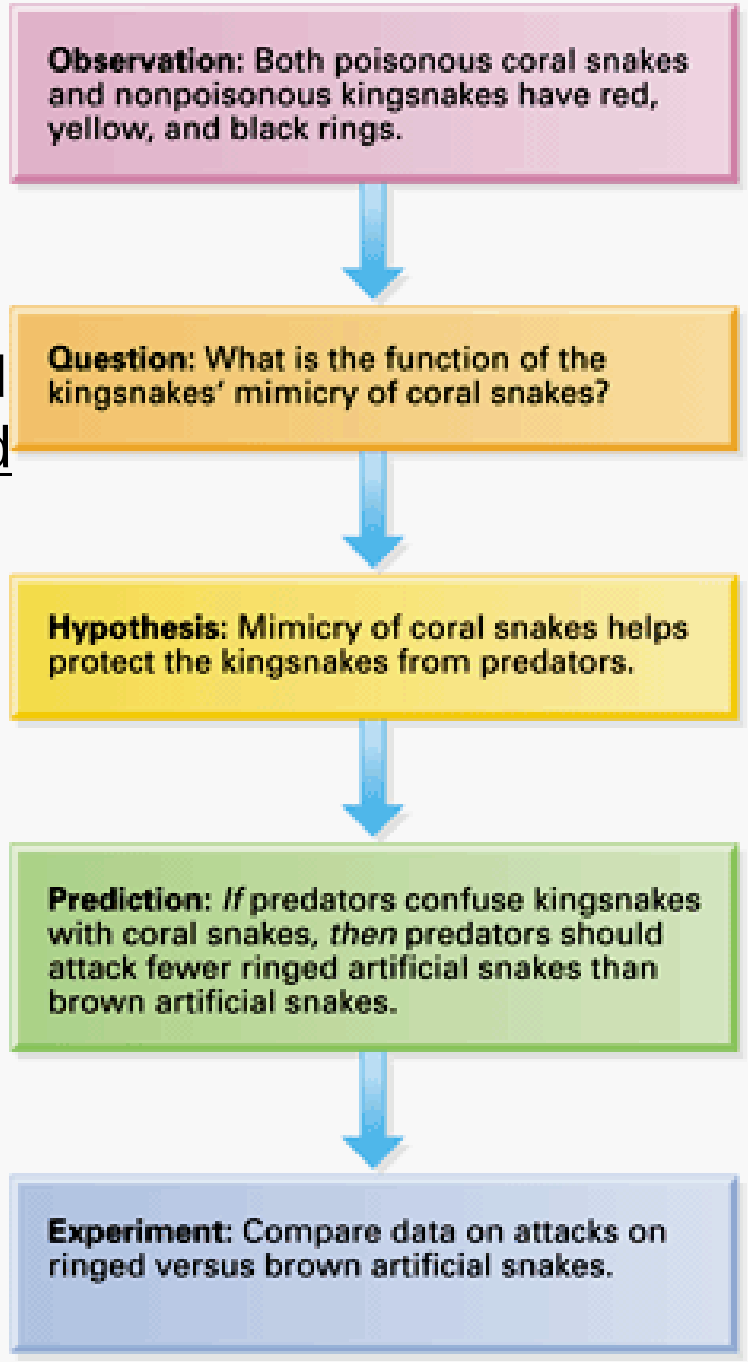
Designing a Controlled Experiment

- **Controlled experiment:** tests the effect of a single variable.

- **Variable:** any factor that can be changed
  - **Dependent variable** is the measured effect caused by the
  - **Independent variable** which is the factor being studied

- **Controlled Factors:** all other variables must be held constant.

- **Hypothesis: "If . . . , then . . ."**



Observations may lead to questions and hypothesis

Warning coloration: Why is this frog so colorful and visible?

Why does this fly look so much like a bee?

Data: is the measured results of the experiments

Growth Chart

Age (years)	Height (cm)
2.0	86
2.5	90
3.0	93
3.5	98
4.0	100
4.5	104
5.0	107
5.5	110
6.0	114

Data of height vs. age of a child's growth.

Independent Variable: Age

Dependent Variable: Height

Components of a Controlled Experiment

State a hypothesis

Identify the independent variable

Control all other factors

Identify the dependent variable

Identify or make a control group

Control all other factors

Collect and record data

Make data table and graphs

Verify results with repeats

Design an experiment to test the effectiveness of a particular cough drop.

Design an experiment to test if a new fertilizer increases plants to growth.