

# Computer genomics

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# 1 Rembering old topics on DNA

What is DNA made of?

- Pentose sugar (the *sides* of the ladder)
- Phosphate group (the *sides* of the ladder)
- Nitrogenous bases (the rungs of the ladder)

**What is a polymer:**

Any of a class of natural or synthetic substances composed of very large molecules, called macromolecules.

What is a Nitrogenous base made of?

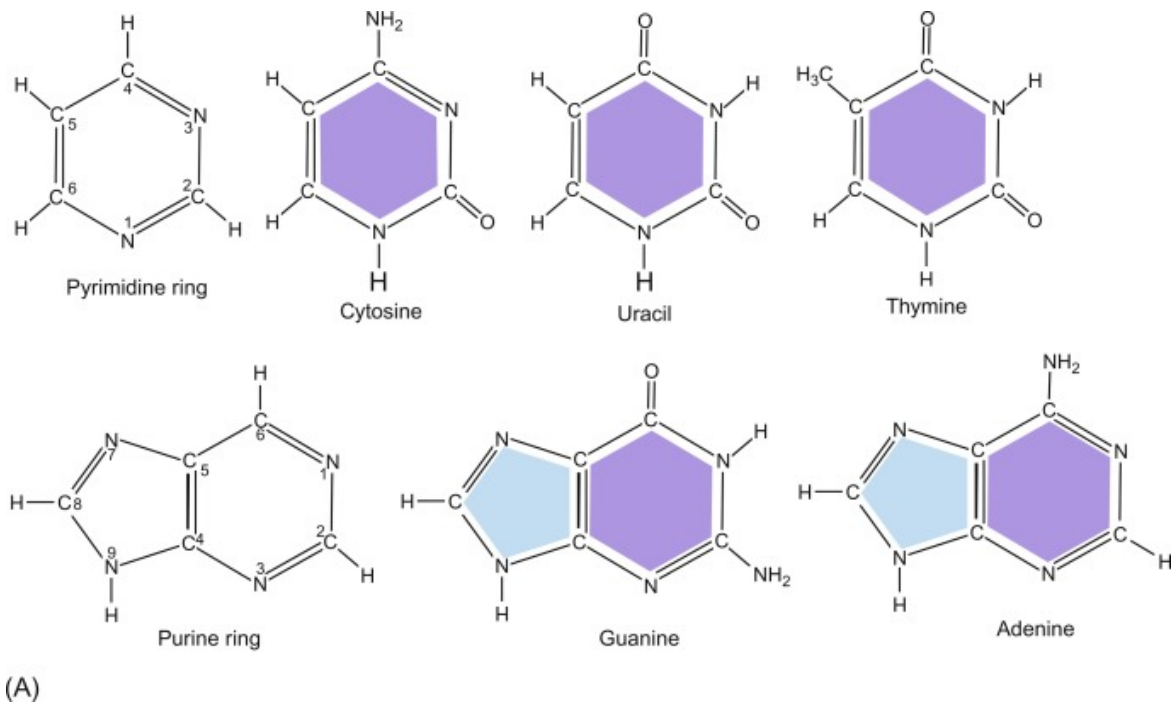


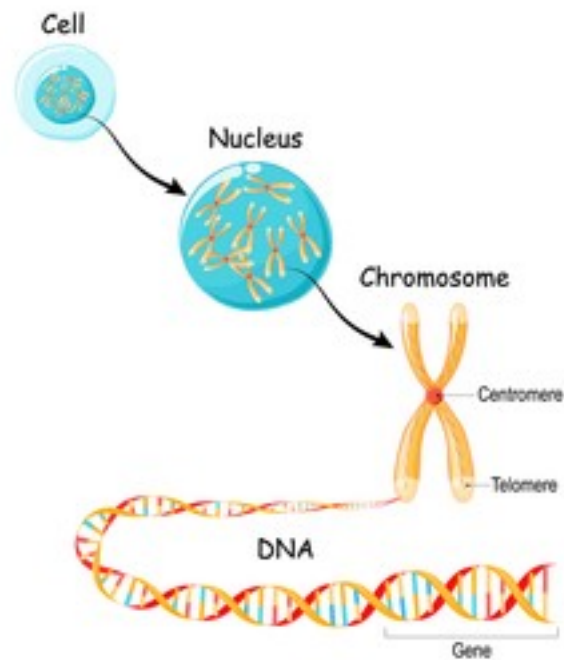
Figure 1: Nitrogenous bases are made of...

What process can you do with DNA?

- Translation (Protein Synthesis)
- Transcription (Synthesizes RNA)
- Central Dogma (Transcription + Translation)

## Where on earth can I find DNA?

The nucleus of a cell contains Chromosomes and DNA is contained within the Chromosomes.



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Figure 2: DNA...

## Nucleotide composition

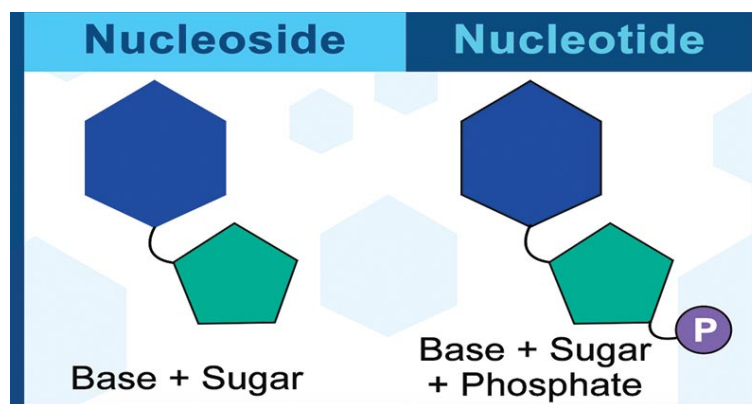


Figure 3: Here we see a nucleotide and a nucleoside

Remember!

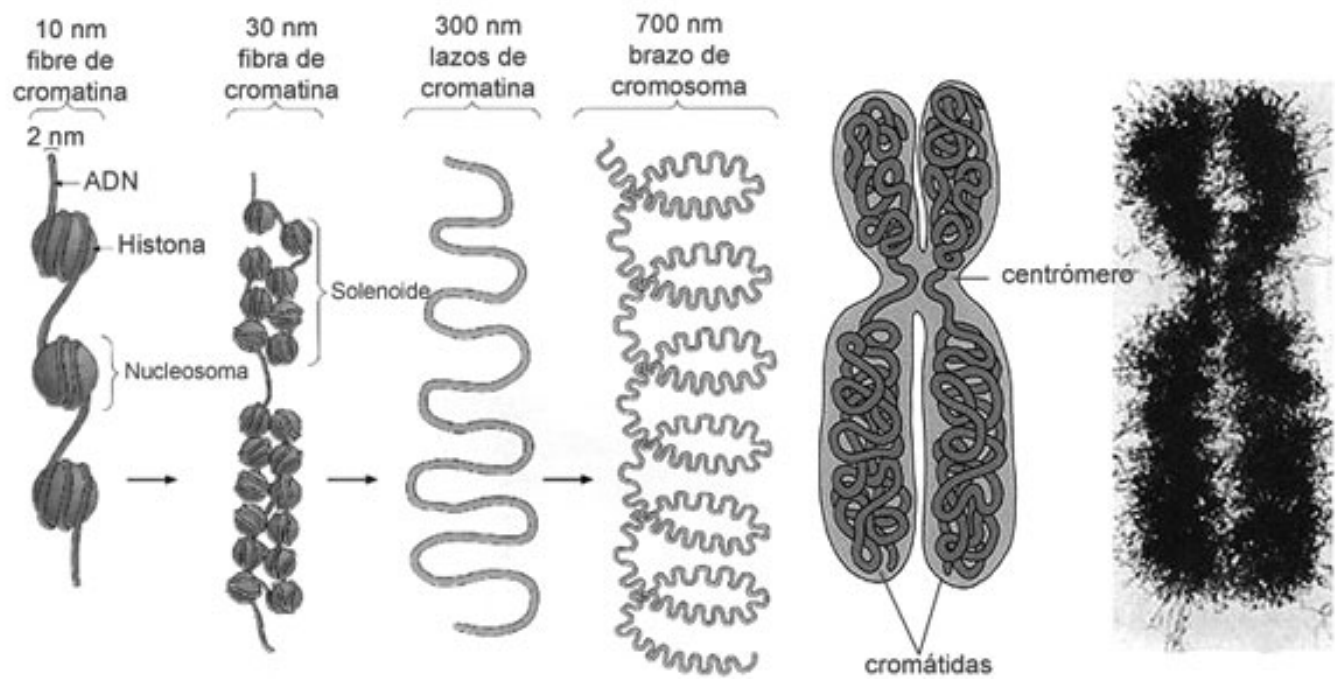


Figure 4: A deeper look into Chromosomes

## 2 Beginning and struggles in the age of genomics.

Notes about the video:

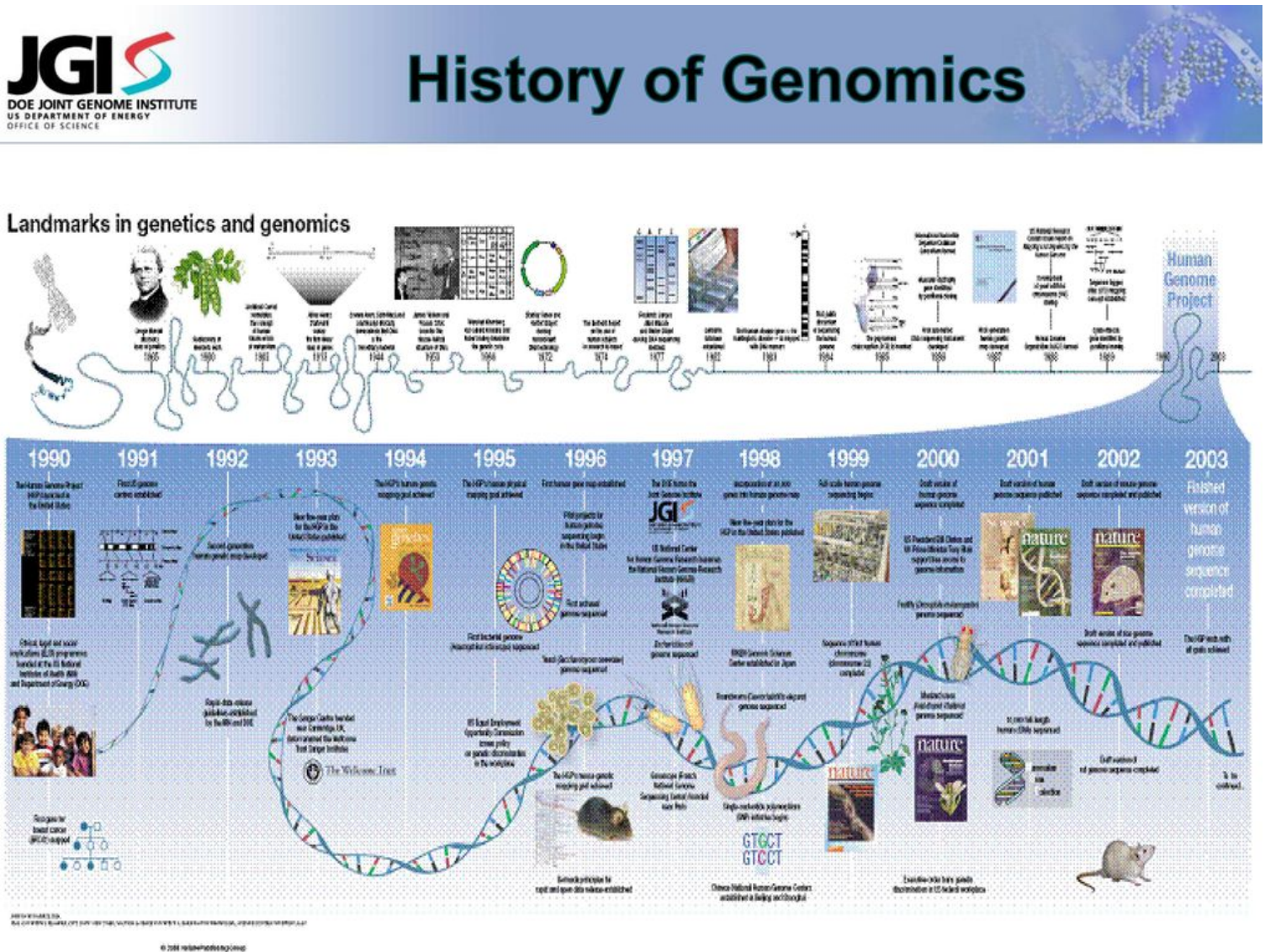


Figure 5: History of Genetics

## 3 Important years

- 1865: Laws of genetics (Mendel laws).
- 1900: Darwin theory + Mendel laws join together
- 1913: Alfred Henry first linear genetic maps
- 1953: Watson and Crick discover the structure of DNA

1966: Determination of the genetic code  
 1977: Creating of the first methods to sequence DNA  
 1982: GenBank database was established  
 1985: Discovery of the chain reaction polymerase  
 1988: They start to talk about the human genome project  
 1990: The human genome starts and the ELS(Ethical, legal and social implications)  
 1993: The wellcome Trust Sanger Institute  
 1997: Joint Genome institute and National Humans Genome Research Institute (JGI and NHGRI)  
 2003: Finished version of the human genome sequence completed

**Challenges** Biology: Concrete the structure and function of the genomes.  
 Health: Find benefits based on the human genome knowledge.  
 Society: Use genomics to maximize the benefis and minimize dangers in society.

- Humans share 99 of their DNA.
- Thymine gets along with Adenine. (hydrogen bonding)
- Guanine gets along with Cytosine. (hydrogen bonding)
- Model organisms: yeast, bacteria.

### **The biggest challenges:**

- Indentify the functional and structural components in the HG.
- Understand the organization of the genetic networks and protein routes to see how they co-relate to the phenotype in organisms.
- To develop a detailed hereditary variation in the HG.
- To comprehend the genetic variation between species as a factor for evolution.
- To develop laws that allow the generalized use of the information about the HG for both research purposes and clinic purposes.
- Find diseases caused by pecific gens.
- Use probability to predict genetic diseases and drug side effects.
- Kill mosquitos using genetics haha
- Become super humans?
- Relationship (gens) - (human behavior).
- Find genetic variations that contribute on your helath and resistance against diseases.
- Ethics boundaries because of course we are mad scientists.

**The solutions:**

**1. Develop technology**

- Sanger sequencing
- Marker based genetics.
- Cloning.
- Chain reaction of the polymerase

**2. Make resources available**

**3. Computational Biology**

**4. Education at different levels**

**5. ELSI (Ethic Legal Social implications)**