Proteomics Course

LECTURE-2
Central Dogma: Basics of DNA, RNA, Proteins

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Lecture outline

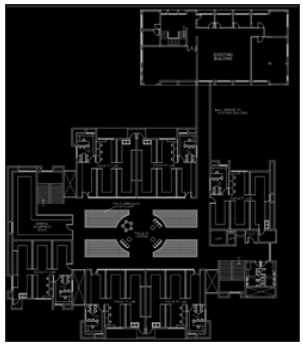
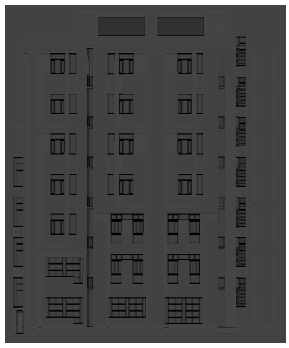
- Central Dogma
- DNA
- RNA
- Proteins

Central dogma: understanding protein function is key to biology

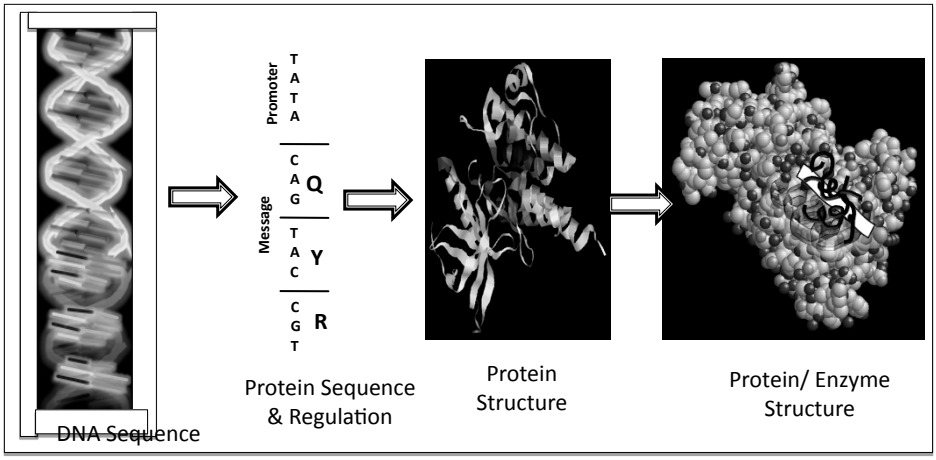
DNA
Genetic
blueprint

RNA
Molecular
Photocopy

Proteins
Building
blocks

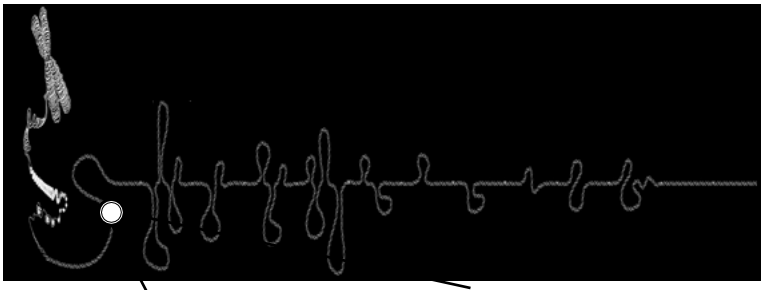




Proteins transform 1-D sequences to 3-D functional molecules

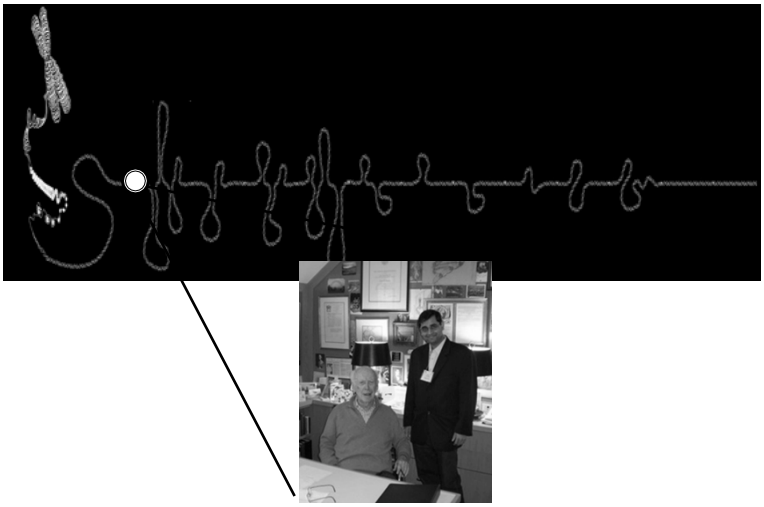


Milestone Discoveries related to DNA

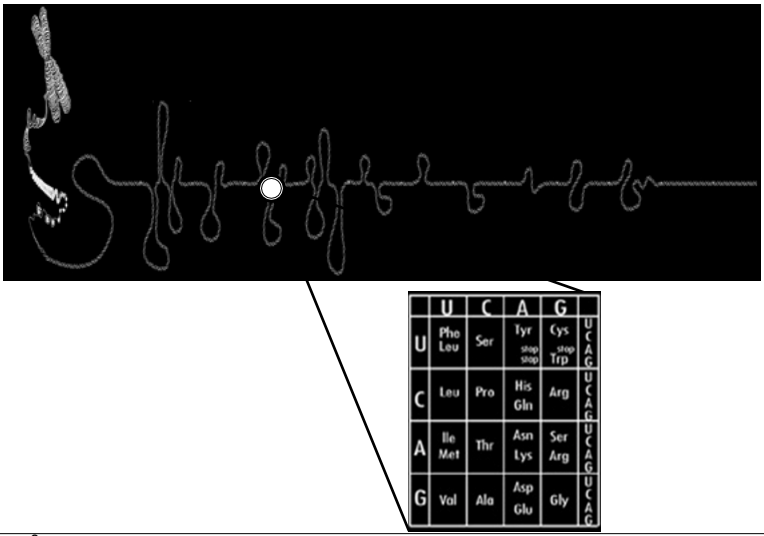
Mendel - laws of genetics (1865)



DNA double helix structure - Watson and Crick (1953)

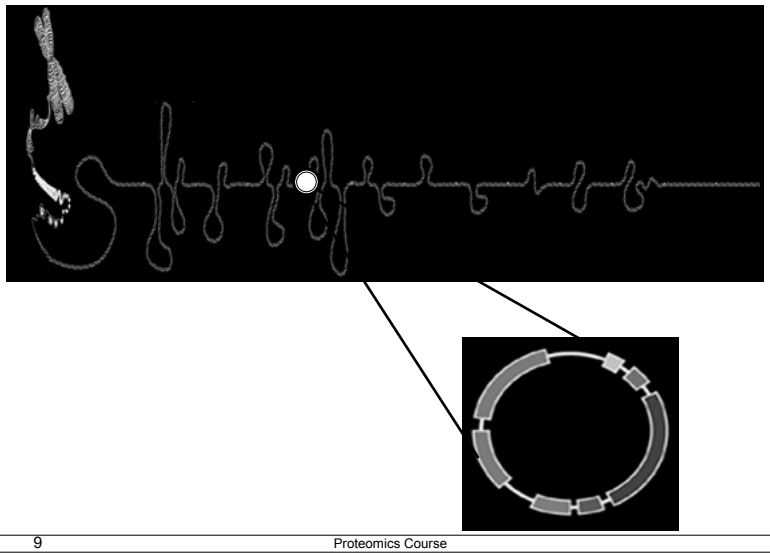


Nirenberg, Khorana & Holly determined genetic code (1966)

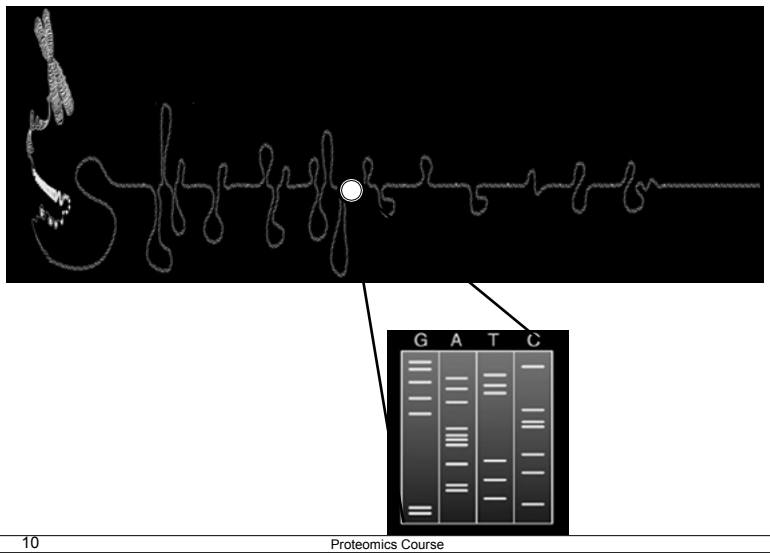


	U	C	A	G	
U	Phe Leu	Ser	Tyr stop stop	Cys stop Trp	U C A G
C	Leu	Pro	His Gln	Arg	U C A G
A	Ile Met	Thr	Asn Lys	Ser Arg	U C A G
G	Val	Ala	Asp Glu	Gly	U C A G

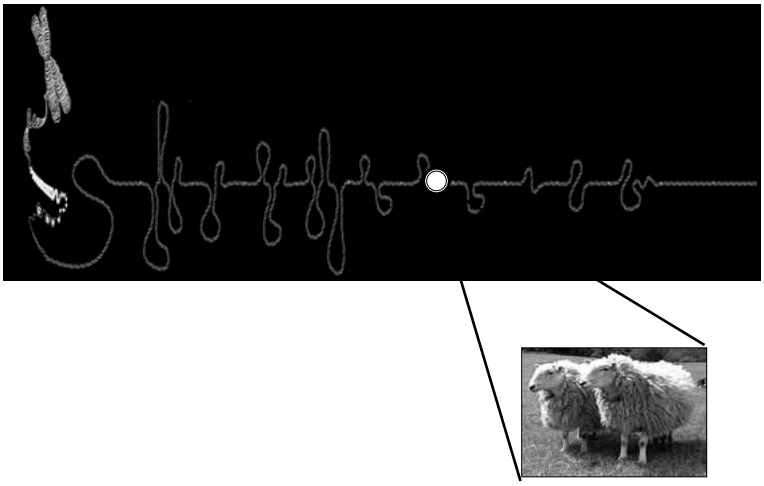
Cohen & Boyer developed Recombinant DNA technology (1972)



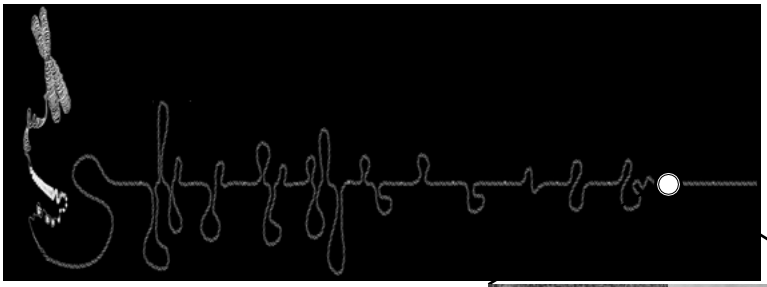
Sanger, Maxan and Gilbert developed DNA sequencing methods (1977)



Cloning (1997)



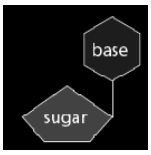
Human Genome Project (2003)



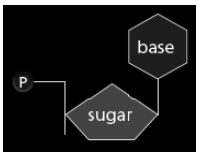
Next Generation Sequencing

Structure of DNA

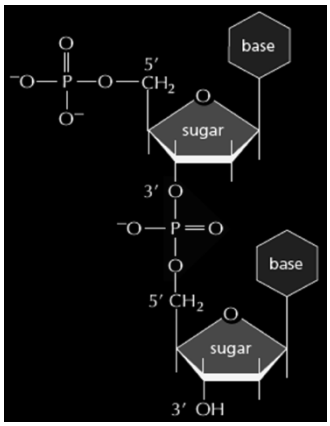
Nucleoside, Nucleotide and Nucleic acid



Nucleoside=
Base + Sugar

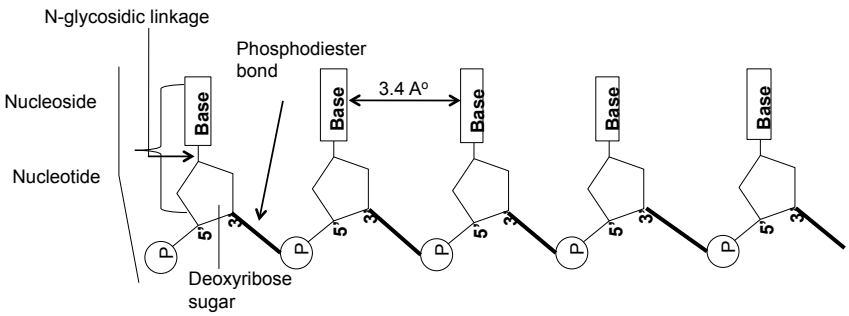


Nucleotide=
Base + Sugar + Phosphate

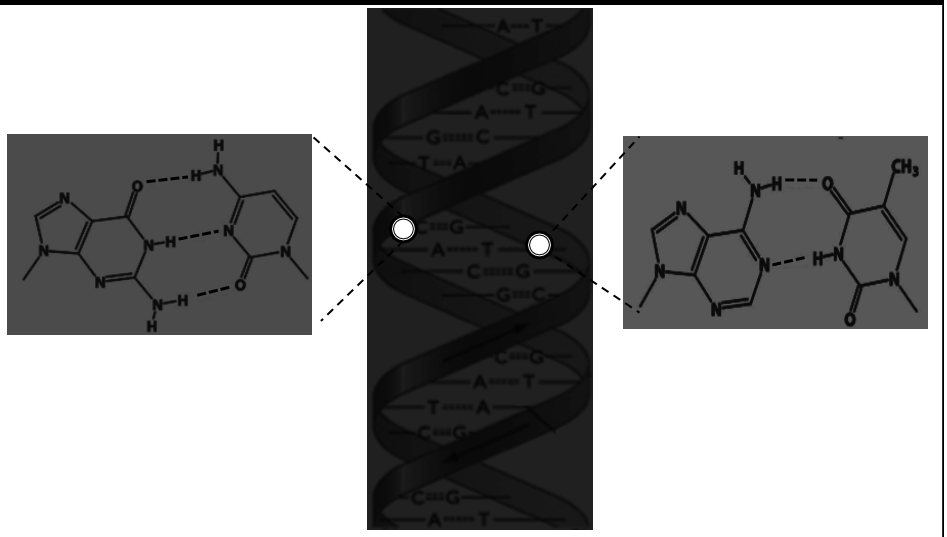


Nucleic Acids =
Nucleotide joined by phosphodiester bonds

Structure of DNA: basic components

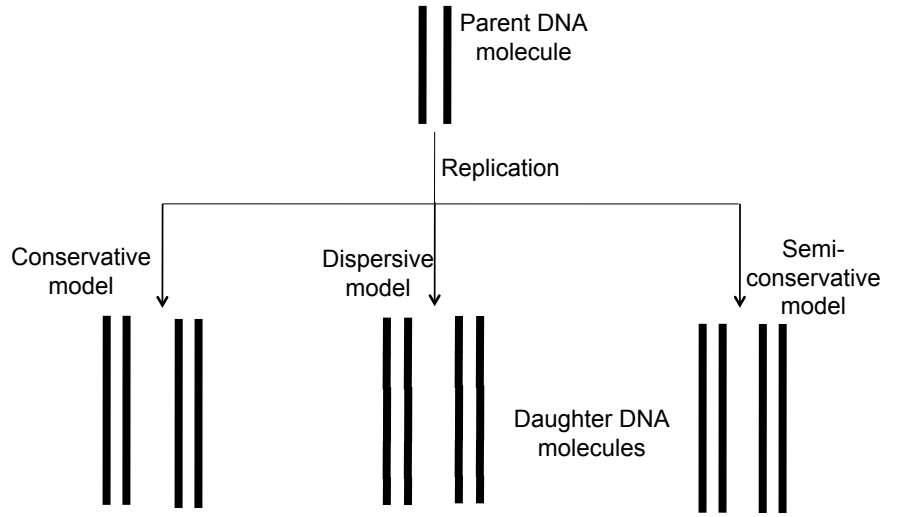


DNA double helix structure

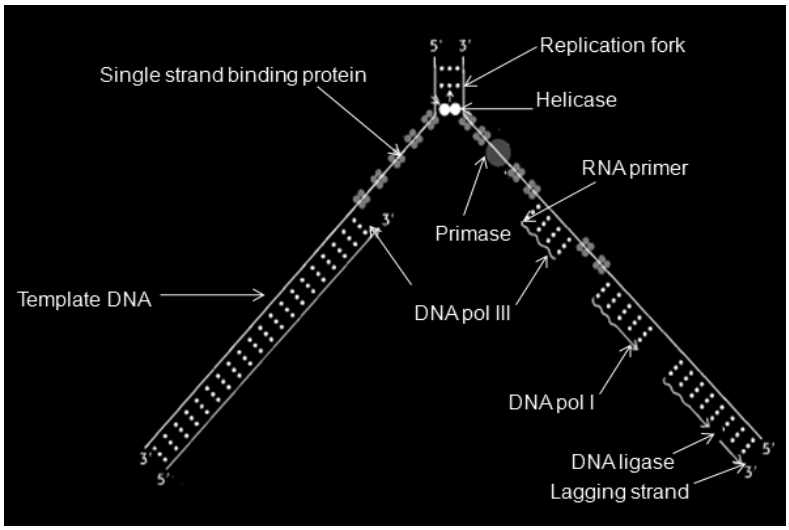


Function of DNA

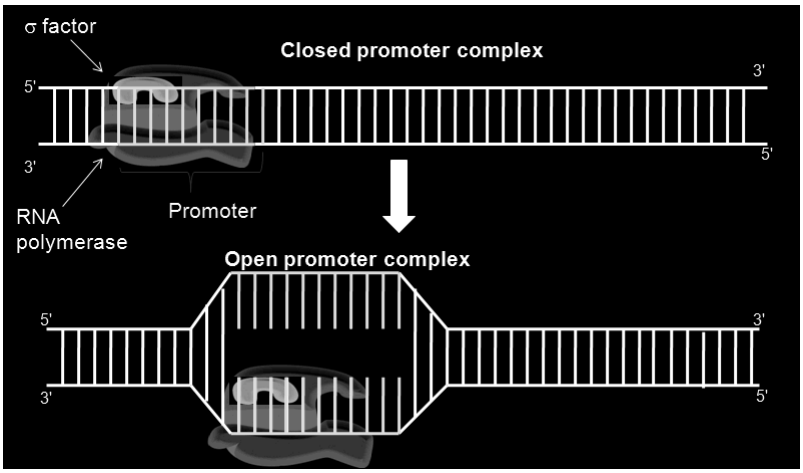
Proposed models for DNA replication



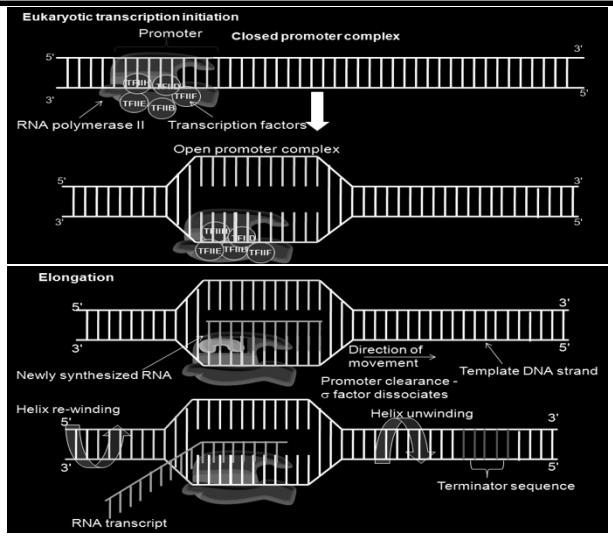
DNA Replication



Transcription of DNA: Prokaryotic



Transcription of DNA: Eukaryotic

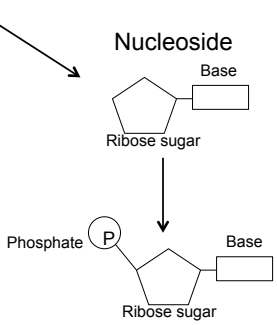


Structure and Function of RNA

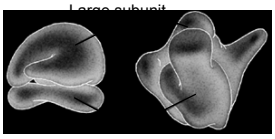
RNA Structure

Sugar phosphate backbone

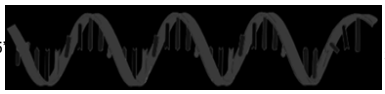
Nitrogenous bases – Adenine/ Guanine/ Uracil/ Cytosine



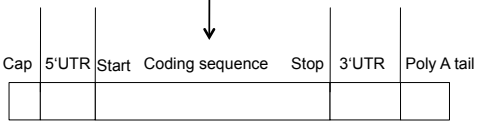
Different Classes of RNA

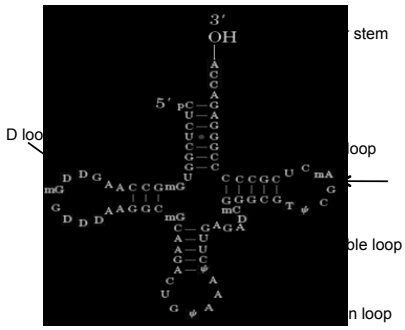


Ribosomal RNA (rRNA)



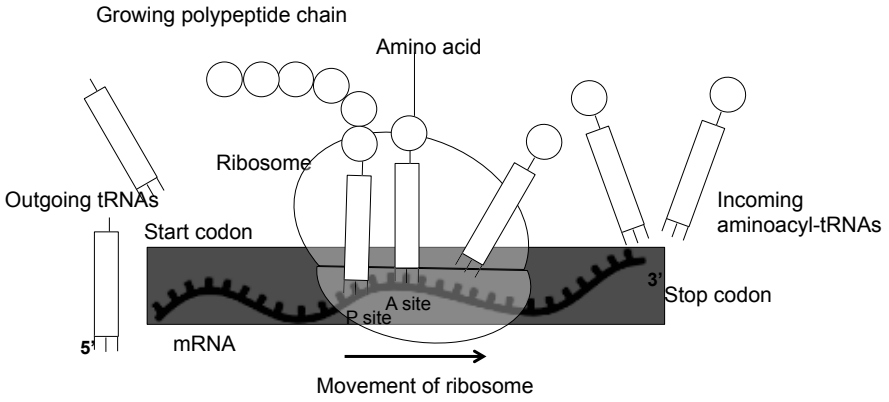
Messenger RNA (mRNA)





Transfer RNA (tRNA)

Functions of different classes of RNA in protein synthesis



Summary

- Central Dogma
- DNA
- RNA
- Proteins

REFERENCES

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