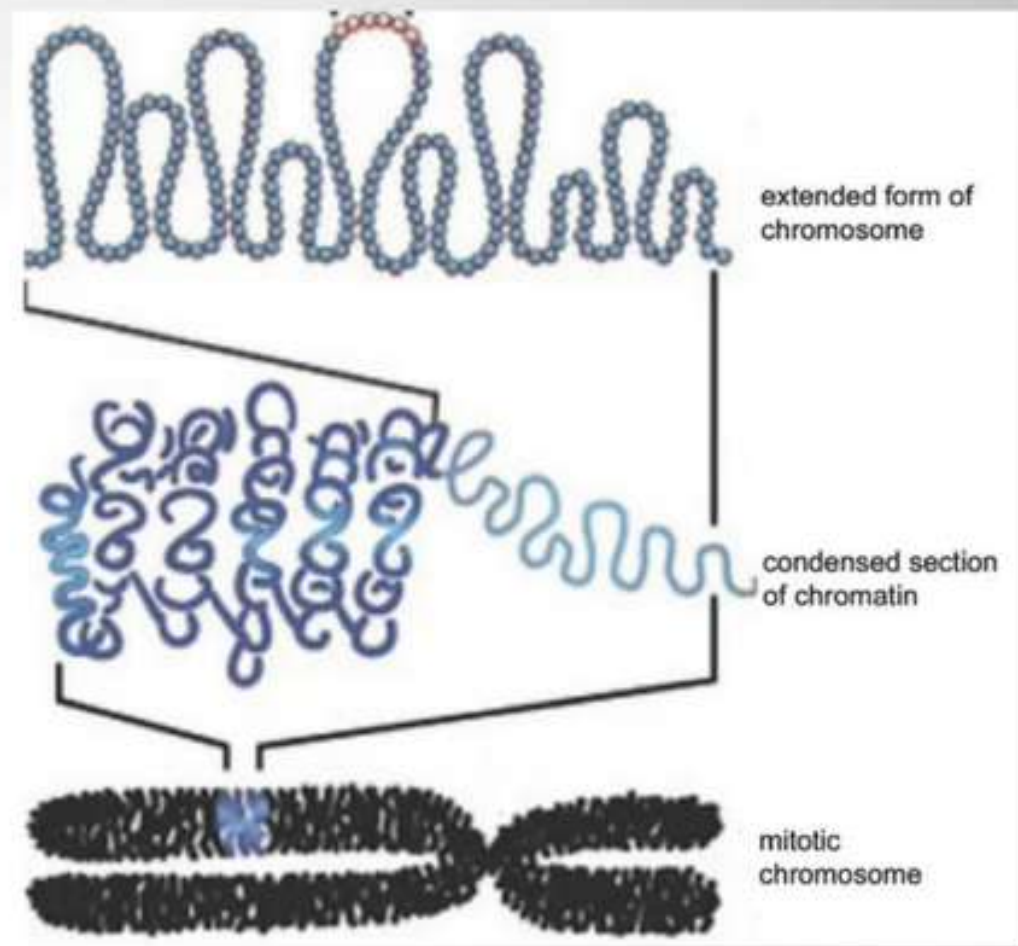
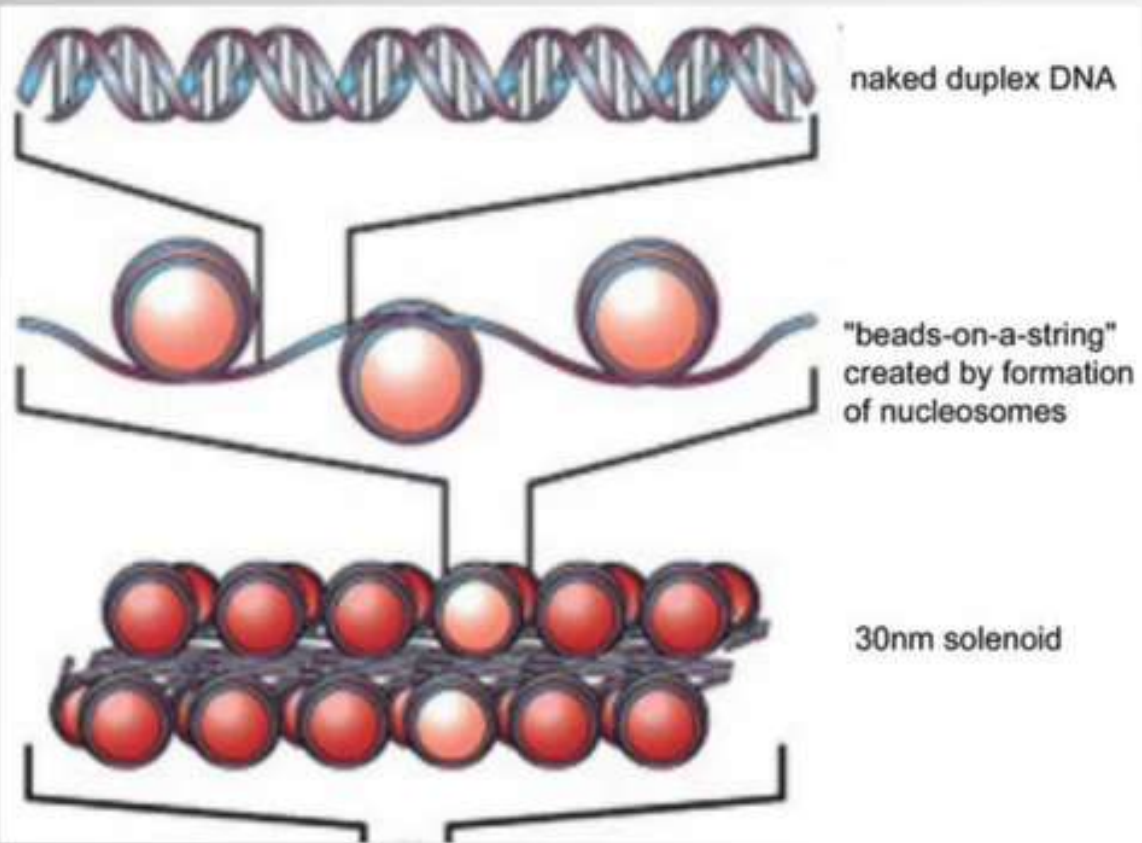
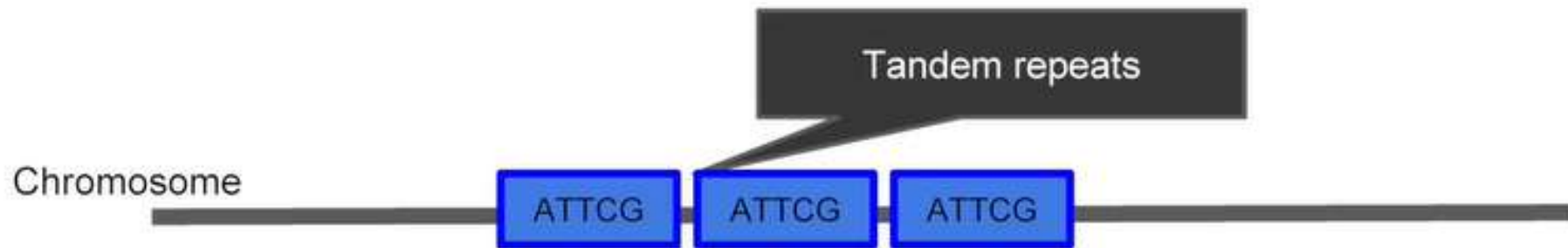


Molecular biology structures

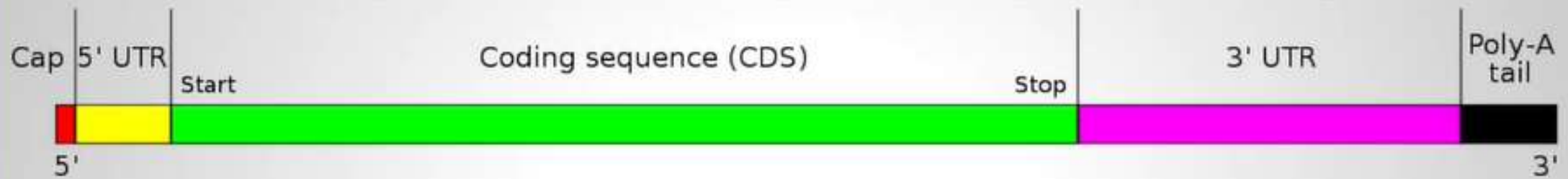


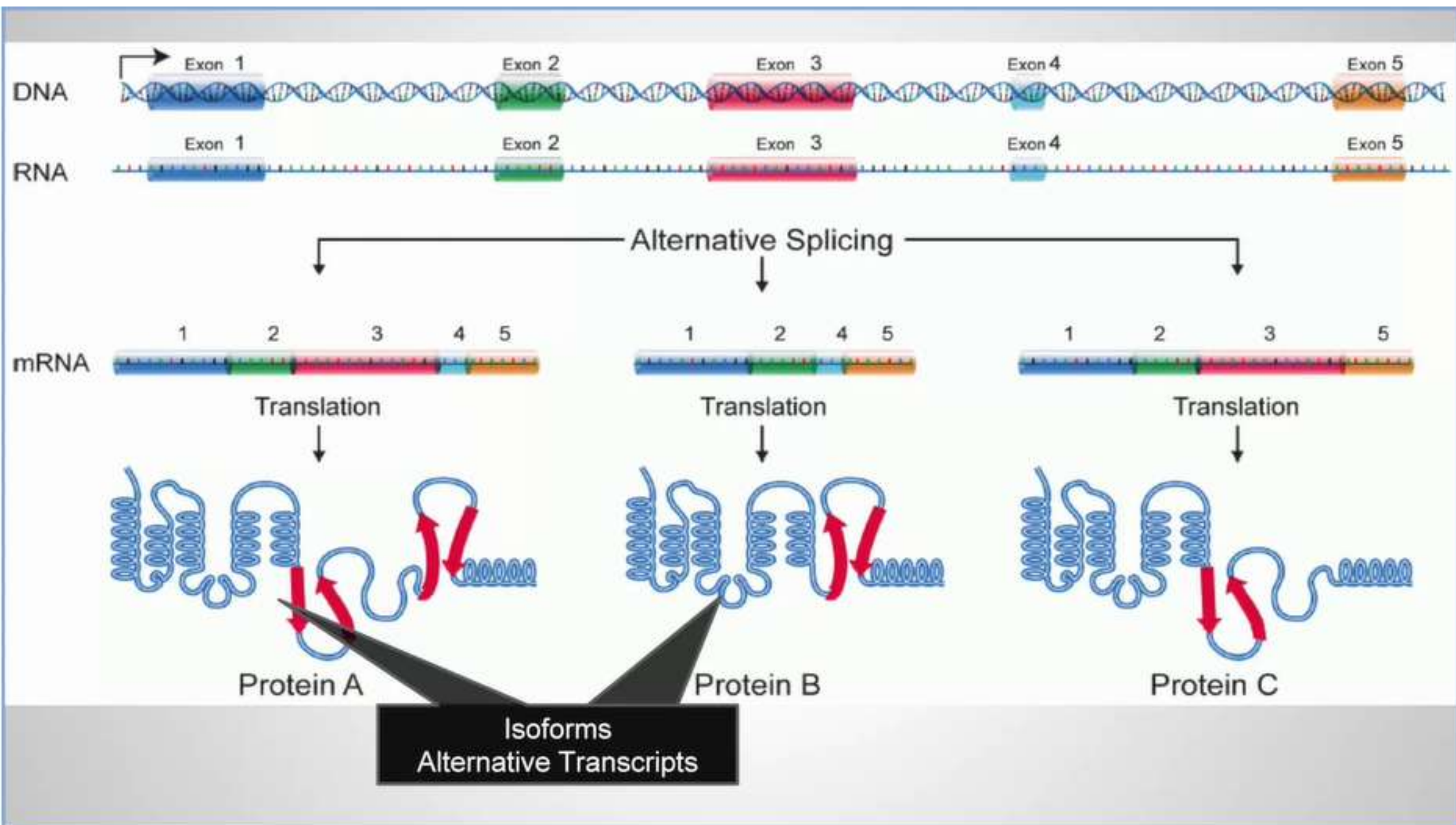
Steven Salzberg





The structure of a typical human protein coding mRNA including the untranslated regions (UTRs)

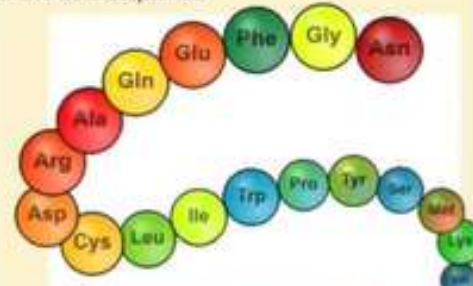




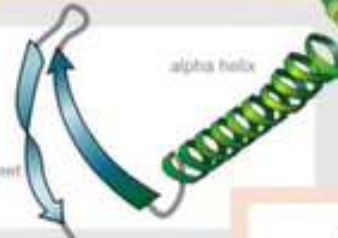
Molecular Biology Structures

image credits: http://commons.wikimedia.org/wiki/File:Main_protein_structure_levels_en.svg
http://commons.wikimedia.org/wiki/File:Protein_structure_examples.png


Primary structure
amino acid sequence



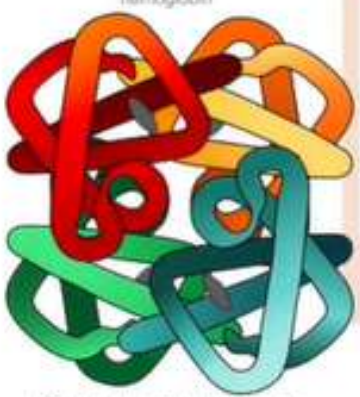
Secondary structure
regular sub-structures

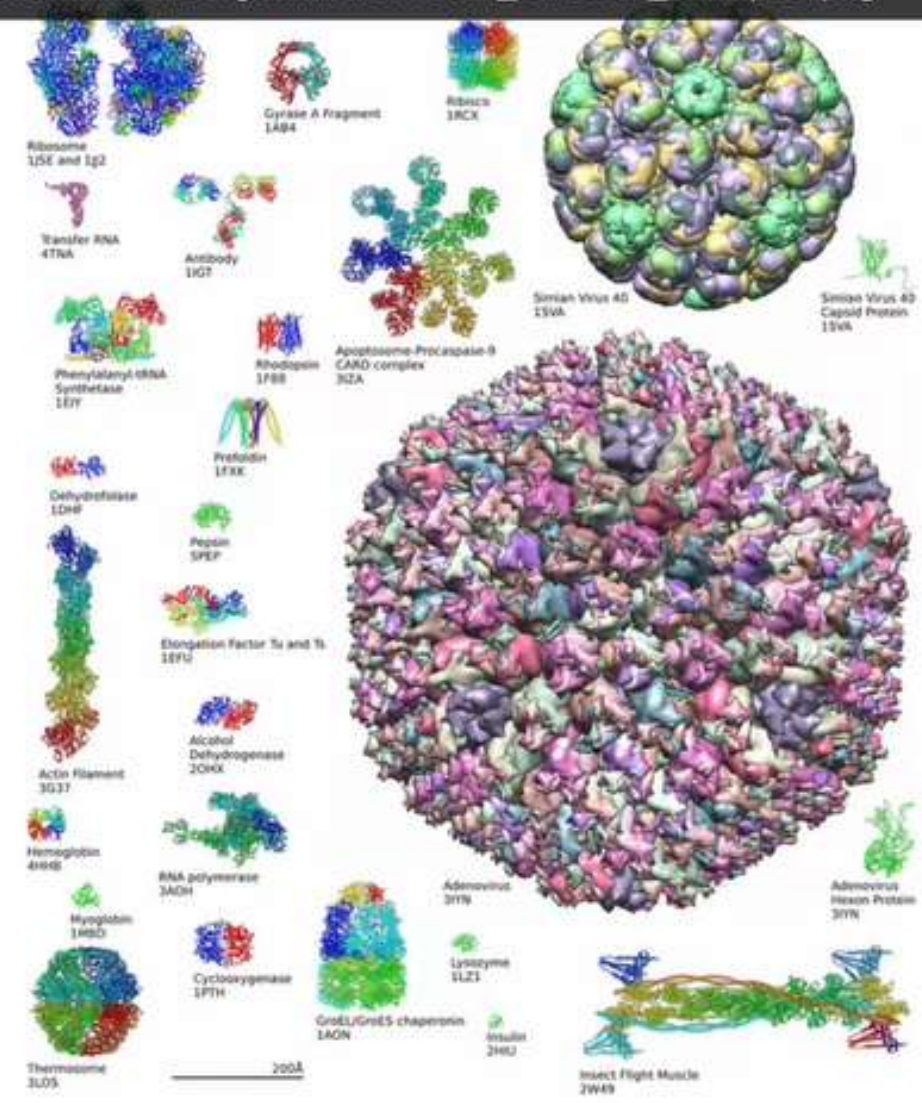


Tertiary structure
three-dimensional structure



Quaternary structure
complex of protein molecules





transcription factors

of eukaryotic cells

1 Activator proteins bind to pieces of DNA called enhancers. Their binding causes the DNA to bend, bringing them near a gene promoter, even though they may be thousands of base pairs away.

Enhancers

Activator proteins

Other transcription factor proteins

2 Other transcription factor proteins join the activator proteins, forming a protein complex which binds to the gene promoter.

Gene

Promoter

3 This protein complex makes it easier for RNA polymerase to attach to the promoter and start transcribing a gene.

RNA polymerase

note

This diagram simplifies the DNA greatly—promoters, enhancers, and insulators can be dozens or even hundreds of base pairs long.

4 An insulator can stop the enhancers from binding to the promoter, if a protein called CTCF (named for the sequence CCCTC, which occurs in all insulators) binds to it.

Methyl groups

Insulator

5 Methylation, the addition of a methyl group to the C nucleotides, prevents CTCF from attaching to the insulator, turning it off, allowing the enhancers to bind to the promoter.

CTCF

(CCCTC-binding factor)

