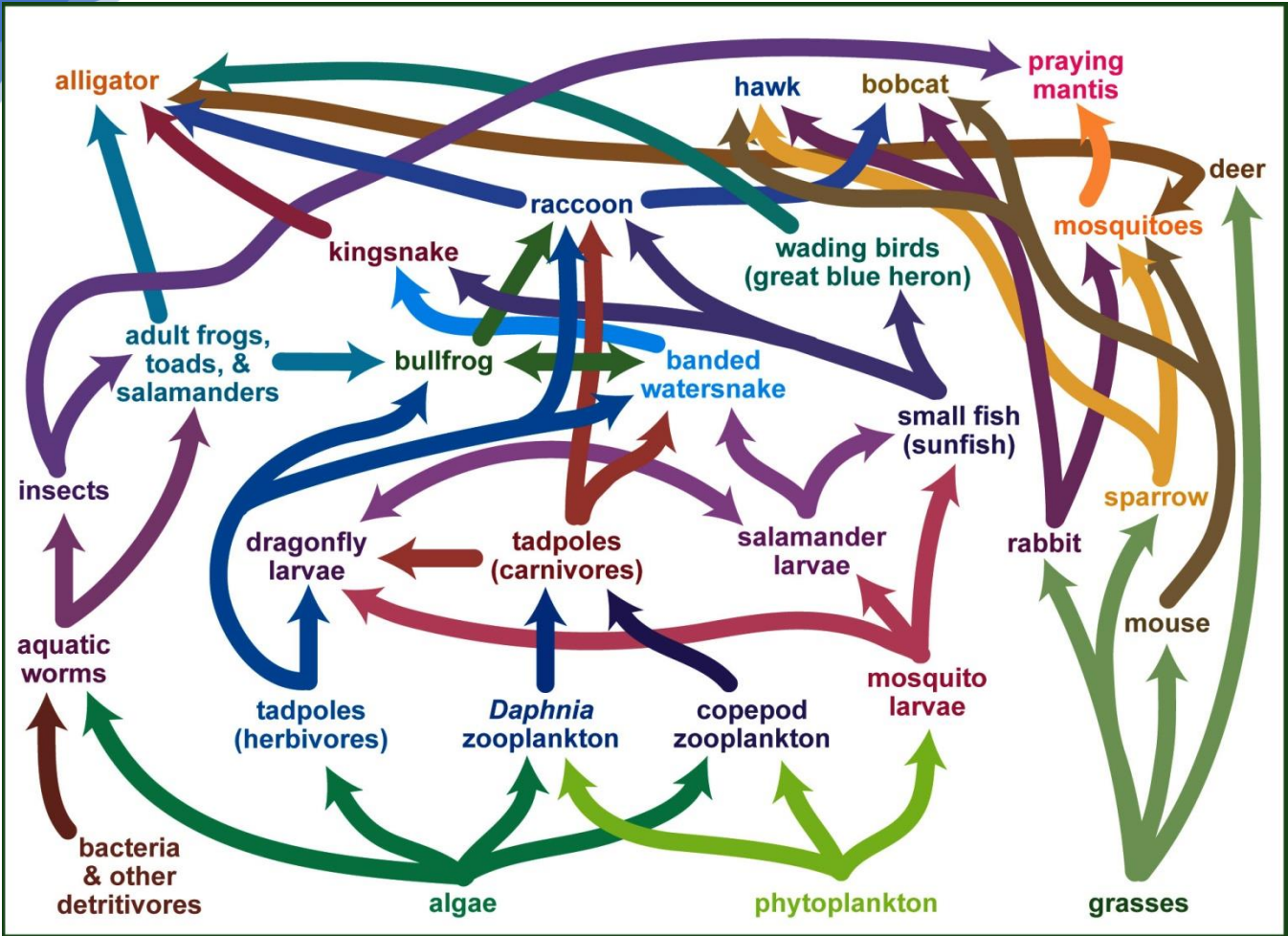
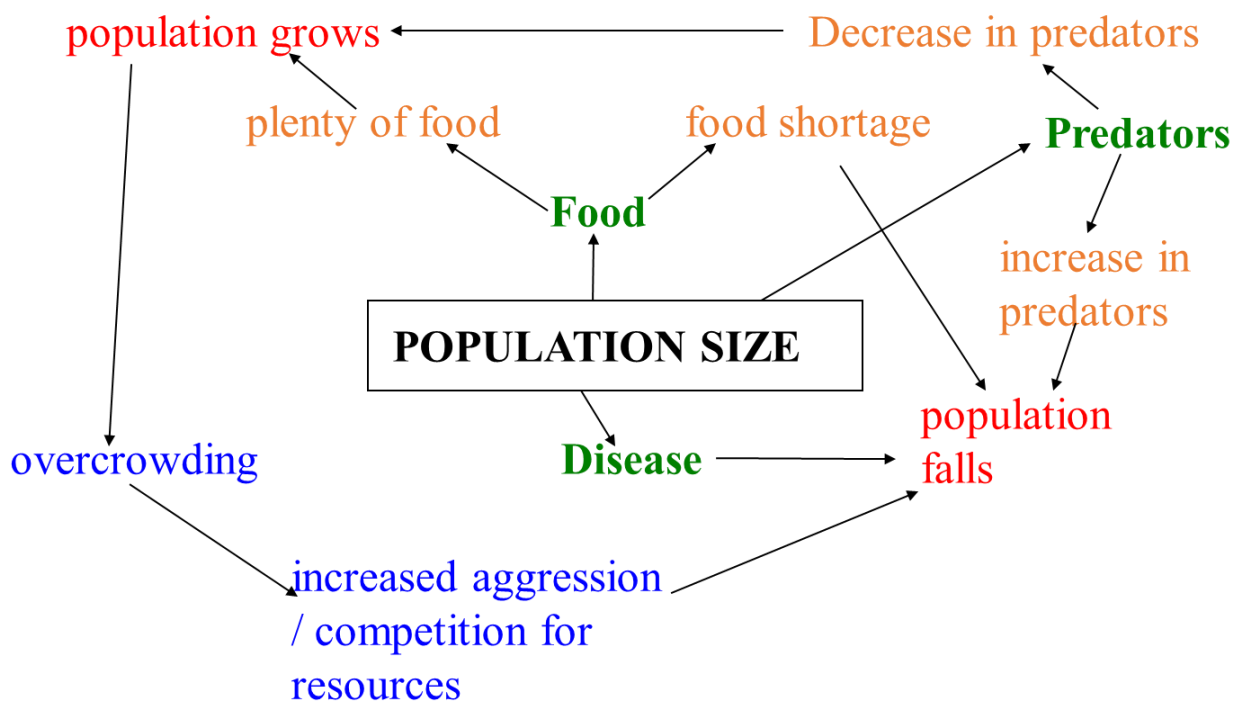




4. Population Size

To do: Draw a concept map of what effects the size of a population.

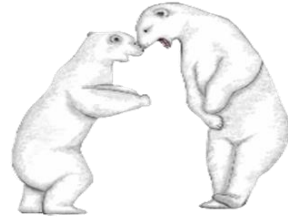
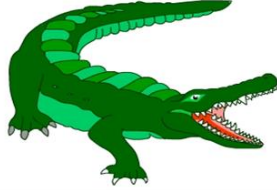


5. Animals that eat other animals

- Populations of animals are often limited by the amount of food.
- What are animals that eat other animals called?



predators



- What are the animals that predators eat called?



prey



To do: Define the words Predator and Prey and give an example of each.

Predator-prey interactions

- Mathematical models of predator-prey interactions by Lotka and Volterra suggest that exploitative interactions themselves can produce population cycles without any influences from outside forces such as weather.
- Predator-prey cycles have also been observed in a few laboratory populations under restricted circumstances.
- To persist in the face of exploitation, hosts and prey need refuges.
- The refuges that promote the persistence of hosts and prey include secure places to which the exploiter has limited access.
- However, living in large groups can be considered as a kind of refuge since it reduces the probability that an individual host or prey will be attacked.
- It appears that predator satiation is a defensive tactic used by a wide variety of organisms from rain forest trees to temperate insects.
- Growing to large size can also represent a kind of refuge when the prey species is faced by size-selective predators,
- Size is used as a refuge by prey species ranging from stream insects and intertidal invertebrates to rhinoceros.

Population control

- Predators and parasites have been used to control populations of insects that attack crops or to control invasive weeds.
- Recent research in Kenya has shown that a crayfish, *Procambarus clarkii*, controls the snails that act as intermediate hosts for *Schistosoma*, a highly pathogenic human parasite.

- Preliminary results indicate that crayfish successfully control host snails in the artificial impoundments used for livestock watering and domestic water, important sources of infection by *Schistosoma*.

92-Features of protists

Characteristics of Protists

- ✓ Eukaryotes
- ✓ unicellular

3 Main groups of protists;

- ✓ Protozoans
- ✓ algae
- ✓ fungus-like

1. Protozoans

Animal like protists

Protozoans - Animal like

Grouped by movement

- ✓ pseudopods
- ✓ cilia
- ✓ flagella
- ✓ parasites - no movement

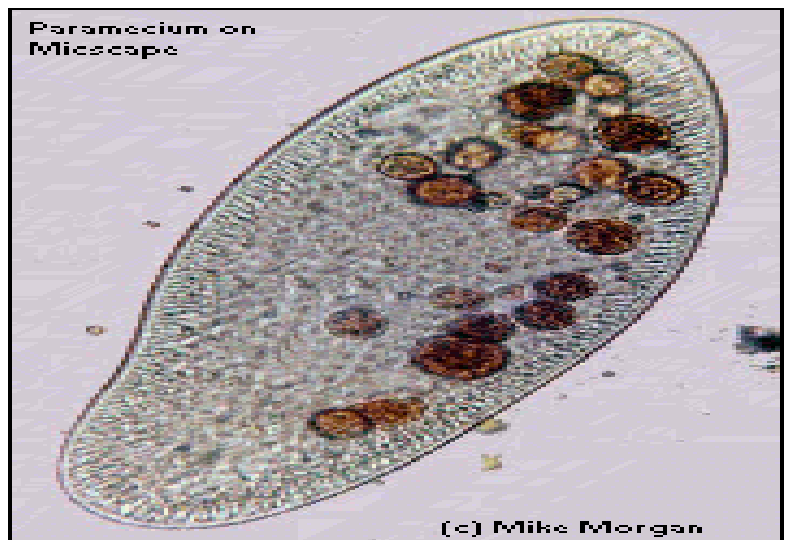
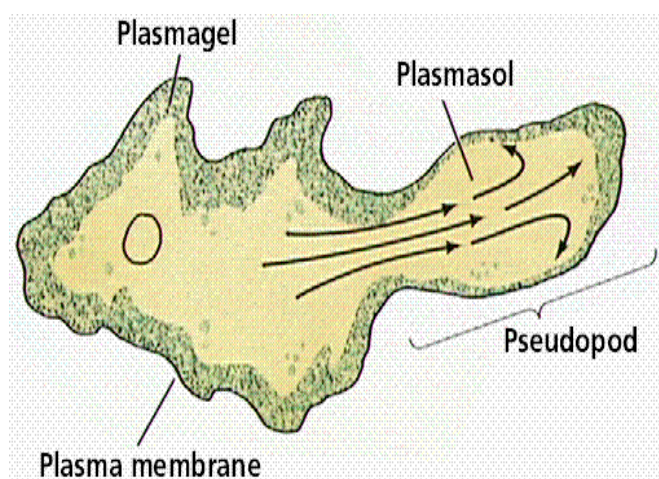
Protozoan Characteristics

- ✓ No cell wall
- ✓ Free-living or parasitic
- ✓ Consumers
- ✓ Habitat – aquatic (ponds, lakes, oceans)
- ✓ Examples: amoeba, paramecium, dinoflagellates

Example 1: Protozoans – amoebas

- Amoebas
 - shapeless, aquatic

Pseudopods in Amoebas



How Amoebas Eat ?

- feeding structures-

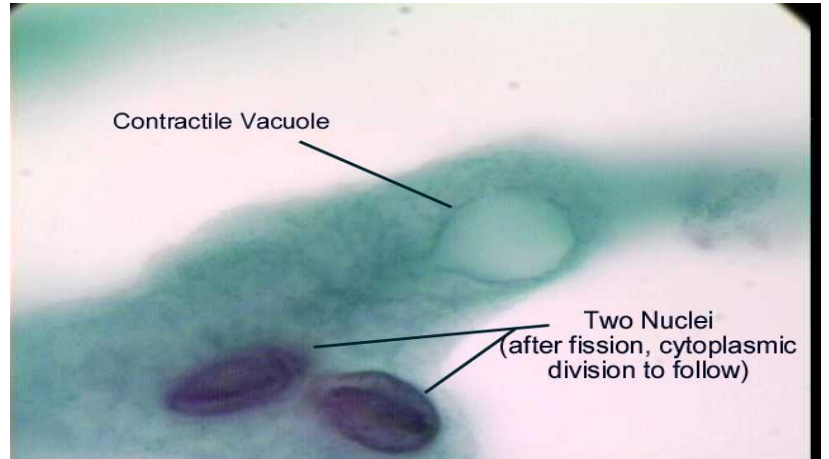
- food vacuole
- digestive enzymes
- diffusion

Getting Rid of Waste

- Contracting vacuole – collect excess water from inside the cell and gets rid of it.

Reproduction of Amoeba

- asexual reproduction
 - Binary fission



93-Groups of protists

Dysentery (an illness)

- Inflammation of the large intestine
- Diarrhea and vomiting
- Caused by an amoeba

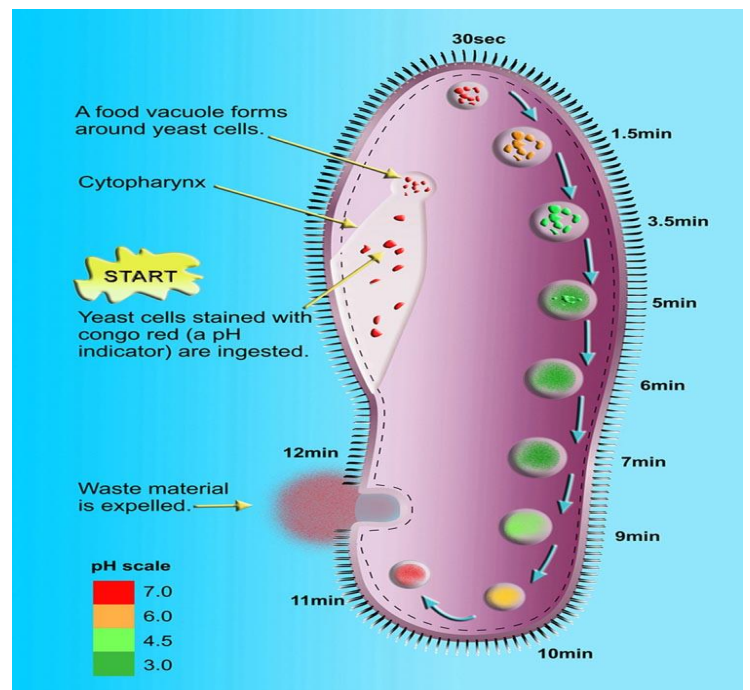
2. Example 2: Protozoans: Ciliates

- Locomotion - Cilia

1. Paramecium - fresh water ciliate

How do Paramecium eat?

- Feed on bacteria
 - Food enters oral groove,
 - moves to the food vacuole,
 - anal pore



Paramecium Reproduction

- **Asexual**- create identical organisms
- **Conjugation** - sexual reproduction
 - *exchange of genetic information*
 - *Not identical - adds diversity*



3. Example 3: Protozoans - Flagellates

- Locomotion - use flagella
- Examples:

2. Trypanosoma - causes African Sleeping Sickness

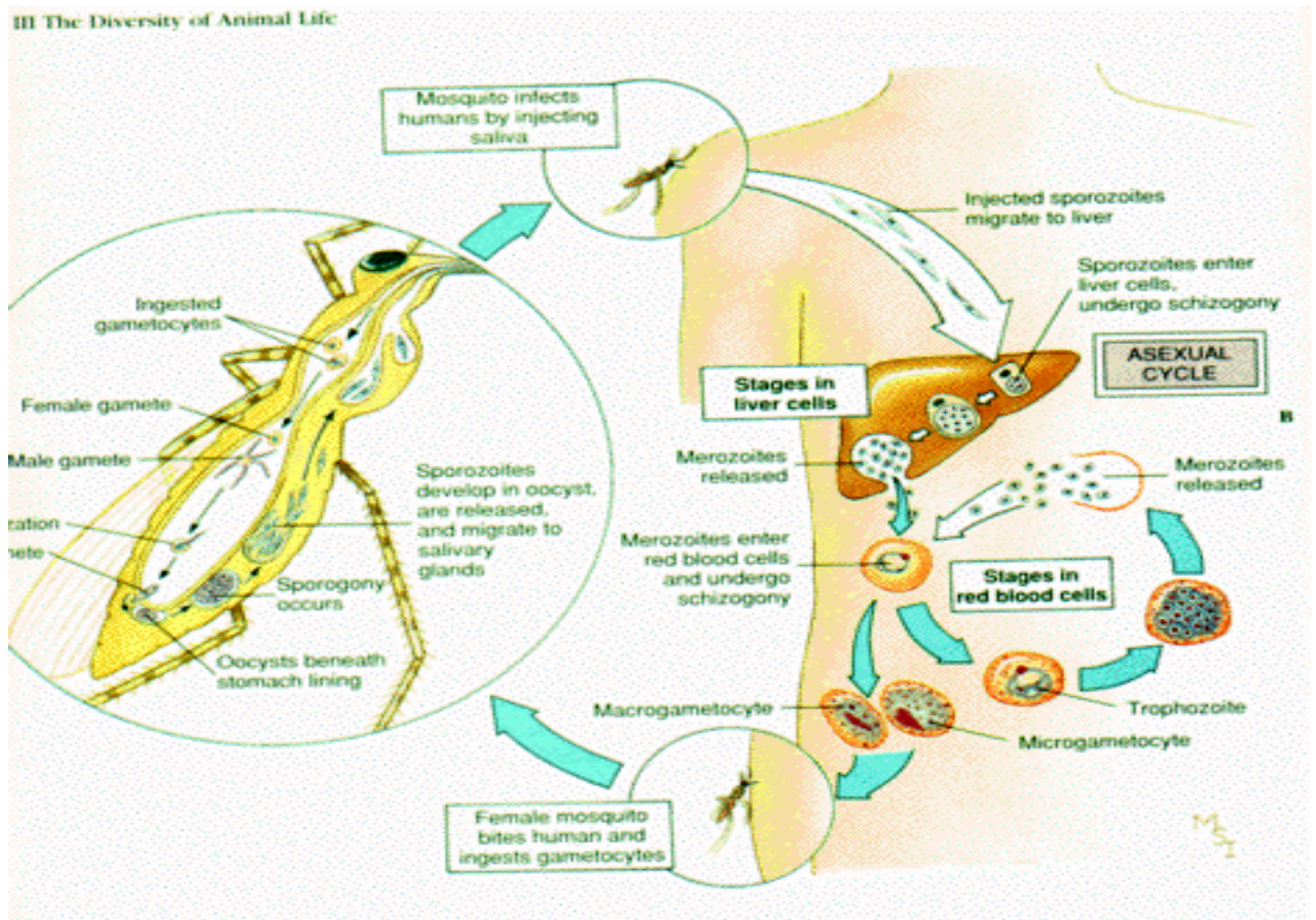
- spread by tsetse fly

4. Example 4: Protozoan - sporozoans

- Locomotion - parasitic
- reproduction
 - spores

Plasmodium - Causes [Malaria](#)

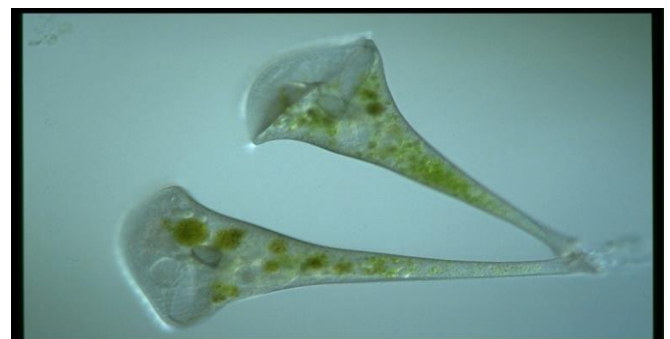
- Spread by mosquito
- Quinine – drug used to treat malaria



Vorticella

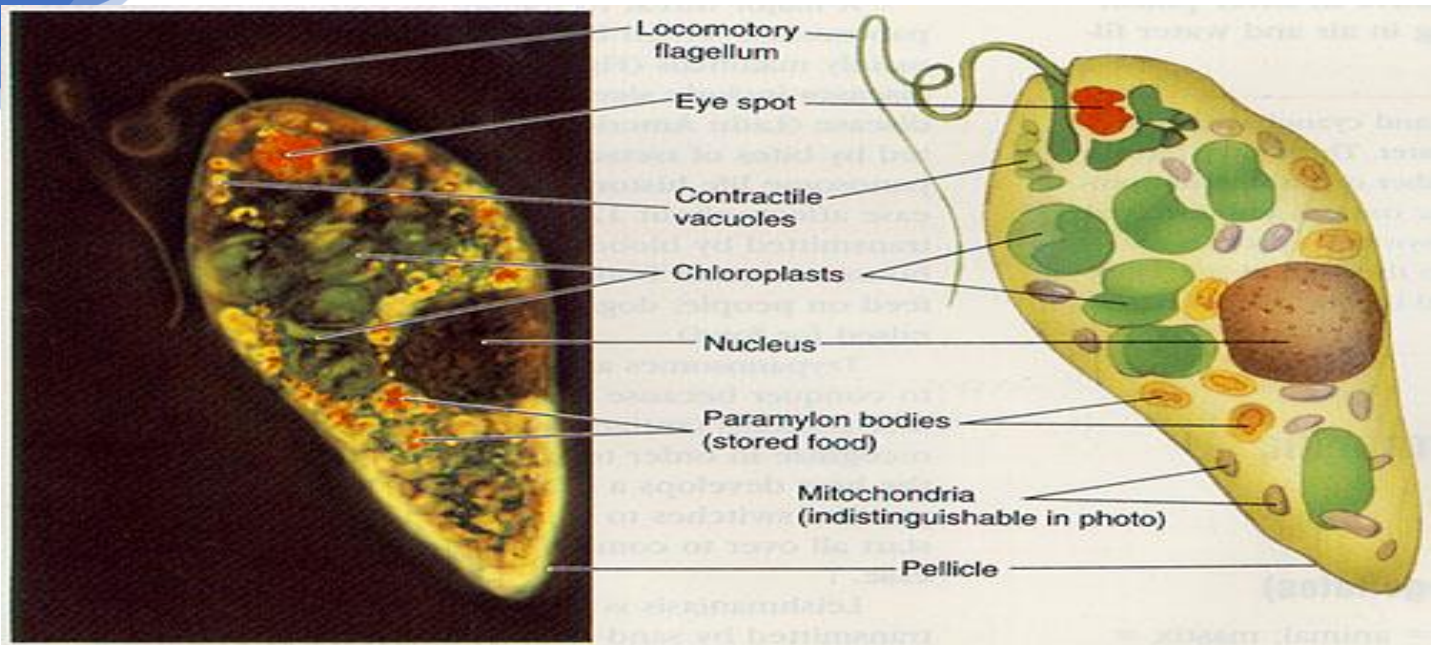
- Attaches to and spins its cilia to create a vortex (water movement)

Stentor



94-Groups of protists

- Both plant-like and animal-like



Euglenoids

- - contain chlorophyll
- - move by flagella
- - Euglena (unique)-
 - eyespot,
 - chloroplast,
 - flagellum

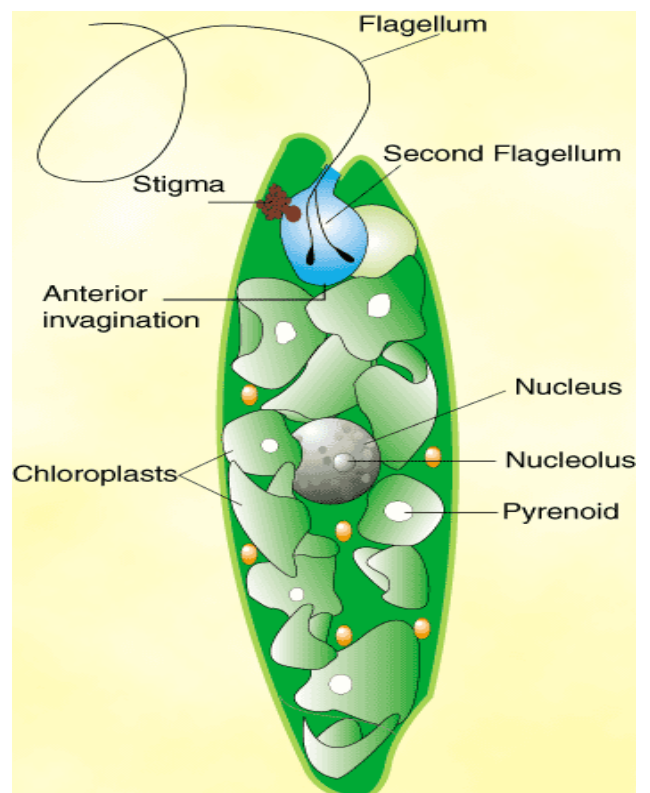
Algae

Plant like protists

B. Algae - plant-like

- Photosynthetic
- Multi-cellular and unicellular
- Classified by pigments (Types of Algae)
 - red
 - brown
 - Green+
 - Examples; Volvox, diatoms, spirogyra

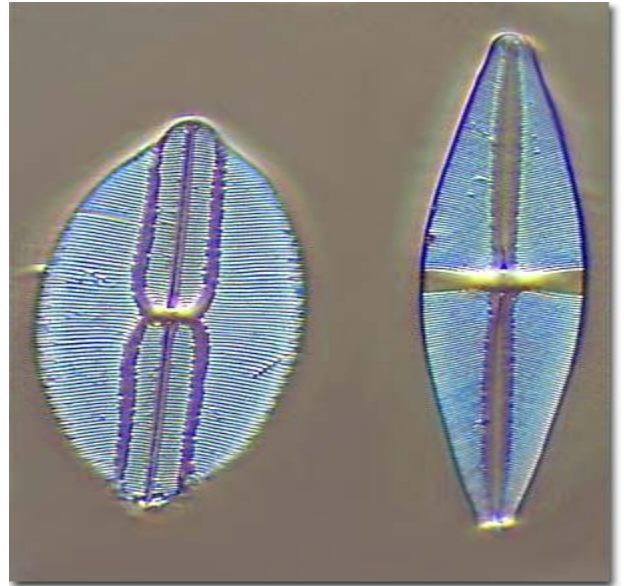
1. Diatoms



- - float in water
- - photosynthesis
- - unicellular
- - silica shells
- Commercial value: Insulating materials, Abrasives , Ceramics, Filtering

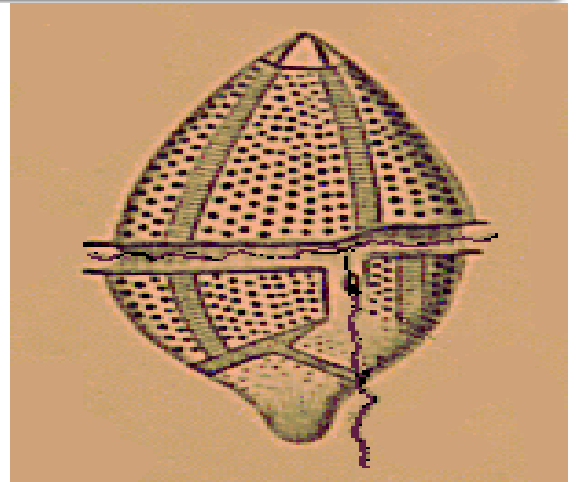
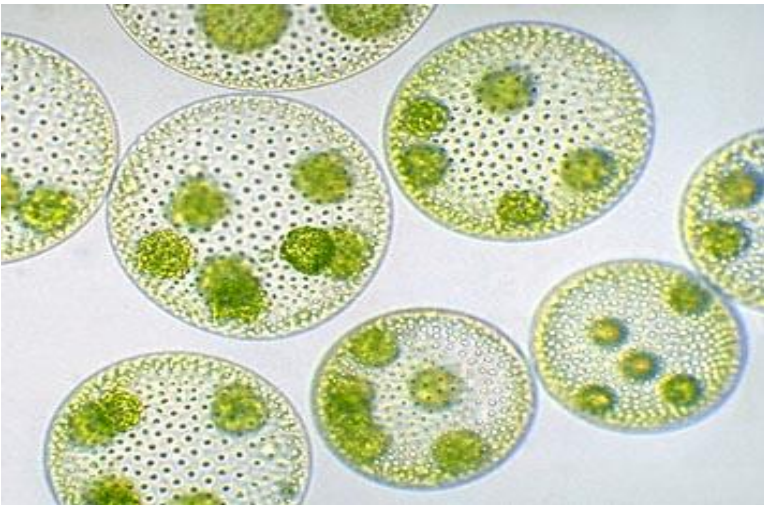
2. Dinoflagellates

- - move by two flagella
- - autotrophs
- - green glow and red tides

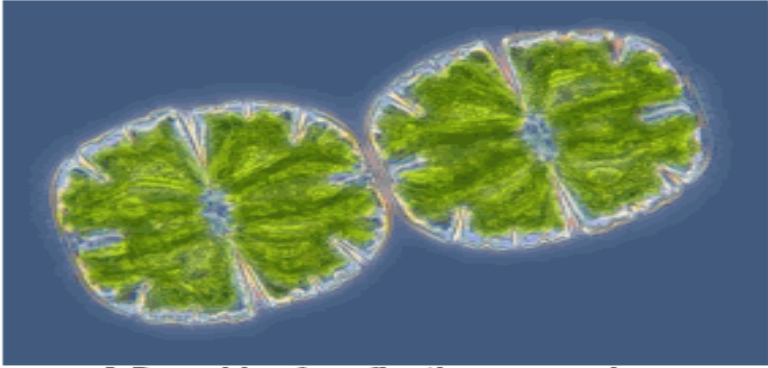


3. Green Algae (Lab 37)

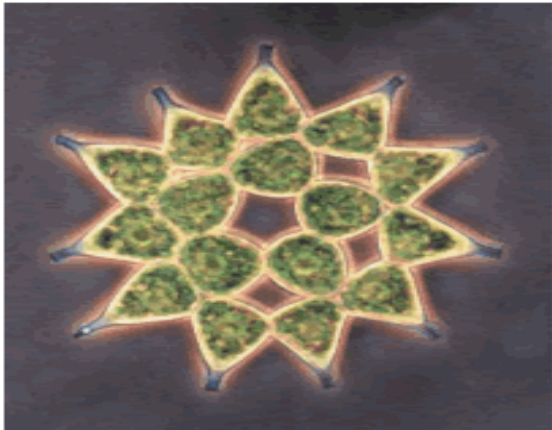
- Most freshwater
- Food Source – called Plankton
- Some are:
 - Free-living
 - Colony
 - filament



Free-Floating –



A Desmid: a free-floating green alga



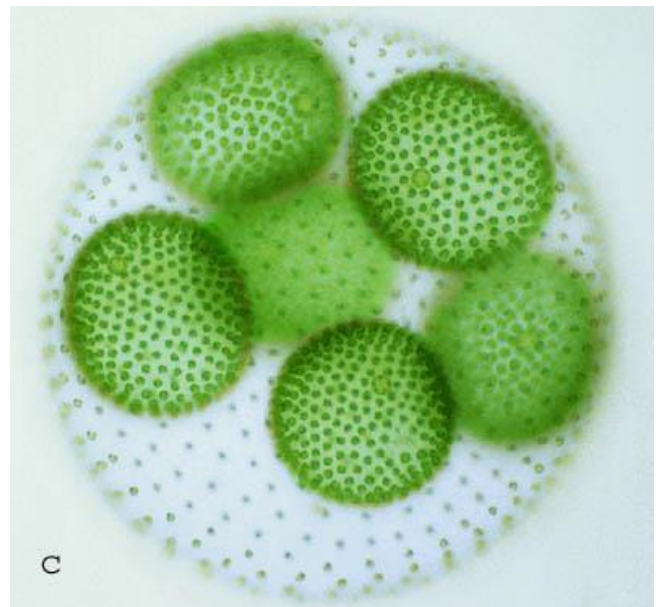
Green alga -*Pediatrum*

- Filament type – exist as a thread

Colony –

Label and Draw

- ✓ Ulothrix
- ✓ Zygnema
- ✓ Spirogyra
- ✓ Hydrodictyon
- ✓ Peridinium
- ✓ chlamydomonas



95-Features of protists

Red and Brown Algae

- ✓ All multicellular
- ✓ Marine
- ✓ Kelp – a form of brown algae
- ✓ Red algae – used in food.

Fungus Protists

Slime Molds

- - plasmodium- visible slime mass
- - moves
- - no cell membrane

- - many nuclei
- - grow on damp organic matter - decompose
- - form a stalk, release spores
- - Reproduce - asexual reproduction, making spores

Fungus Like Protists

- Classified by how they reproduce
 - slime molds
 - mold and mildew - disease causing

Mildew and Water Molds

- - fuzzy growths
- - found on bathroom tiles
- - live off of dead material
- - potato famine- 2 million people died in Ireland
- - caused immigration to the United States

Origins and Importance of Protists

- Green algae

Importance of :

- green algae - oxygen source
- food source -
 - plankton
 - zooplankton
 - phytoplankton

96-Food Webs

- A food web summarizes the feeding relations in a community.
- The earliest work on food webs concentrated on simplified communities in areas such as the Arctic islands.
- However, researchers such as Charles Elton (1927) soon found that even these so-called simple communities included very complex feeding relations.
- The level of food web complexity increased substantially, however, as researchers began to study complex communities.
- Studies of the food webs of tropical freshwater fish communities revealed highly complex networks of trophic interaction that persisted even in the face of various simplifications.
- A focus on strong interactions can simplify food web structure and identify those interactions responsible for most of the energy flow in communities.

97-Food web and structure of communities

- Manipulative studies of predaceous species have identified many keystone species, including starfish and snails in the marine intertidal zone and fish in rivers.
- On land, birds exert substantial influences on communities of their arthropod prey.

Jane Lubchenko (1978)

- Jane Lubchenko (1978) demonstrated that the influence of consumers on community structure depends upon their feeding preferences, their local population density, and the relative competitive abilities of prey species.
- Keystone species are those that, despite low biomass, exert strong effects on the structure of the communities they inhabit.

Exotic predators and the structure of food webs

- Exotic predators can collapse and simplify the structure of food webs.
- Introduced fishes have devastated the native fishes of Lake Atitlan and Gatun Lake in Central America.

Examples

- The influence of the Nile perch on the fish community of Lake Victoria is tangled with massive changes in the lake's ecosystem.
- Introduction of the Nile perch is rapidly reducing the species-rich fish fauna of Lake Victoria to a community dominated by a handful of species.

Humans

- Humans have acted as keystone species in communities. People have long manipulated food webs both as a consequence of their own feeding activities and by introducing or deleting species from existing food webs.
- In addition, many of these manipulations have been focused on keystone species.
- Hunters in tropical rain forests have been responsible for removing keystone animal species from large areas of the rain forests of Central and South America. Chinese farmers have used ants as keystone predators to control pests in citrus orchards for over 1,700 years.

98-Foundation and keystone species

- Some species have unusually strong impacts on community structure, preserving the balance of the community or even making its existence possible.
- These "special" species include foundation and keystone species.

Foundation species

- A foundation species plays a unique, essential role in creating and defining a community. Often, foundation species act by modifying the environment so that it can support the other organisms that form the community
- Kelp (brown algae) is a foundation species that forms the basis of the kelp forests off the coast of California. Kelps create environments that allow the survival of other organisms that make up the kelp forest community.
- The corals of a coral reef are another foundation species.
- The exoskeletons of living and dead coral make up most of the reef structure, which protects other species from waves and ocean currents. Beavers, which modify their environment by building dams, can also be seen as a foundation species.

Keystone species

- A **keystone species** is a species that has a disproportionately large effect on community structure relative to its biomass or abundance.
- Keystone species differ from foundation species in two main ways: they are more likely to belong to higher trophic levels (to be top predators), and they act in more diverse ways than foundation species, which tend to modify their environment.
- Different sources use different definitions for keystone and foundation species. In some sources, foundation species are viewed as a subcategory of keystone species.

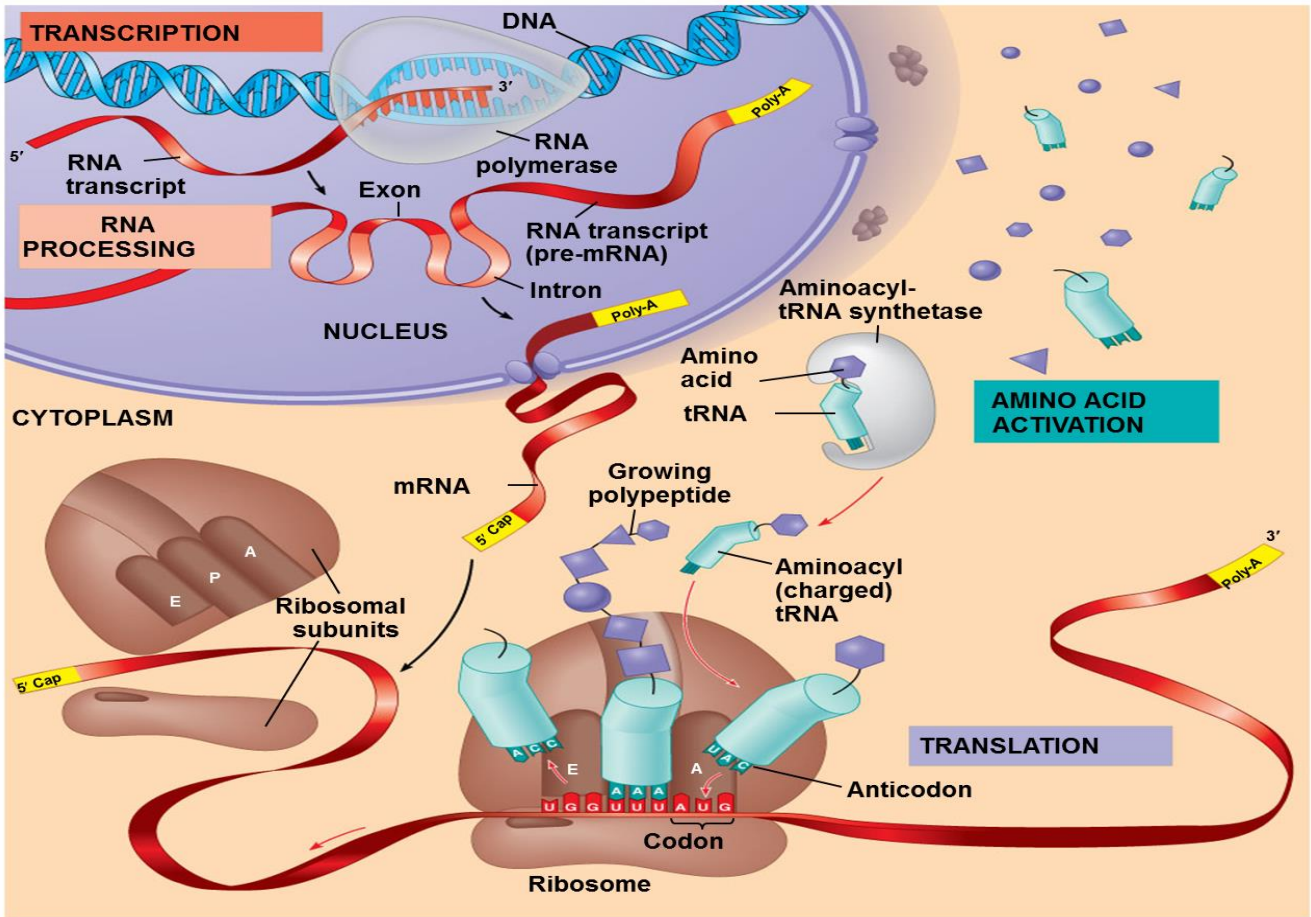
99-From gene product to gene

In some cases the primary structure of a gene product (a protein) may be the starting point of gene discovery. This holds especially for proteins that can be isolated relatively easily by some marker or bioassay, or proteins that are highly induced by some experimental treatment.

- Working backwards from protein structure to gene characterization is very laborious and may only be applicable in cases where ecological functions can be associated a priori with a suspected protein
- The laborious Edman Degradation Technique has now been replaced mostly by sequencing using mass spectrometry, in which masses are estimated for peptides generated from proteolytic digests of the protein, while the fragment pattern obtained is compared with entries in a database that include sizes predicted from the genomic sequence.
- Working backwards from protein structure to gene characterization, and in some ecological applications this may be the only way to begin genomic explorations.

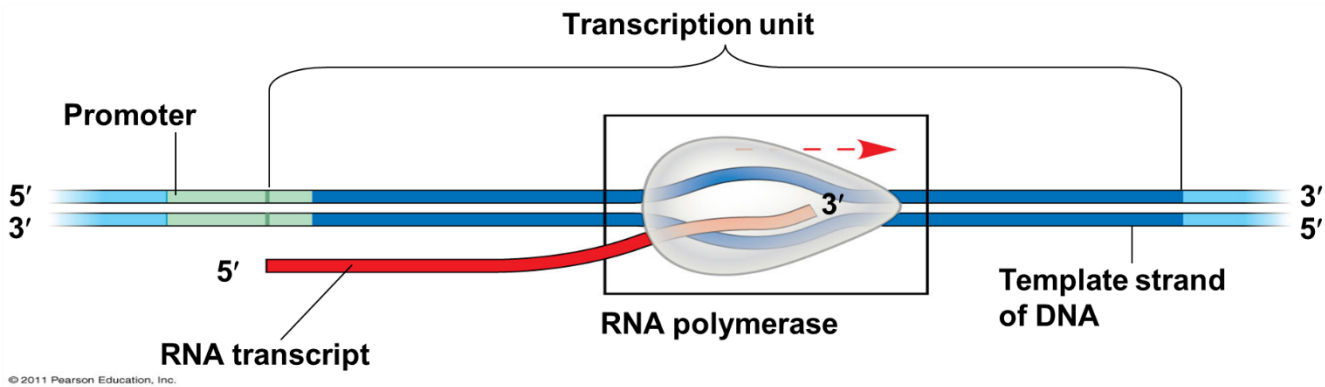
What Is a Gene?

- The idea of the gene has evolved through the history of genetics
- We have considered a gene as
 - A discrete unit of inheritance
 - A region of specific nucleotide sequence in a chromosome
 - A DNA sequence that codes for a specific polypeptide chain
 - In summary, a gene can be defined as a region of DNA that can be expressed to produce a final functional product, either a polypeptide or an RNA molecule



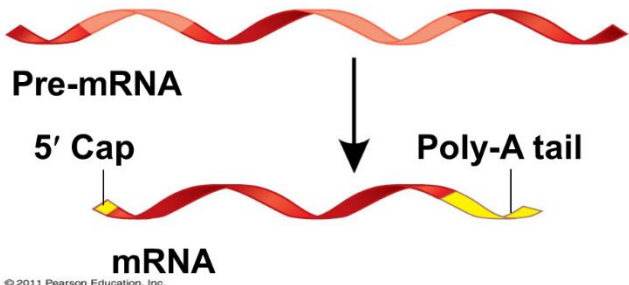
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Figure 17.UN02

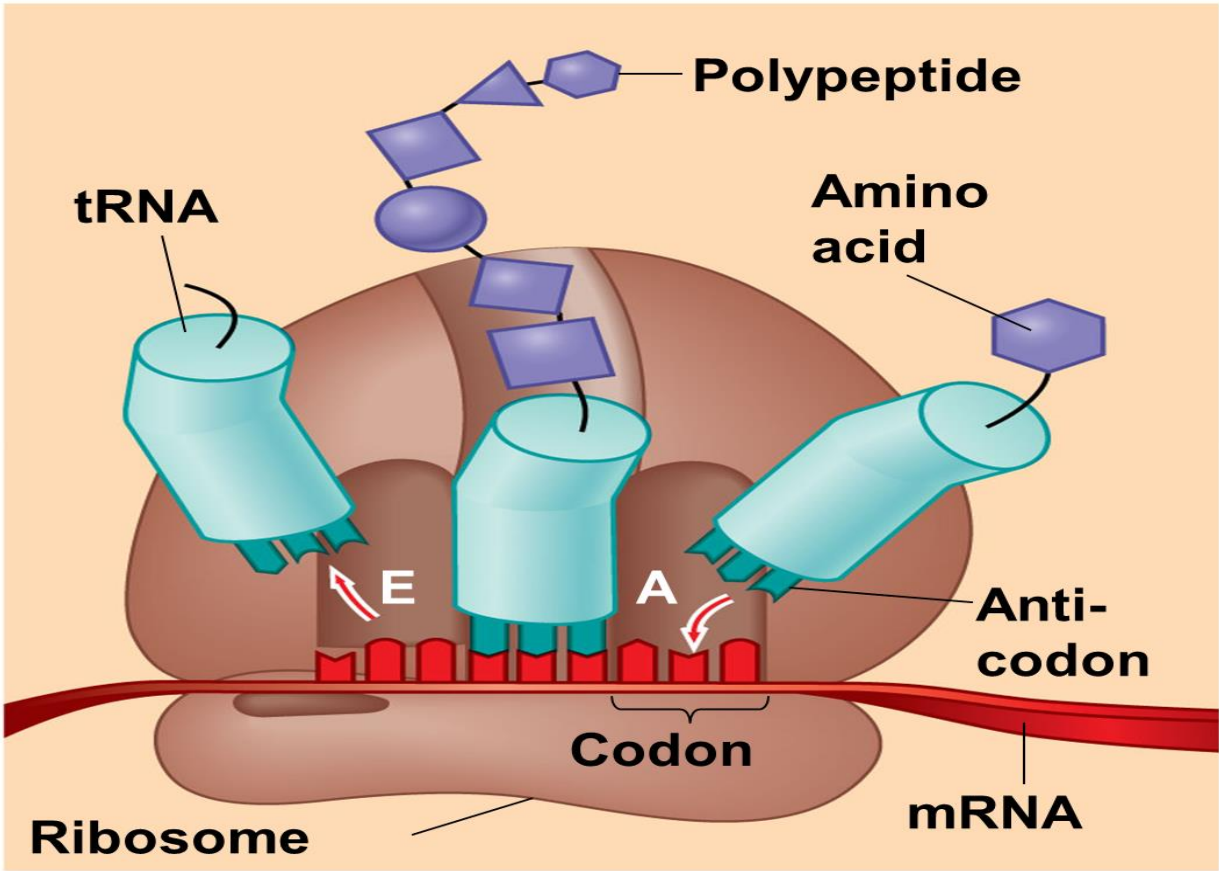


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Figure 17.UN03



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Colinearity of Gene and Protein

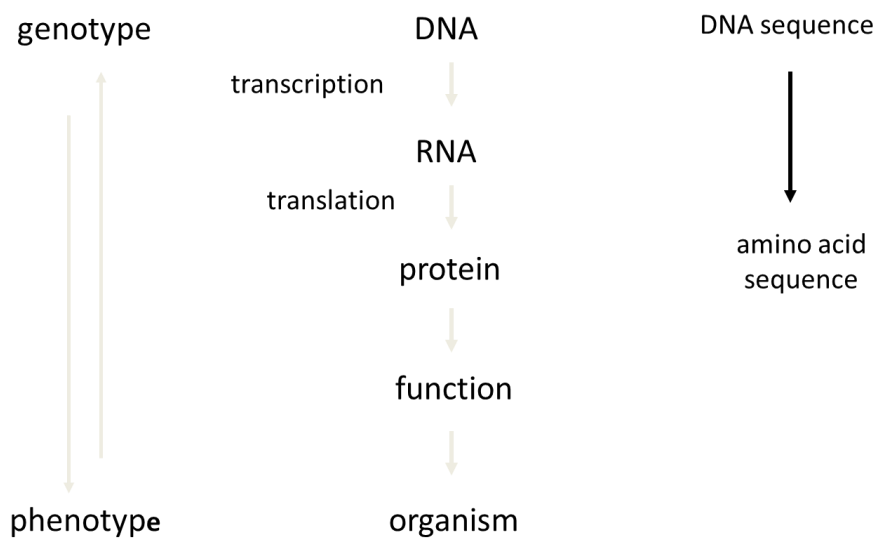


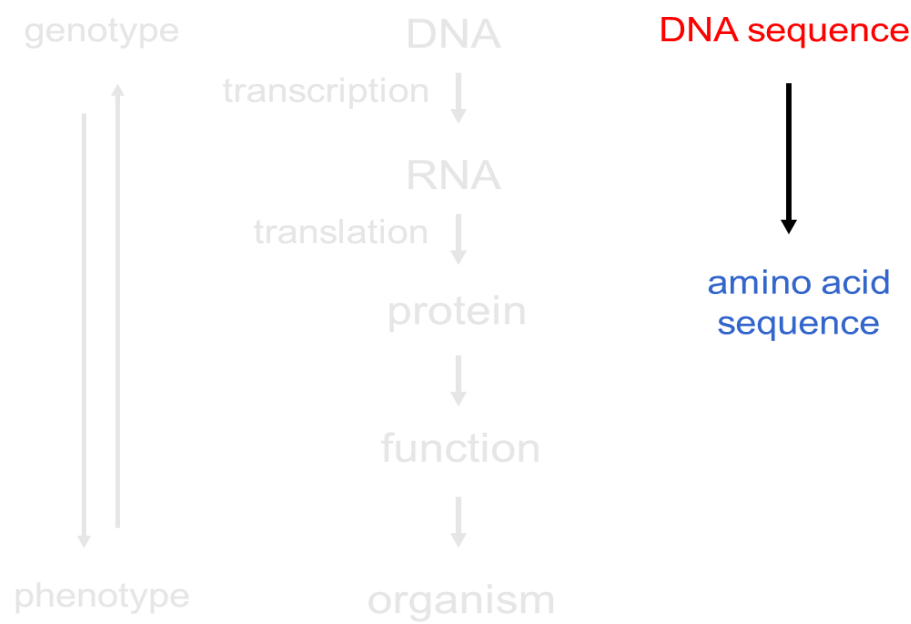
Figure 17.UN05

Type of RNA	Functions
Messenger RNA (mRNA)	
Transfer RNA (tRNA)	
	Plays catalytic (ribozyme) roles and structural roles in ribosomes
Primary transcript	
Small nuclear RNA (snRNA)	

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100-Colinearity of Gene and Protein

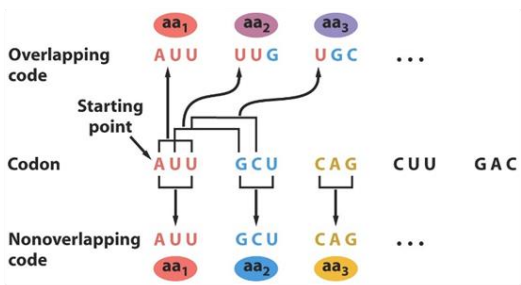
Colinearity of Gene and Protein



Genetic Code

		Second letter				Third letter
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA Gln CAG }	CGU } CGC } Arg CGA } CGG }	
	A	AUU } Ile AUC } AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA Lys AAG }	AGU } Ser AGC } AGA Arg AGG }	
	G	GUU } Val GUC } GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA Glu GAG }	GGU } GGC } Gly GGA } GGG }	

Genetic Code is nonoverlapping.



A codon (three bases or triplet) encodes an amino acid.

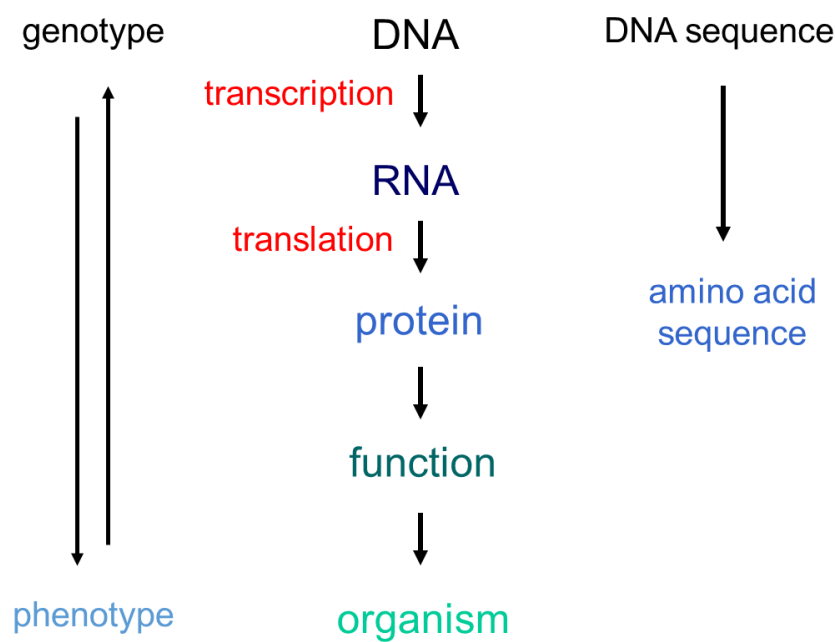
Genetic Code is read continuously from a fixed starting point.

There is a start codon (AUG).

There are three stop (termination) codons. They are often called nonsense codons.

Genetic Code is degenerate. Some amino acids are encoded by more than one codon.

Molecular Basis for
Relationship between Genotype and Phenotype



Eukaryotic RNA

Three RNA Polymerases

RNA Polymerase

Synthesis of

I	rRNA (except 5S rRNA)
II	mRNA*, some snRNA
III	tRNA, some snRNA, 5S rRNA

* eukaryotic RNA is monocistronic
prokaryotic RNA can be polycistronic