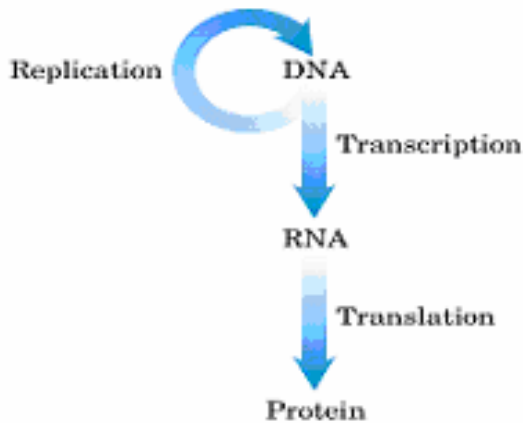


Genes and Chromosomes



DNA molecules are the largest macromolecules in the cells and are commonly packed into structures called **chromosomes**.

A single chromosome may carry thousand of **genes**

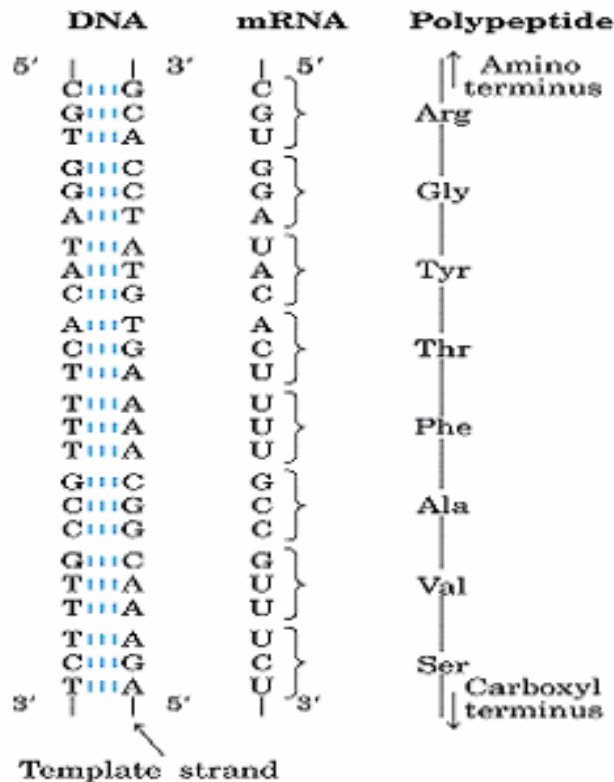
Together, all of a cell's gene and intergenic DNA (DNA between genes) is called **GENOME**

The Sizes of DNA and Viral Particles for Some Bacterial Viruses (Bacteriophages)

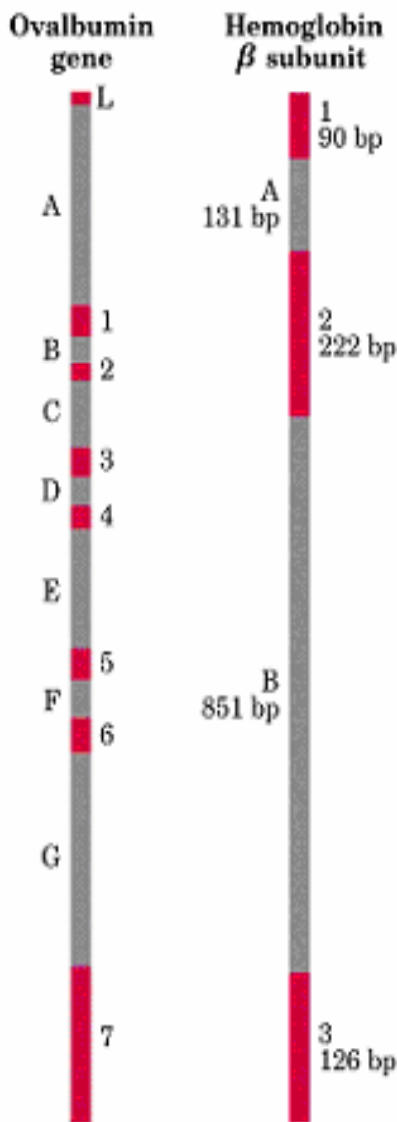
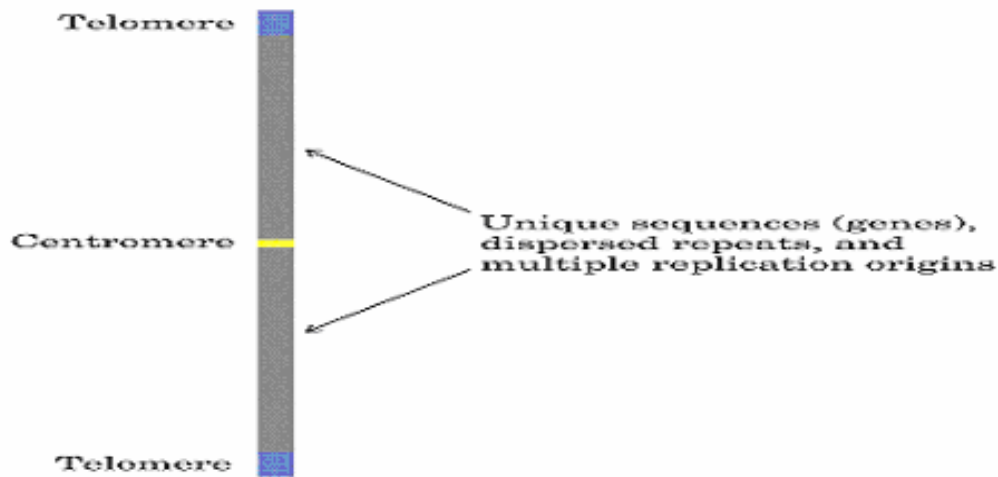
Virus	Number of base pairs in viral DNA*	Length of viral DNA (nm)	Long dimension of viral particle (nm)
φX174	5,386 [†]	1,939 [†]	25
T7	39,936	14,377	78
λ (lambda)	48,502	17,460	190
T4	168,889	60,800	210

* The complete base sequences of these bacteriophage genomes have been determined.

[†]Data are for the replicative form (double-stranded).



Chromosome



Genes

introns – intervening sequences

exons – coding sequences

Normal Chromosome Number in Some Organisms*

Bacteria	1	Honeybee (female)	32
Fruit fly	8	Fox	34
Red clover	14	Cat	38
Garden pea	14	Mouse	40
Yeast	16 [†]	Rat	42
Maize (corn)	20	Rabbit	44
Frog	26	Human	46
Hydra	30	Chicken	78

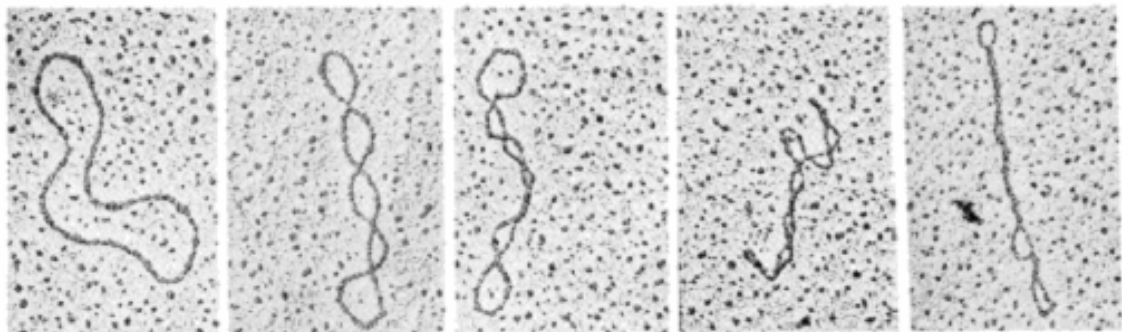
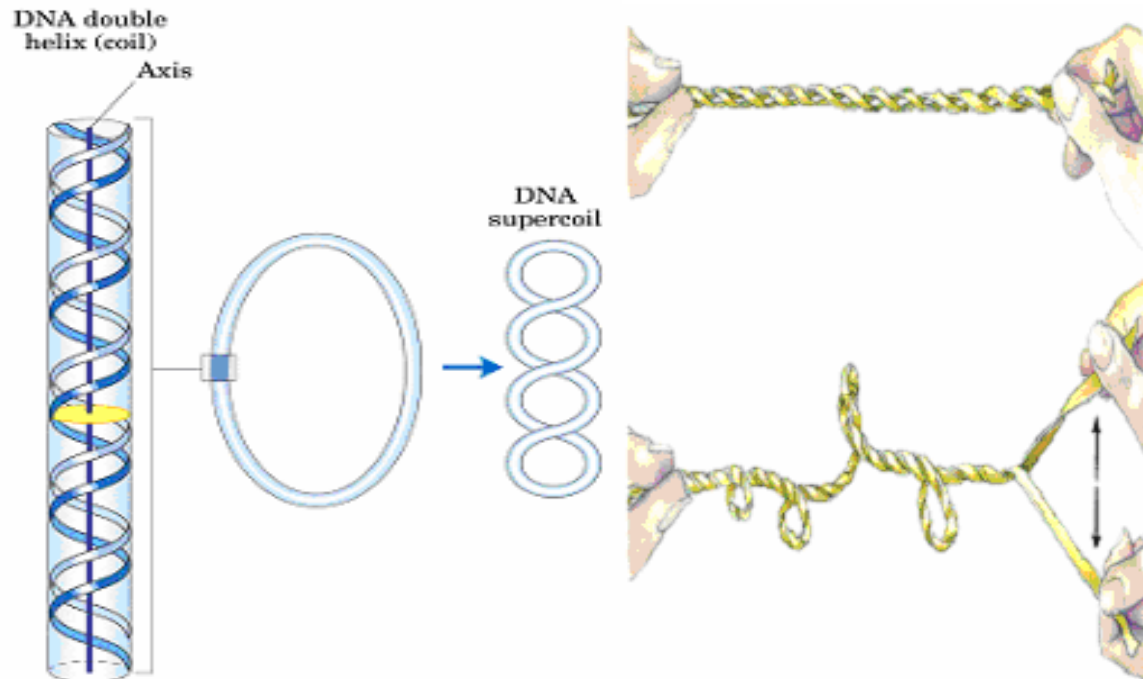
*The diploid chromosome number is given for all eukaryotes except yeast.

[†]This is the haploid chromosome number for the yeast *Saccharomyces cerevisiae*. Wild yeast strains generally have eight (octoploid) or more sets of these chromosomes.

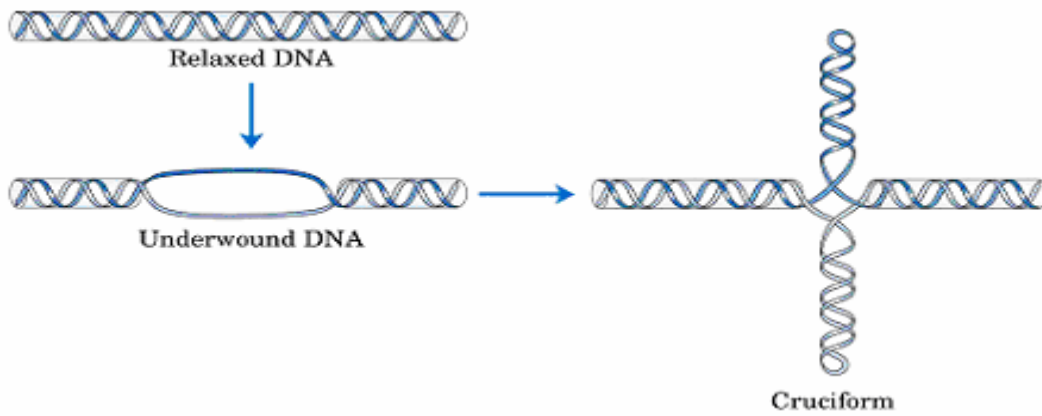
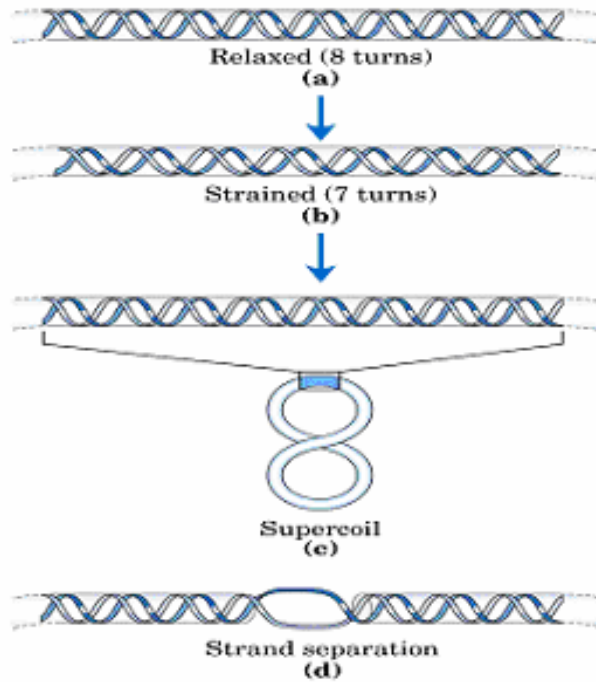
Eukaryotic chromosomes



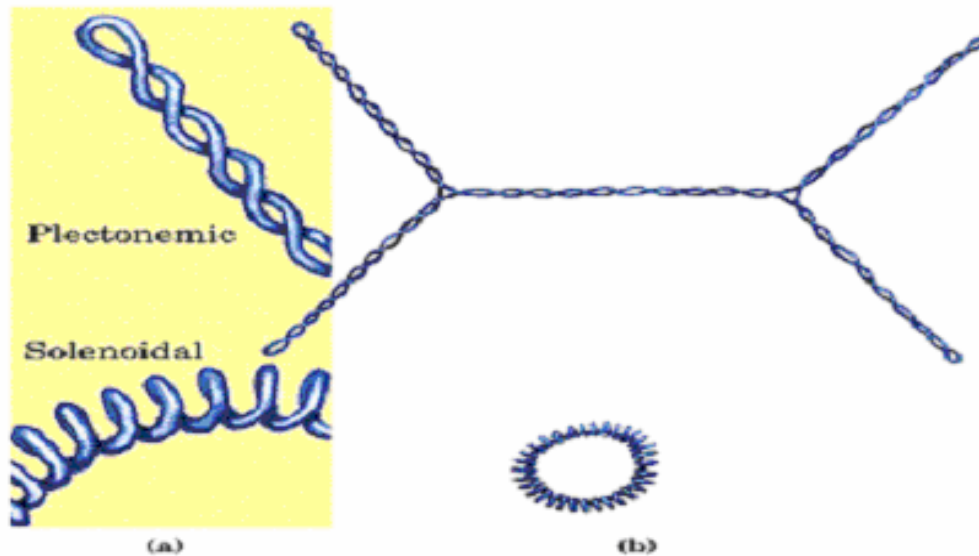
Supercoiling of DNA

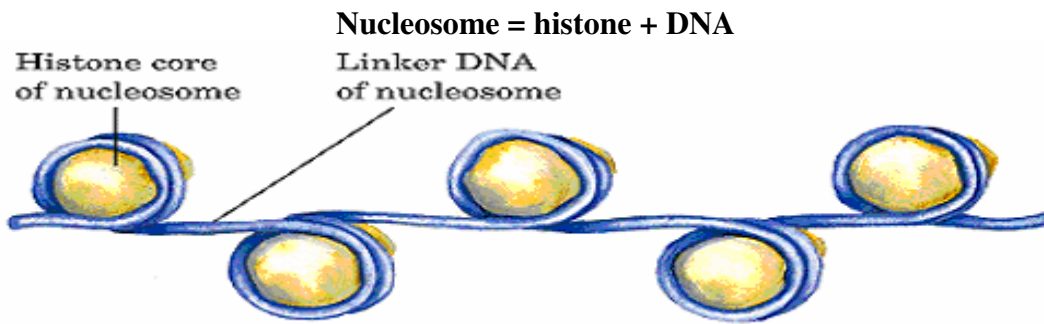


0.2 μm



Plectonemic and solenoidal supercoiling





(a)

Types and Properties of Histones

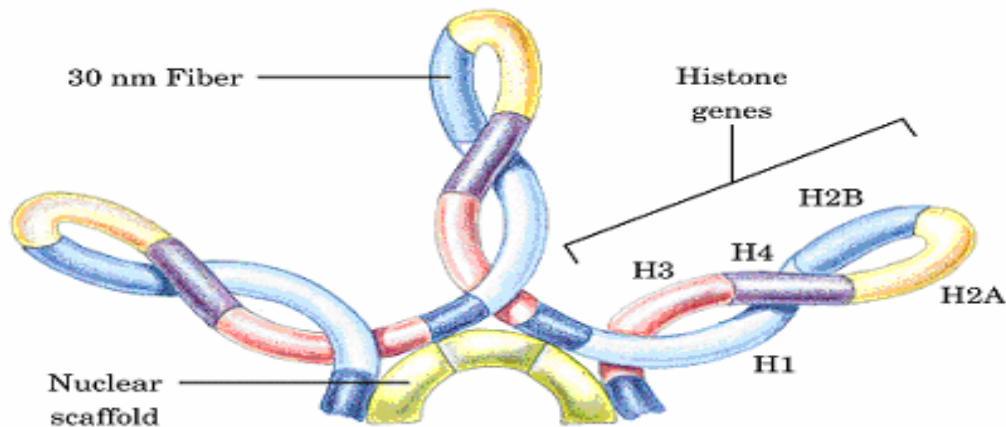
Histone	Molecular weight	Number of amino acid residues	Content of basic amino acids (% of total)	
			Lys	Arg
H1*	21,130	223	29.5	1.3
H2A*	13,960	129	10.9	9.3
H2B*	13,774	125	16.0	6.4
H3	15,273	135	9.6	13.3
H4	11,236	102	10.8	13.7

*The sizes of these histones vary somewhat from species to species. The numbers given here are for bovine histones.

Nucleosomes are packed in 30nm fiber



Loops of 30nm fiber attached to nuclear scaffold



Two chromatids
(10 coils each)

One coil
(30 rosettes)

One rosette
(6 loops)

Nuclear
scaffold

One loop
(~75,000 bp)

30 nm Fiber

"Beads-on-a-string"
form of
chromatin

DNA

