Biophysics: Lecture 1

Evolution

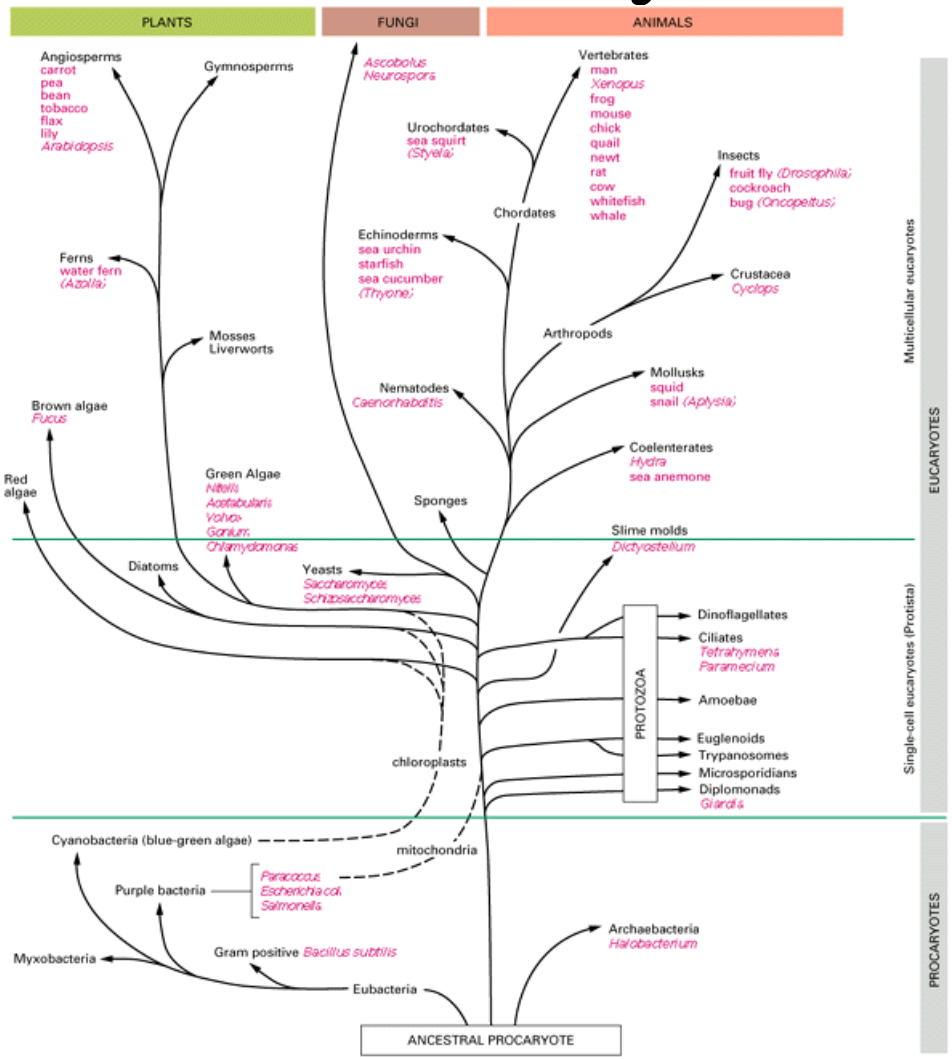
Cell

Biopolymers

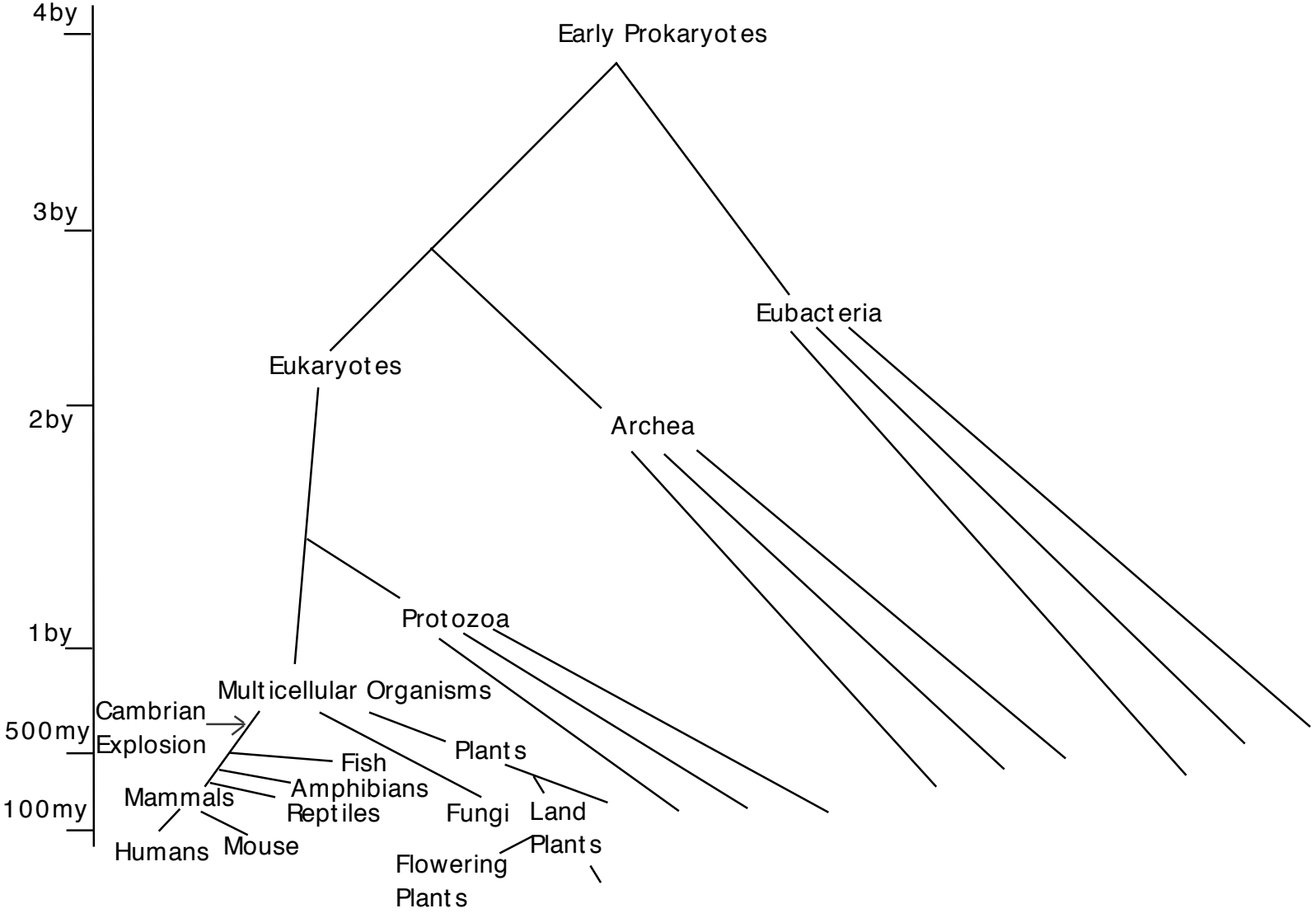
Biology References

- Alberts et al., Molecular Biology of the Cell
- Lodish et al., Molecular Cell Biology
- Berg et al., Biochemistry

Evolutionary Tree

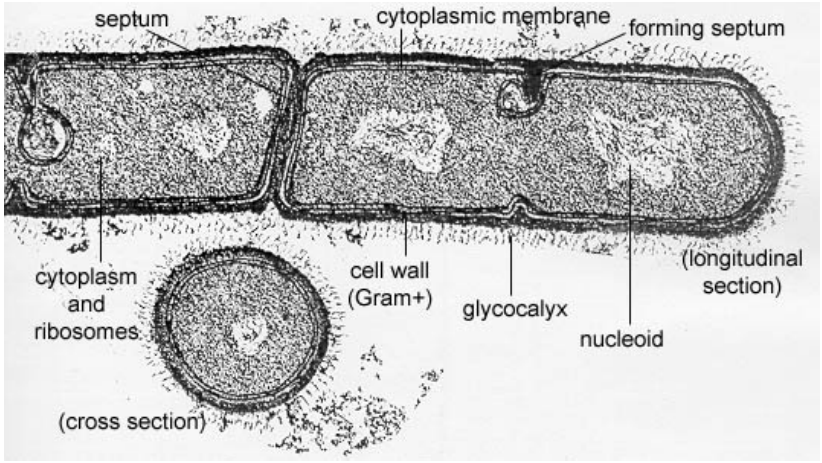


Evolution Timescale

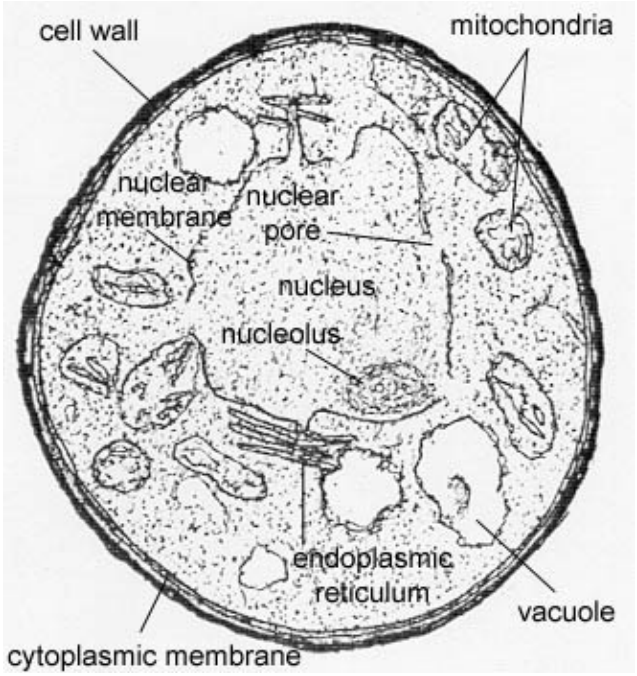


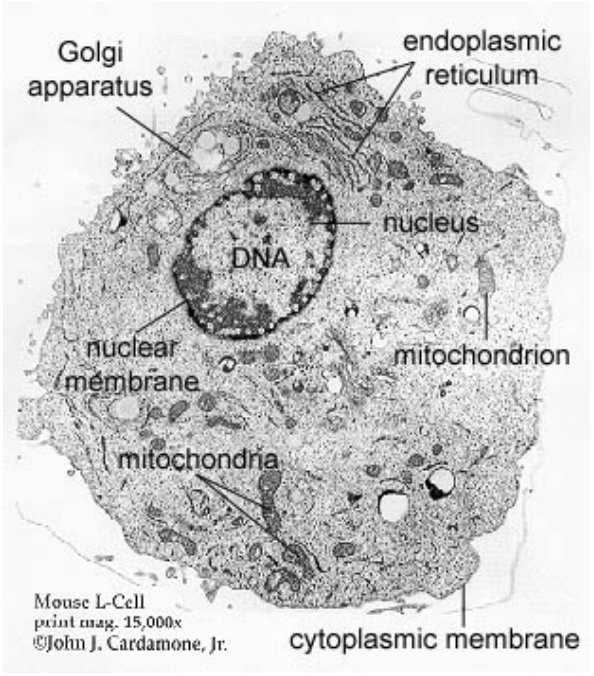
Prokaryotes vs Eukaryotes: Cell

Bacillus megaterium



Candida albicans



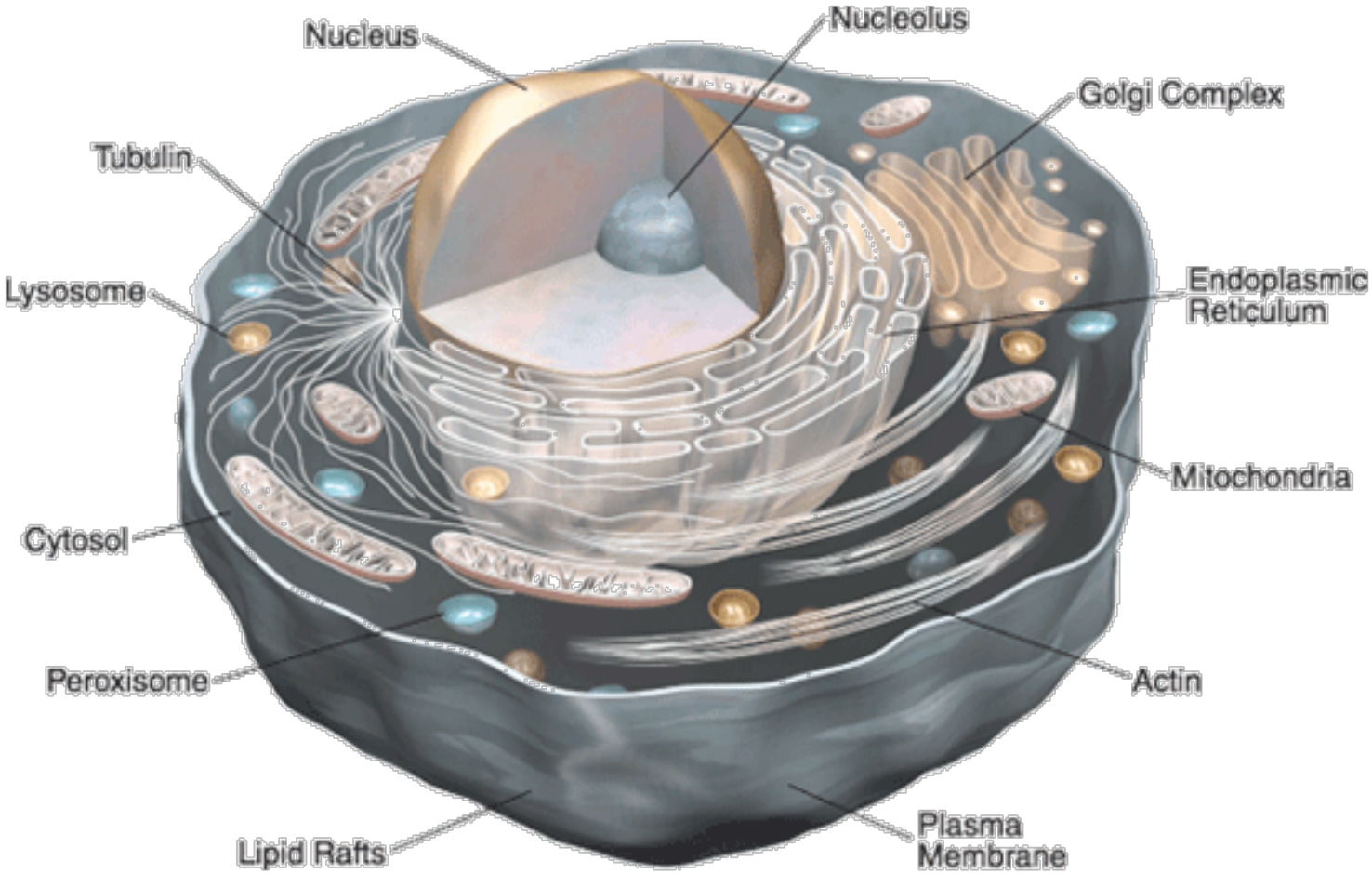


Mouse L-cell

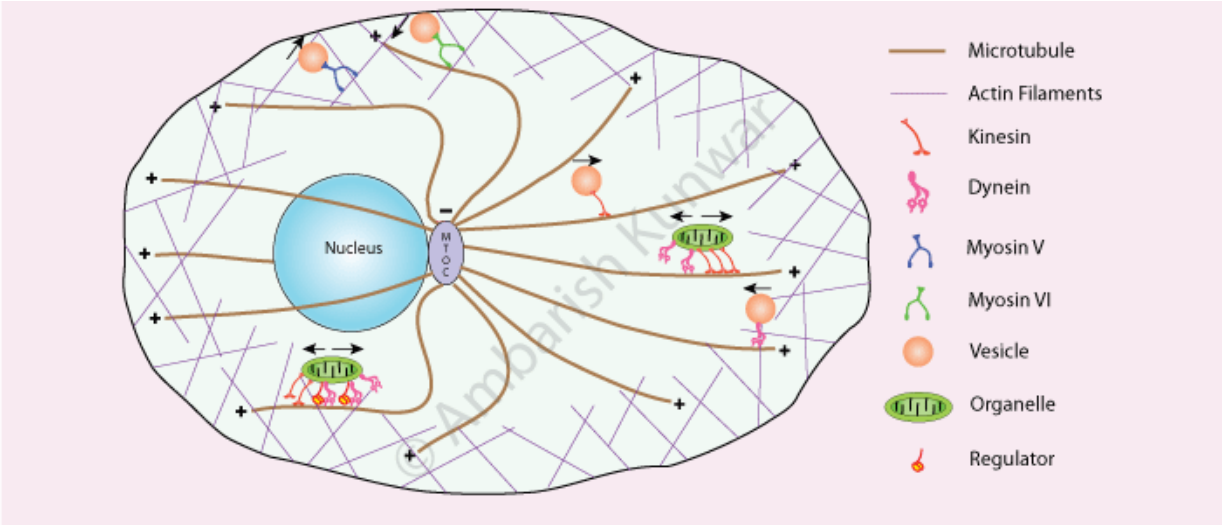
Major Differences

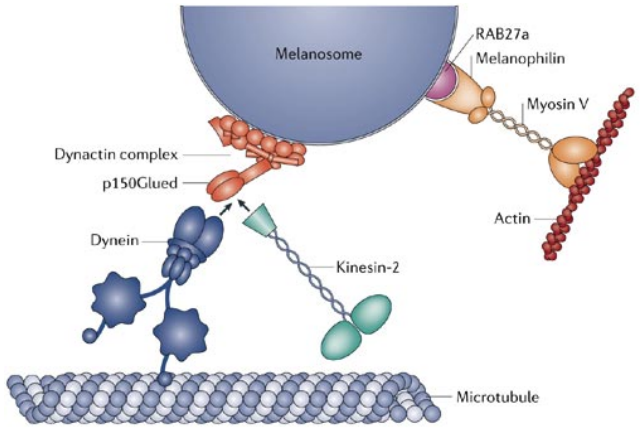
Type	Prokaryote	Eukaryote
Size	0.1-10 microns	10-100 microns
Genome	circular DNA	DNA condensed in chromosomes
Organelles	None	Many organelles
Metabolism	Multiple strategies	Mostly oxydative
Internal membranes	None	Complex folded ER
Mobility	Flagella	Undulipodia

Eukaryotic Cell Organelles

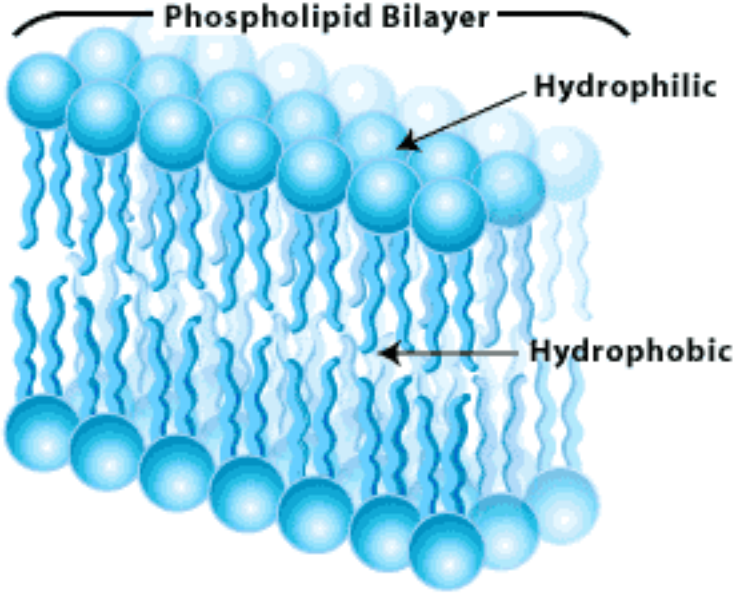


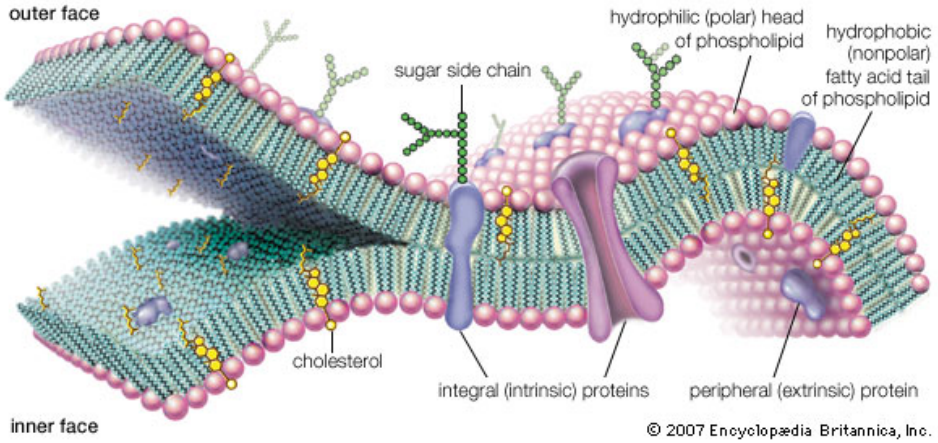
Motor Proteins



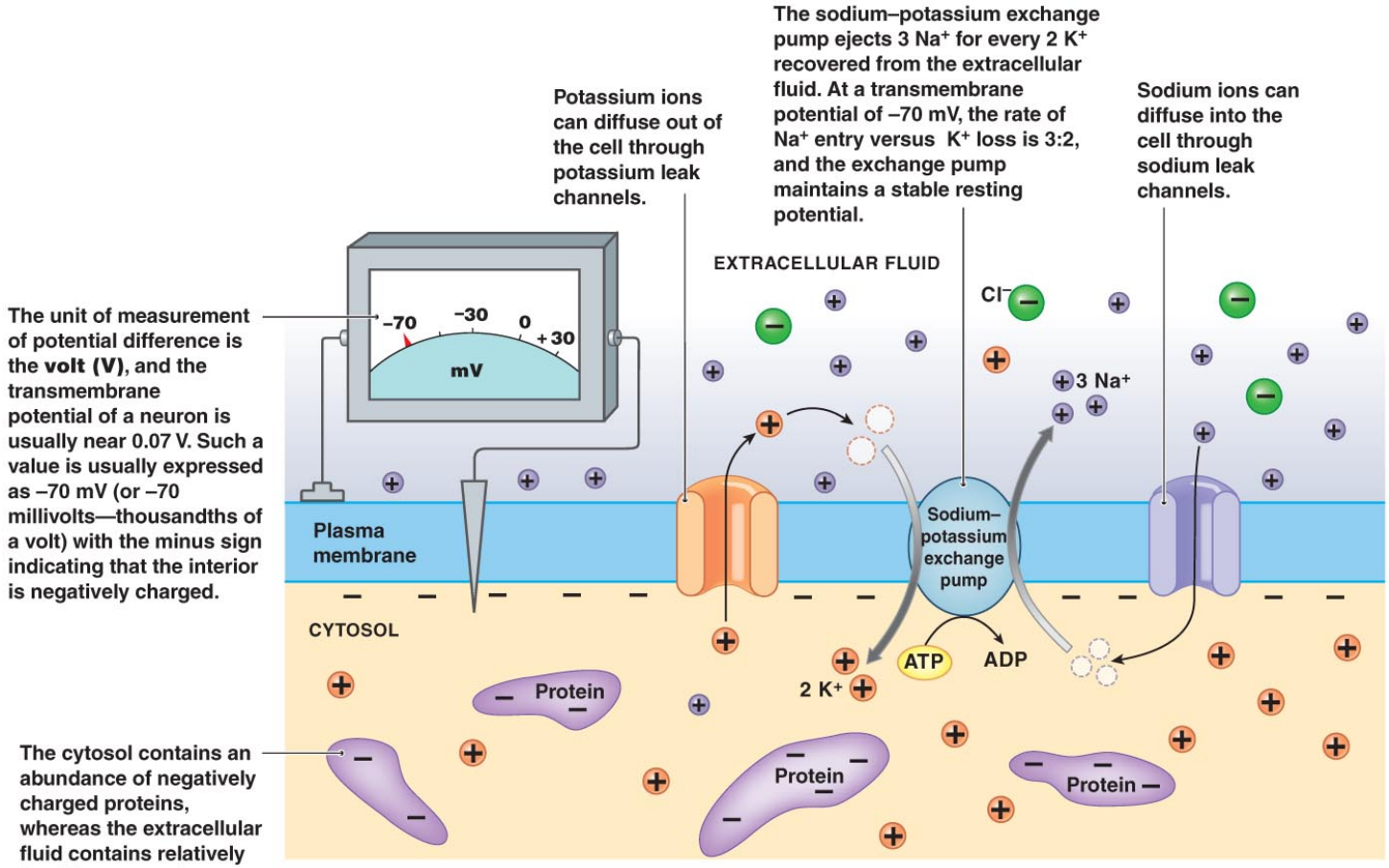


Plasma Membrane



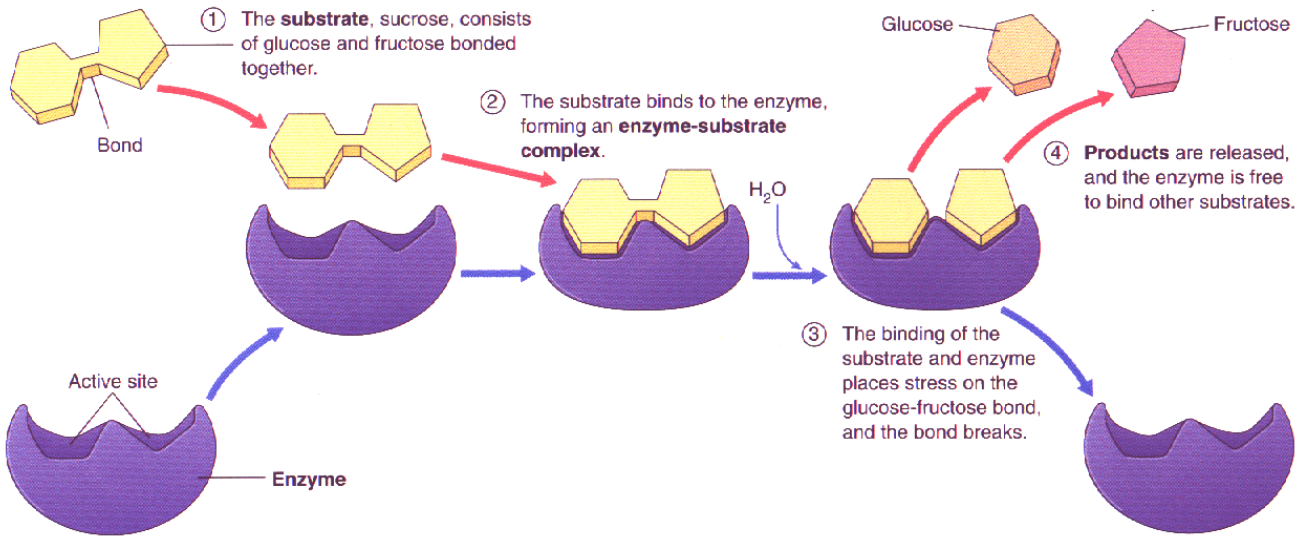


Ionic Pumps and Channels



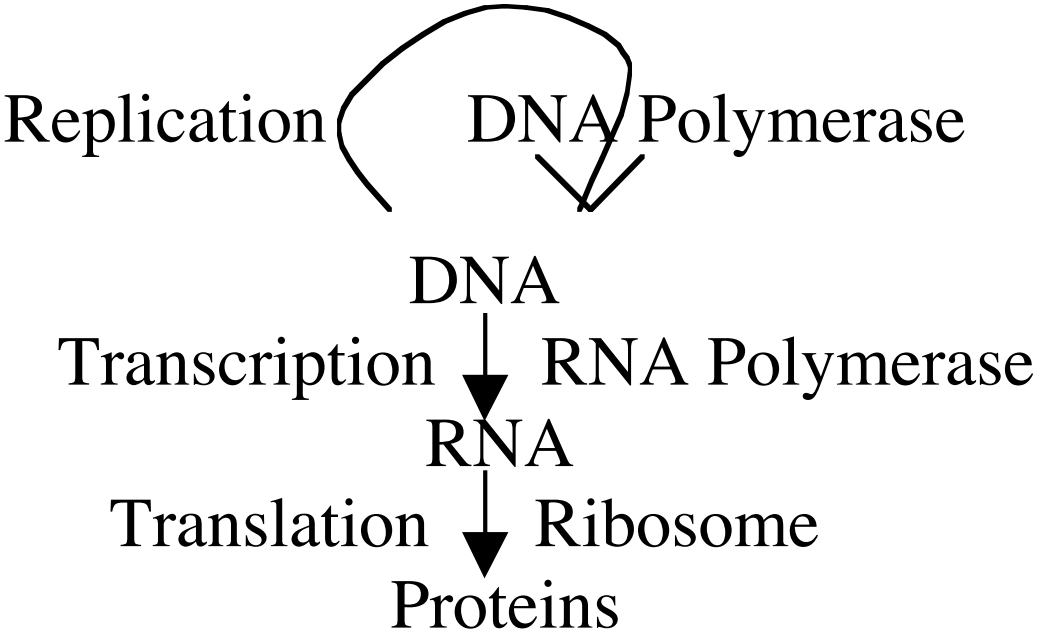
An overview of the events responsible for the normal resting potential of a neuron

Enzymes

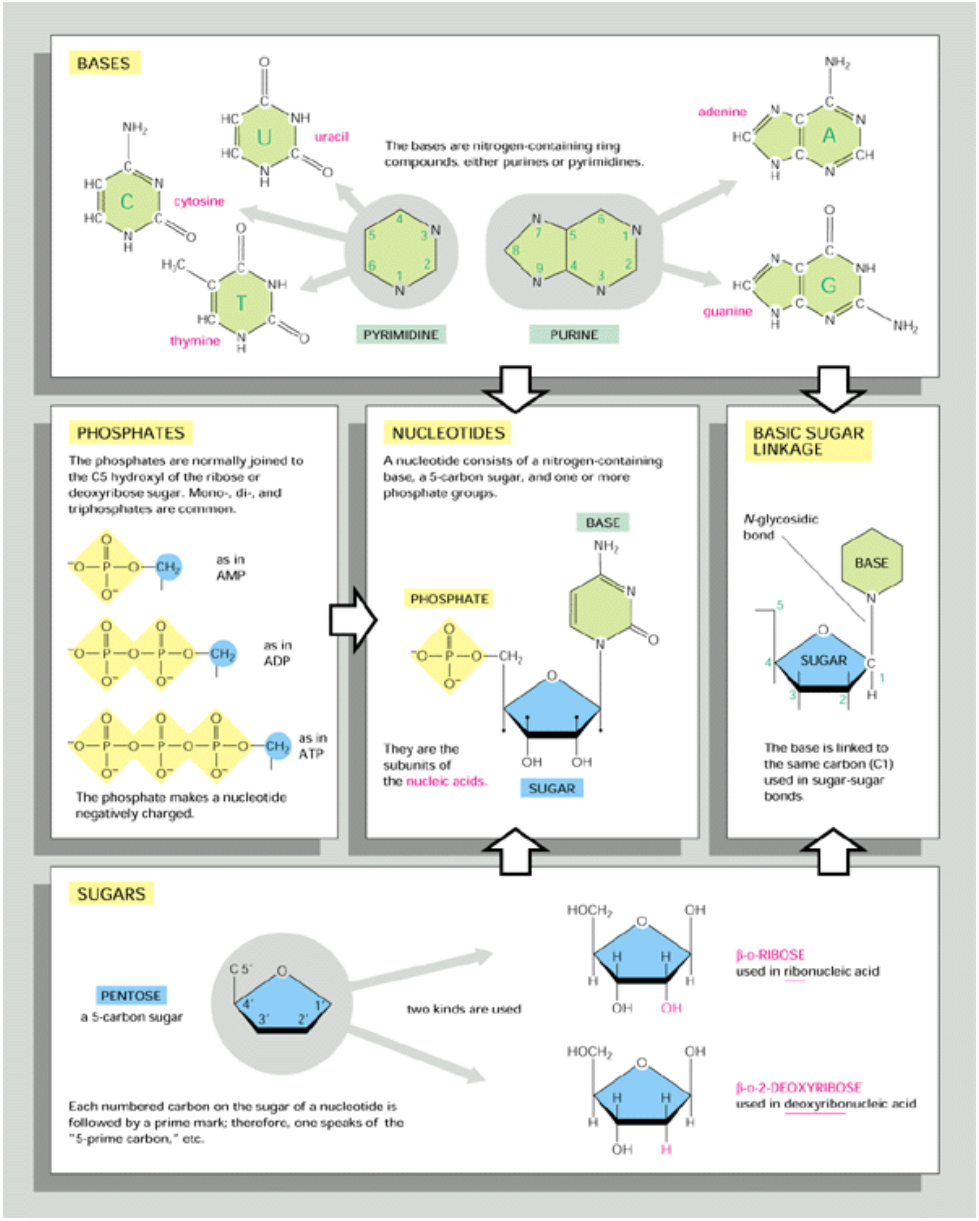


Sucrase Activity

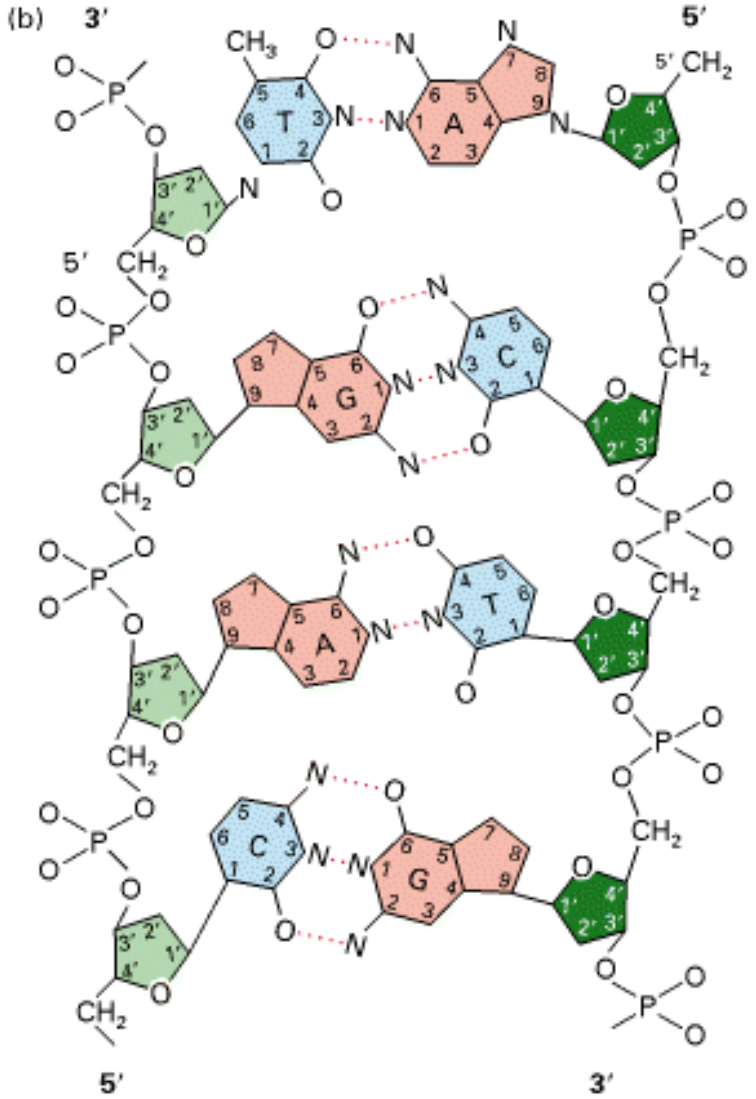
Unity in Diversity: Basic Molecules and Processes

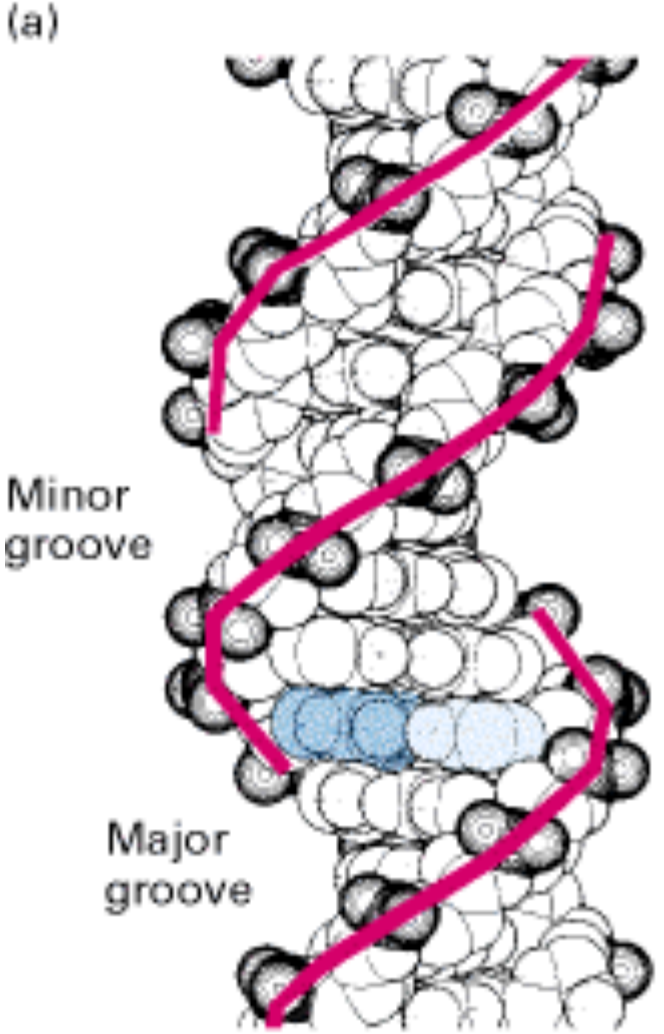


Nucleic Acid Ingredients

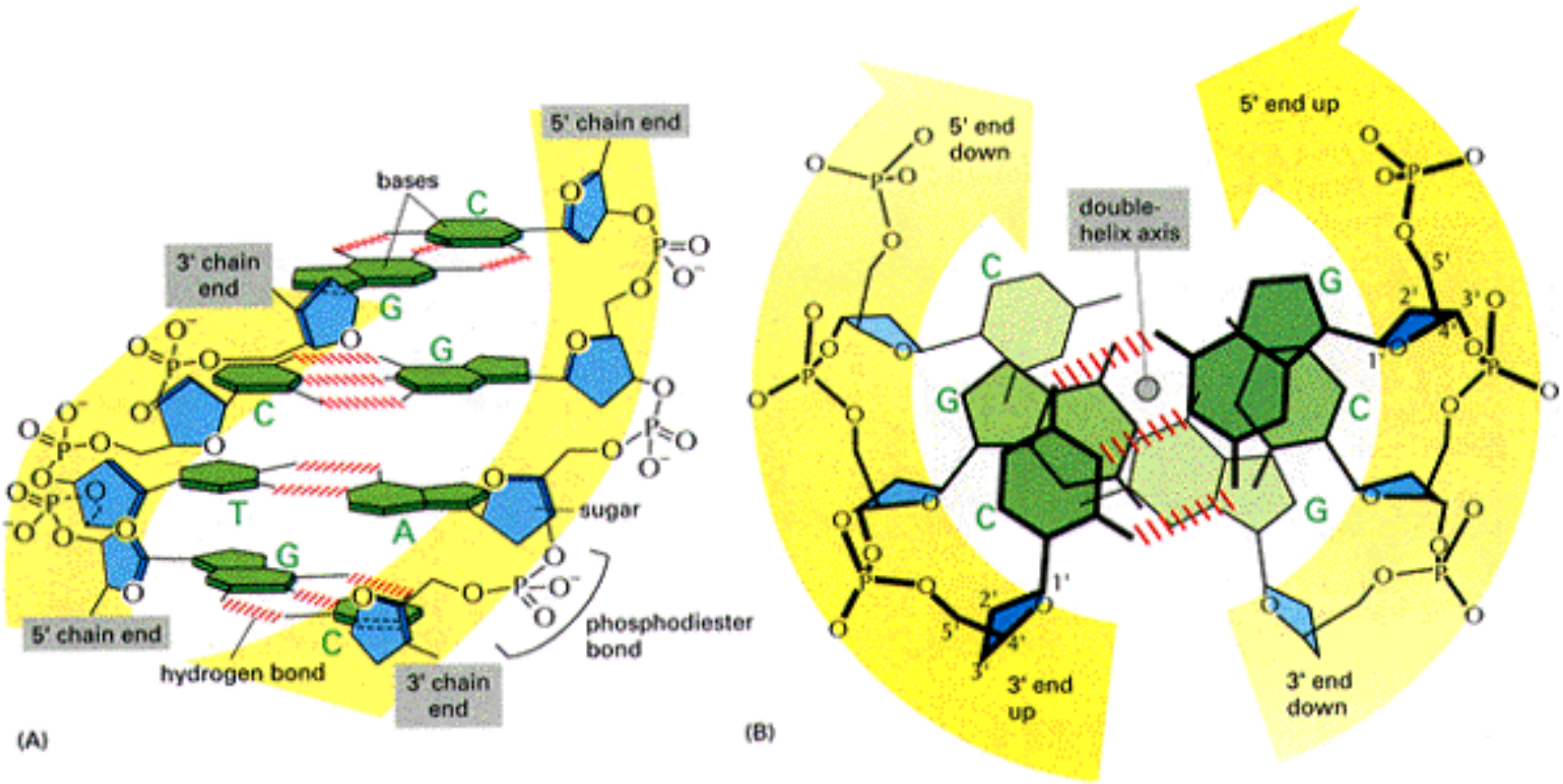


DNA Double Helix



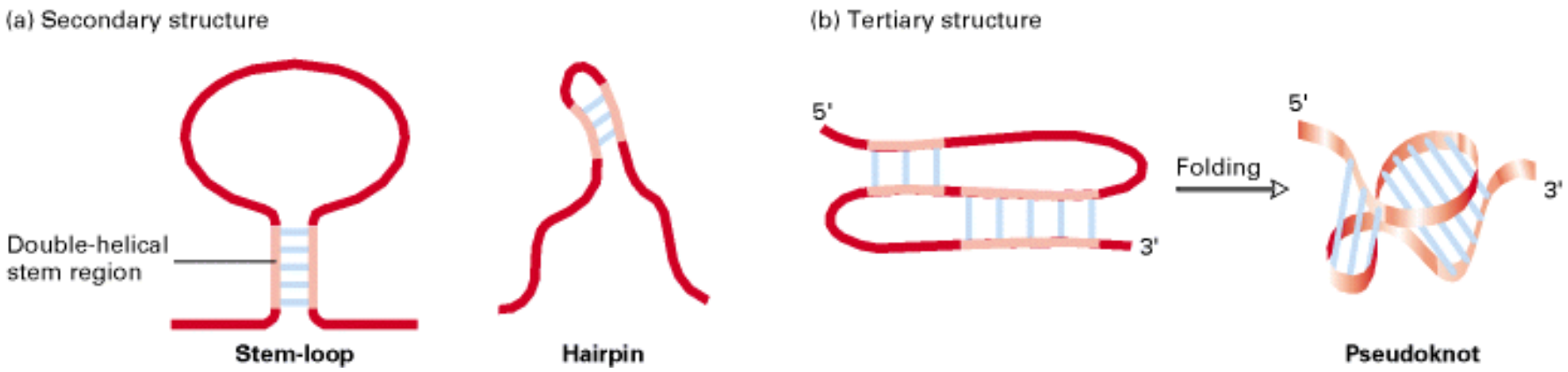


Another Look

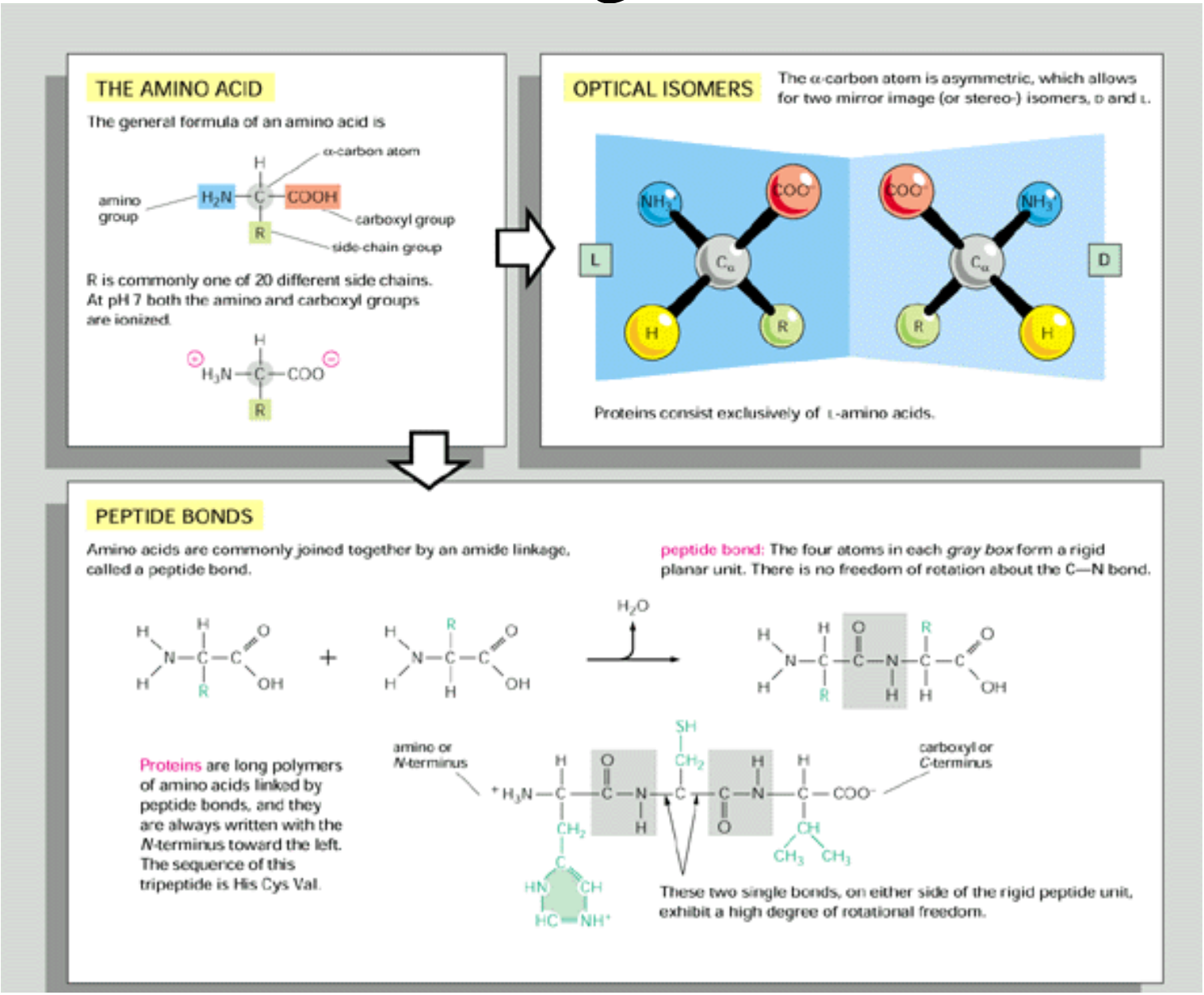


RNA

- Typically single stranded
- 3dim structure depends upon how it folds on itself



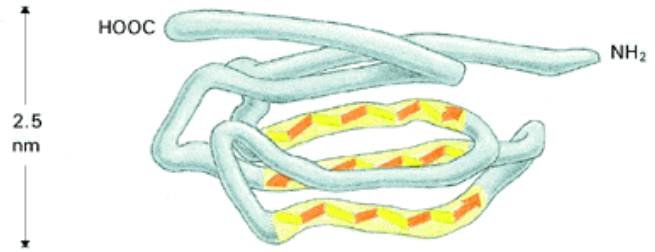
Protein Ingredients



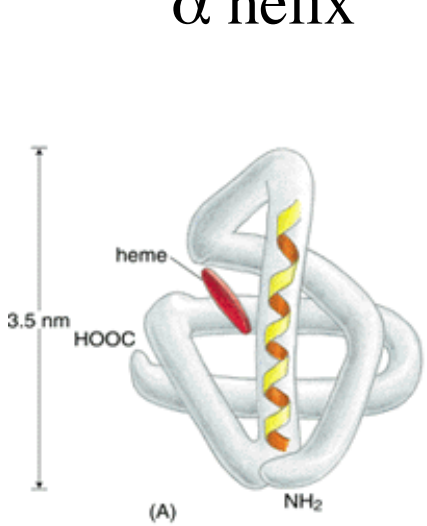
Structural Motifs in Proteins

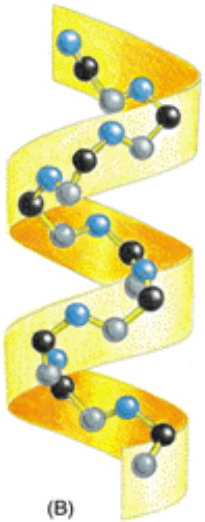
Black, Grey: Carbon
Blue: Nitrogen
Red: Oxygen

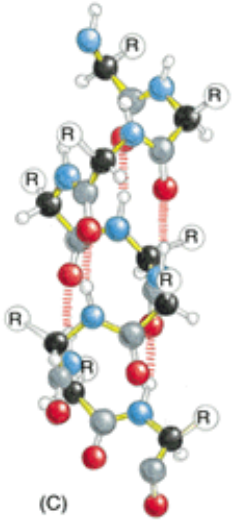
β sheet

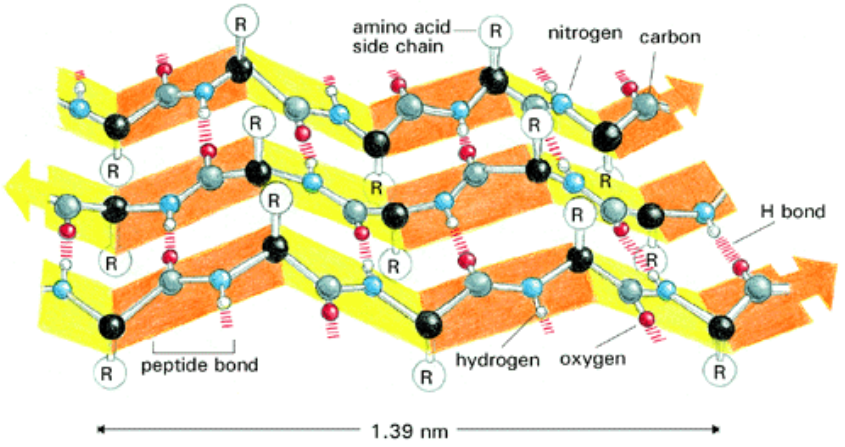


α helix





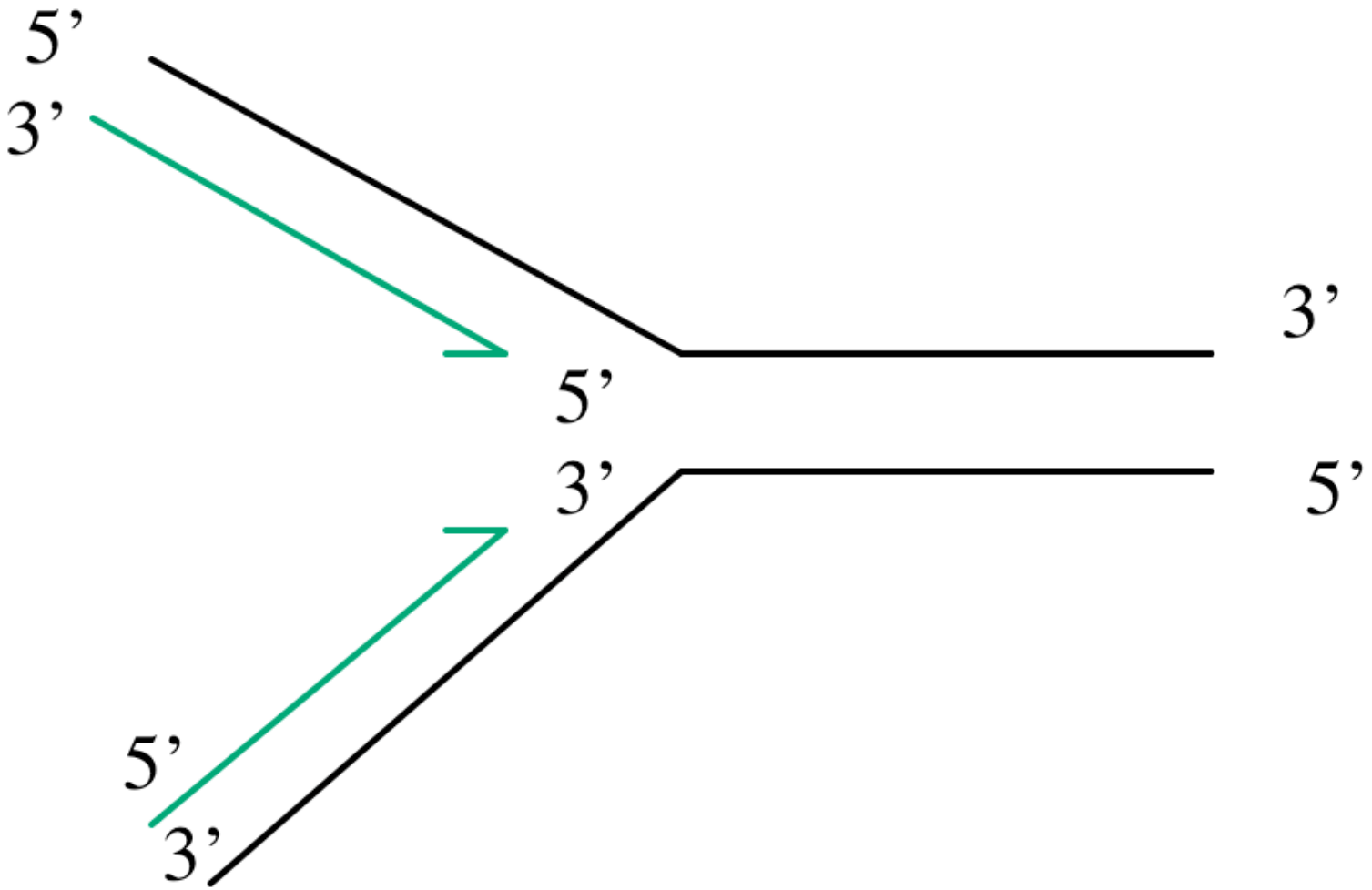




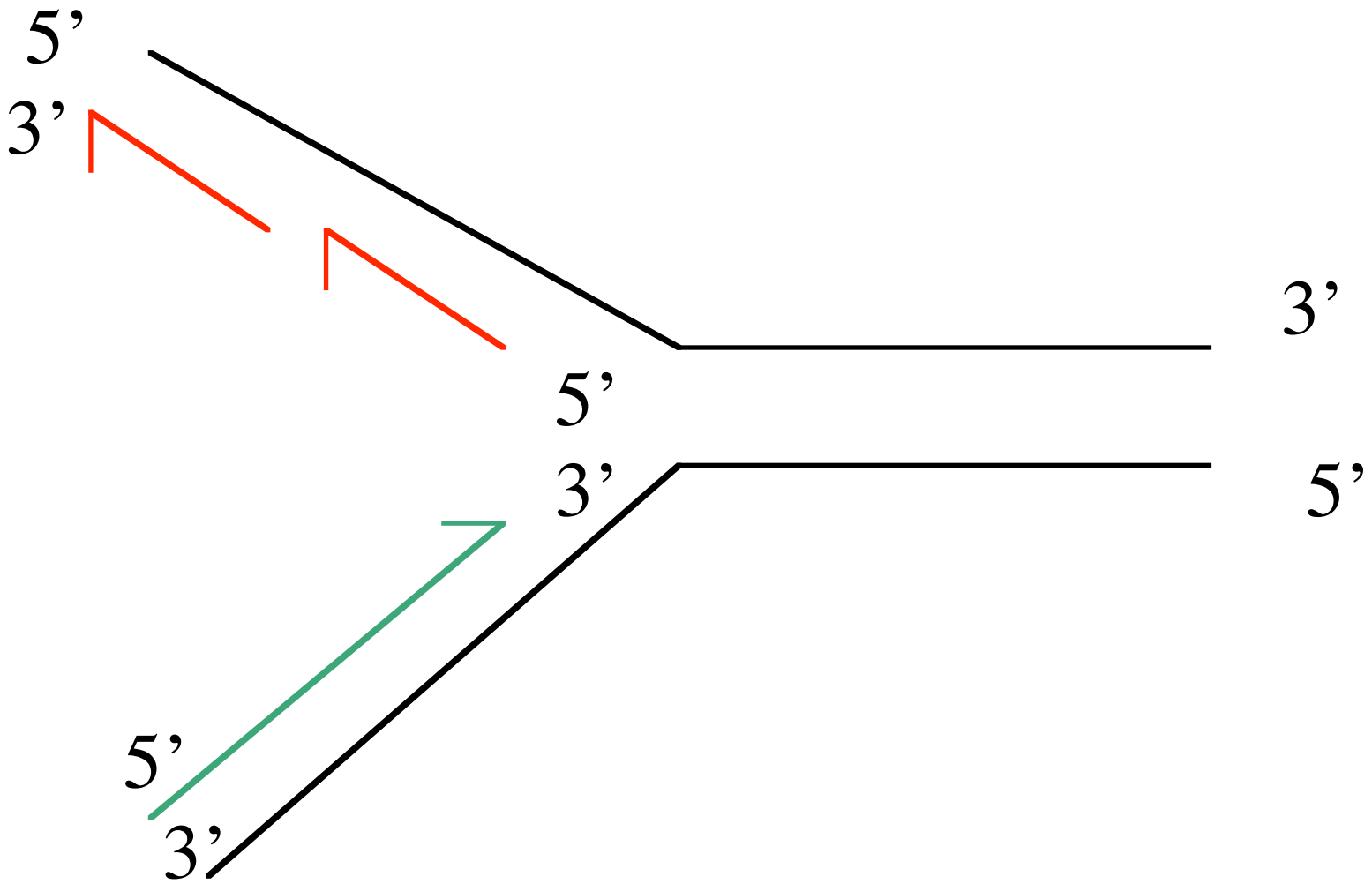
Focus

- Central Dogma
- Central Genetic Processes: Transcription, Translation and Replication

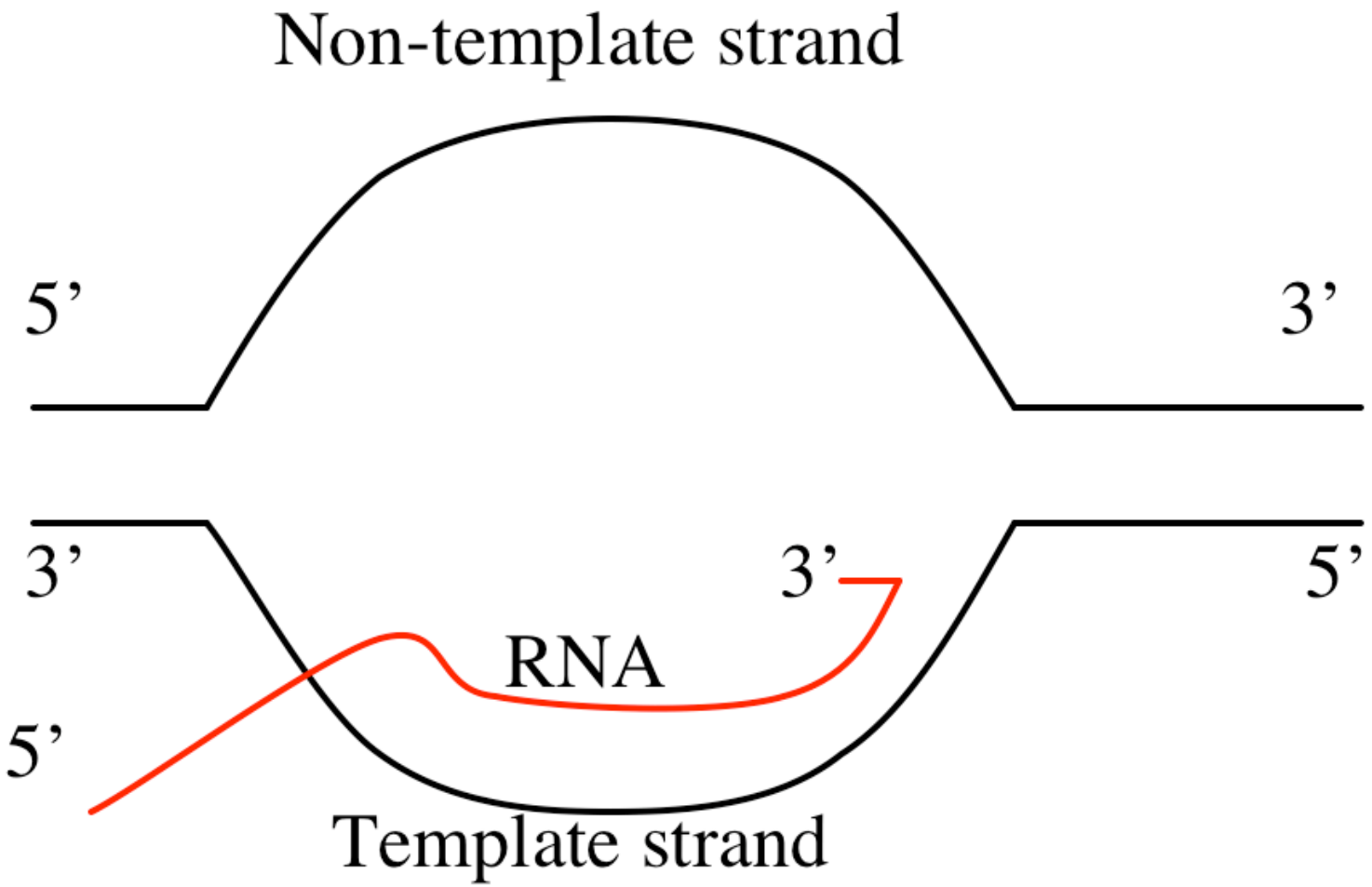
Forbidden Route to Replication



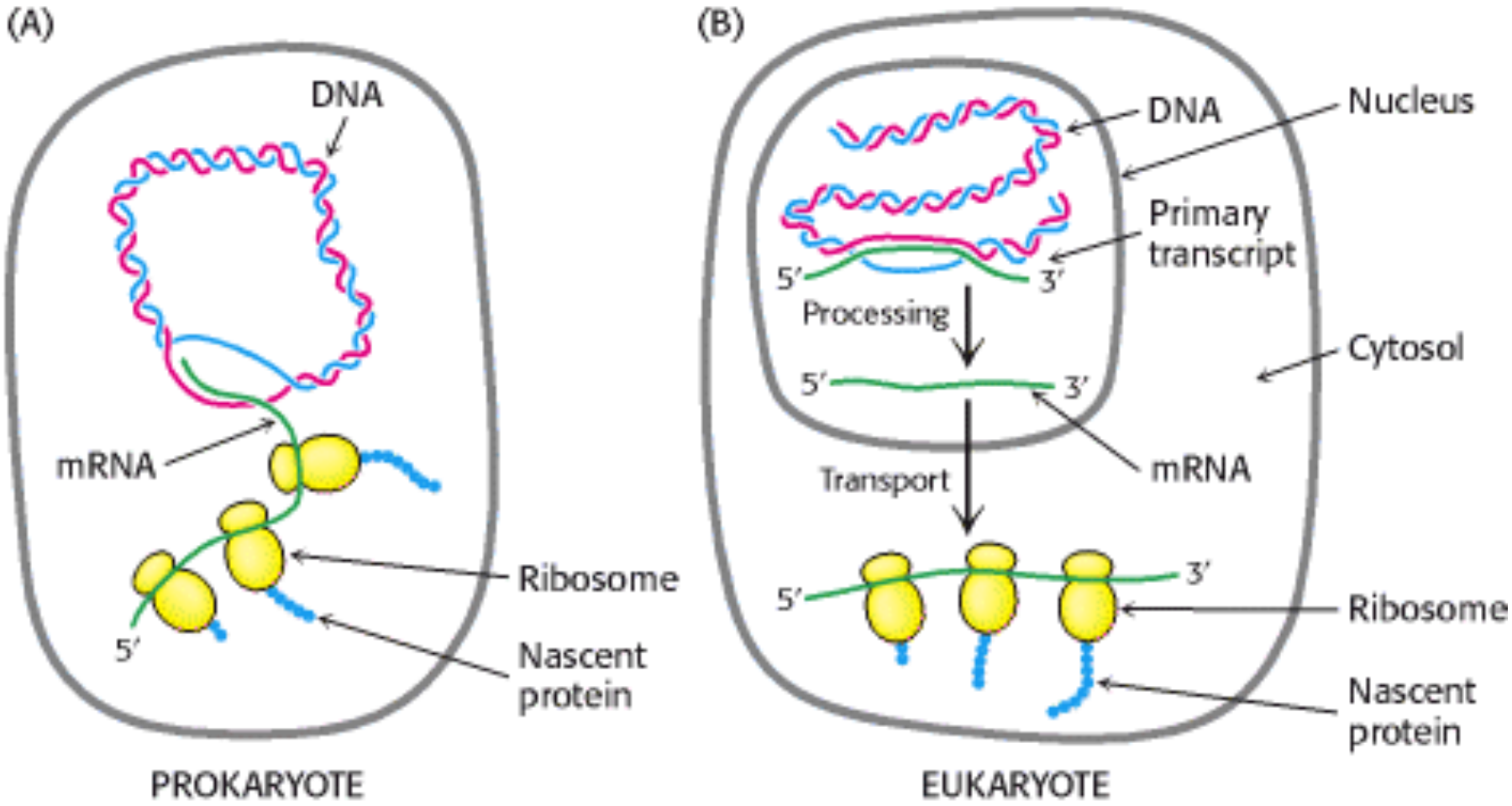
Replication



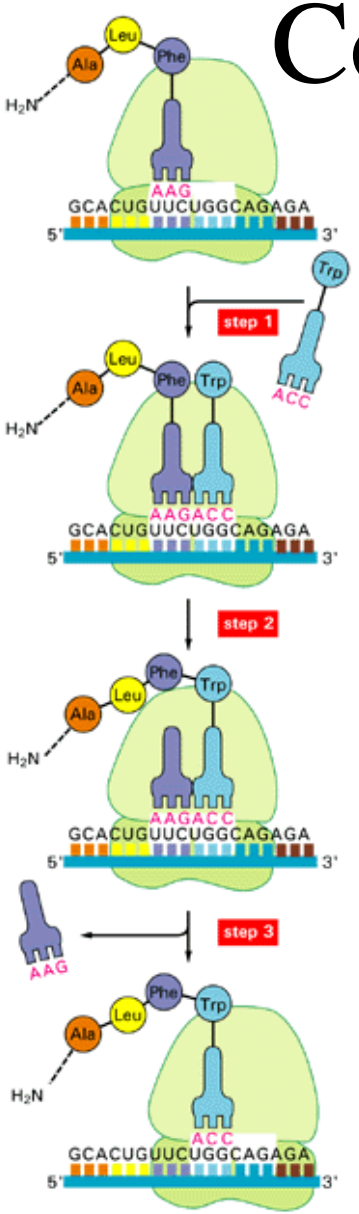
Transcription



Translation



Codons and Amino Acids



The Genetic Code

GCA GCC GCG GCU	AGA AGG CGA CGC CGG CGU	GAC GAU	AAC AAU	UGC UGU	GAA GAG	CAA CAG	GGA GGC GGG GGU	CAC CAU	AUA AUC AUU	UUA UUG CUA CUC CUG CUU	AAA AAG	AUG	UUC UUU	CCA CCC CCG CCU	AGC AGU UCA UCC UCG UCU	ACA ACC ACG ACU	UGG	UAC UAU	GUA GUC GUG GUU	UAA UAG UGA
Ala	Arg	Asp	Asn	Cys	Glu	Gln	Gly	His	Ile	Leu	Lys	Met	Phe	Pro	Ser	Thr	Trp	Tyr	Val	stop
A	R	D	N	C	E	Q	G	H	I	L	K	M	F	P	S	T	W	Y	V	

Videos

http://www.youtube.com/watch?v=4jtmOZaIvS0
http://www.youtube.com/watch?v=41_Ne5mS2ls