

# Introduction of bioinformatics

December 16, 2002

- Cells are structural units that make up plants and animals.
- The most striking and usually the largest structure inside animal and plant cells is called nucleus (plural is nuclei). Living things are divided into two groups.

1). Eukaryotes that possess nuclei.

2). Prokaryote means lack of nuclei- single celled- bacteria.

Inside the nuclei, there are small structures called chromosomes.

	chromosomes	pairs
Fruit flies	8	4
Human	46	23
Bat	46	23
Corn	20	10
rhinoceroses	84	42

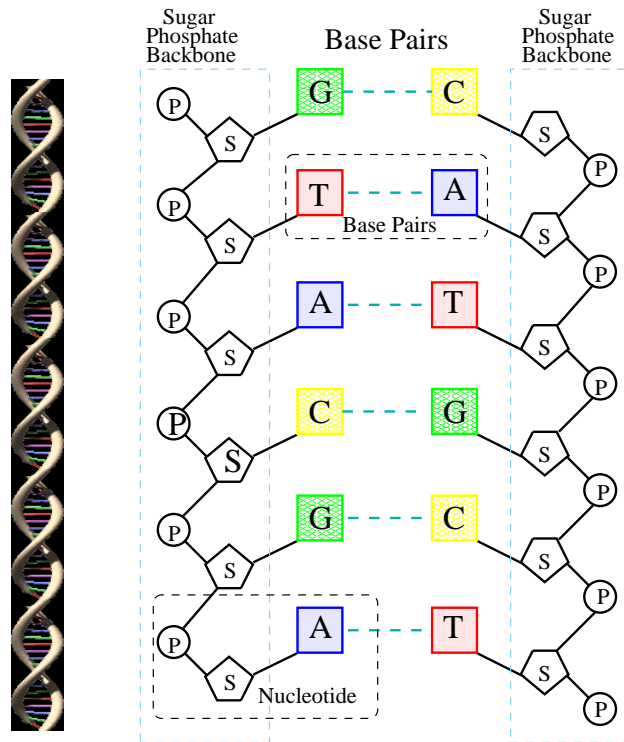
- Chromosomes can be grouped into pairs on the basis of similar shape.
- Genome consist of tightly coiled threads of deoxyribonucleic acid (DNA) and associated protein molecules organized in to structure.
- Genome- All the genetic material in the chromosomes of a particular organism. Genome size is generally given as its total number of base pairs.
- DNA- DNA is a molecule which encodes genetic information. It is a long coiled, double stranded chain of interlocking base pairs, called double helix.

- Four types of bases in DNA.

A	Adenine	T	Thymine
G	Guanine	C	cytosine

- The distinctive ring in DNA is joined to another group of atoms that is identical in each kind of nucleotide. This common portion includes a sugar called deoxyribose attached to a phosphate (P) group.
- Chemical bonds between the phosphate on each deoxyribose and the deoxyribose of a neighboring nucleotide.
- Phosphate links below through a deoxyribose carbon designated by 3' and above through a deoxyribose carbon designated by 5'.

# DNA



- Double helix - storing information necessary to direct the production of proteins.
- Four types of base: A, T, C, G.
- Base pairs: (A,T), (G,C).
- Complementary strands, capable of precise self-replication.

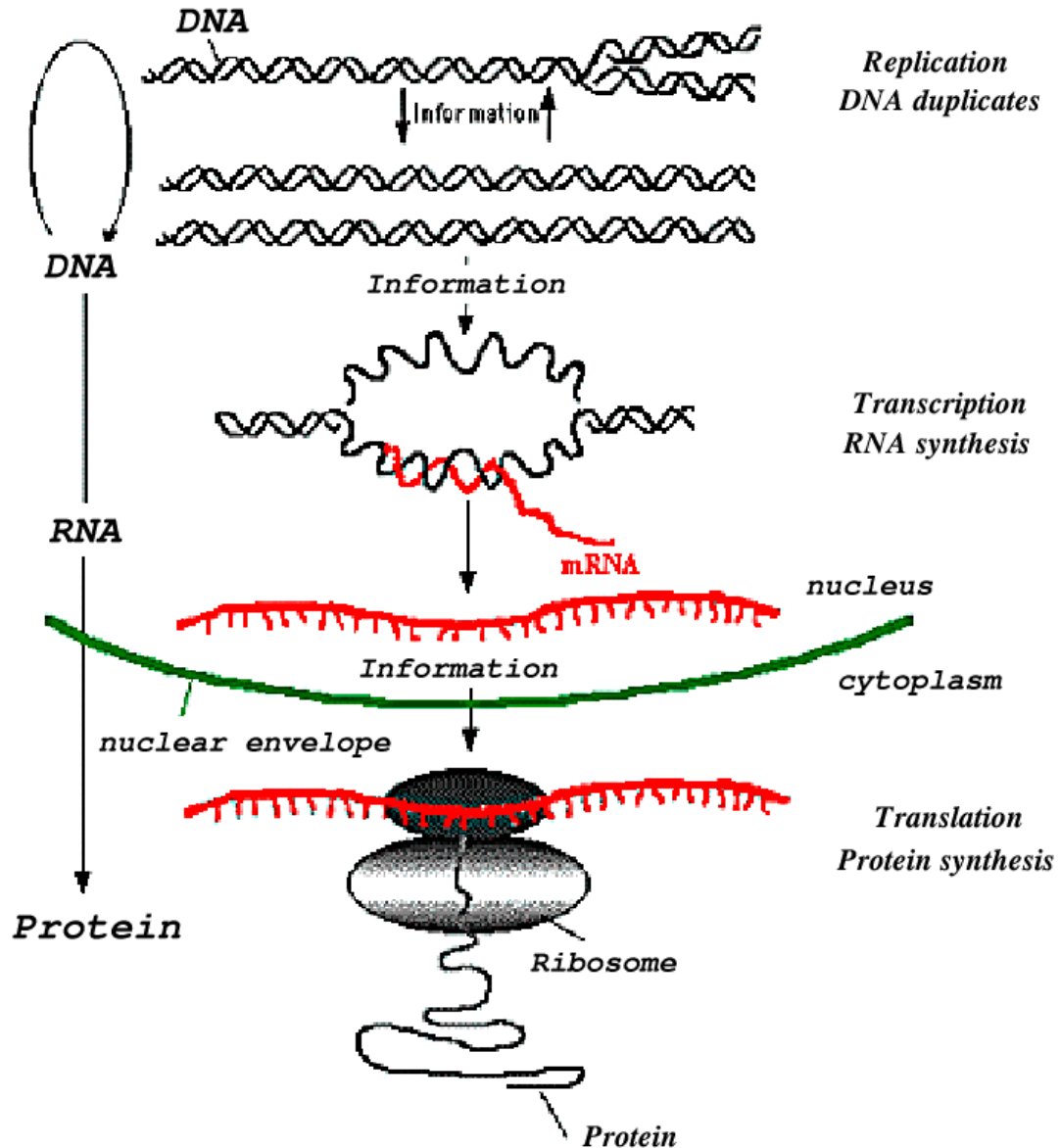
- Base pairs: (A,T), (G,C).
- Order of the basis in the DNA called the sequence, creates a code for information: Code 'ATC' has a different meaning than the code 'TCA'.
- Each cell is equipped with special machinery used to read the sequence and use the information encoded.
- All the genetic information in an organism is referred to collectively as a genome.
- One copy of the human genome is about three billion bases long.

- Gene- A gene is a section of DNA strand that carries the instructions for a specific function.
- Example- Globin genes contain instructions for making hemoglobin protein, which is the protein that allows our blood to carry oxygen through out the body.
- Human have about 60,000 different genes which work together in complex ways to control much of what our bodies do.
- RNA - DNA is stored in the nucleus. The first step in interpreting the information encoded by a gene is to make a copy of the information that can travel outside the nucleus.

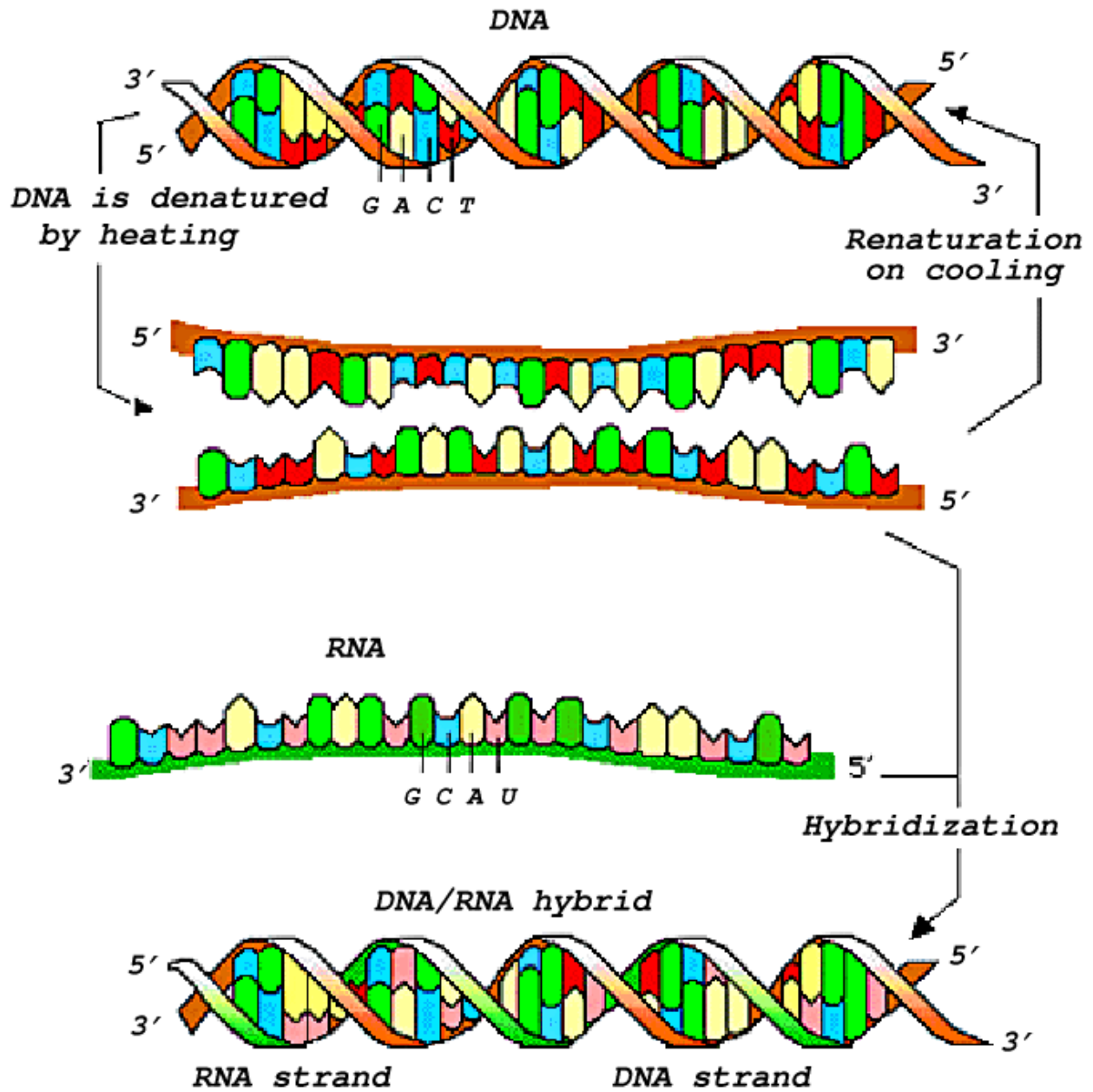


- The process of making this copy is called transcription and the copy is called messenger RNA or mRNA.
- RNA is an information encoding molecule that is very similar to DNA except that:
  - 1). it is a single strand
  - 2). it uses a base called uracil(U) in place of Thymine (T) in DNA.

# Central Dogma



# Hybridization



- Transcription-

- 1). Nucleotide sequence in a gene's DNA is copied into an RNA chain.
- 2). An RNA polymerase molecule binds to promoters of DNA.
- 3). The enzyme separates the two strands of the DNA and selects one strand as the template for copying.
- 4). Each nucleotide to be added to the RNA chain is determined by complementary base-pairing with the successive nucleotides in the selected DNA strand.

5). As the RNA polymerase moves from the beginning to the end of the gene's coding sequence, each properly matched nucleotide is added to the growing end of the RNA chain.

6). The newly made RNA strand has the same nucleotide sequence (except that U replaces T) and the same direction as one of the two DNA strands.

- Protein

Proteins are complex chemicals.

Proteins consist of one or more chains, these chains are called polypeptides.

Polypeptides are linear polymers of amino acids.

- 20 different amino acids:

Ala	Cys	Asp	Glu	Phe	Gly	His	Ile
A	C	D	E	F	G	H	I
Lys	Leu	Met	Asn	Pro	Gln	Arg	Ser
K	L	M	N	P	Q	R	S
Thr	Val	Trp	Tyr				
T	V	W	Y				

- Proteins called enzymes

- 1). directs the building of cell structure.
- 2). allow bodies to get energy from the food.

- To make the protein encoded by a gene, the mRNA attaches to a special machinery in the cell called ribosome that can read the genetic code and make a protein. This process is called as translation.