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# Estrutura e composição química dos ácidos nucleicos

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A análise genética da expressão fenotípica e dos padrões de herança dos genes **não revela** a estrutura dos genes, como são copiados e nem como determinam as características celulares.

# Primeiras informações

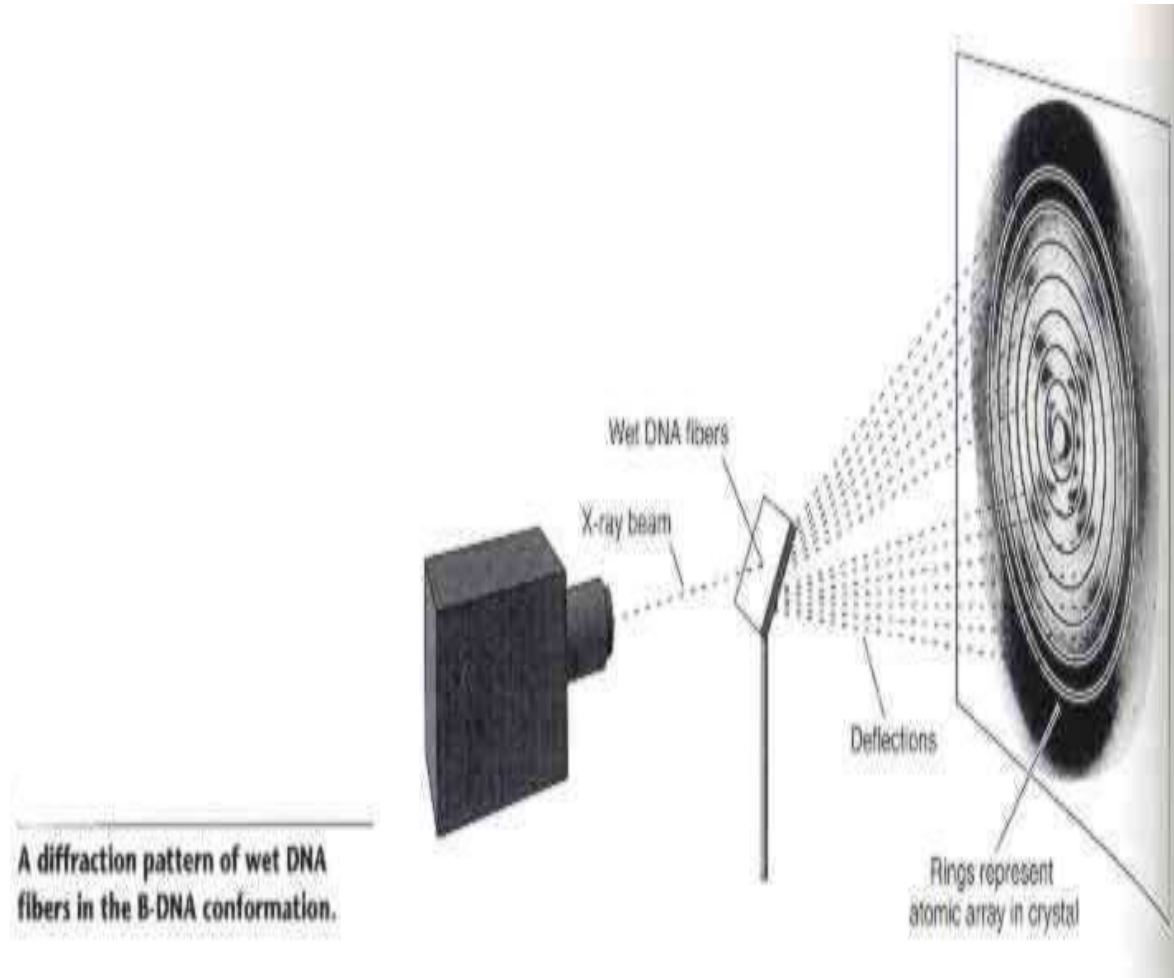
Chargaff (1950)

**Conteúdo em bases nitrogenadas de amostras de DNA  
obtidas de vários organismos**

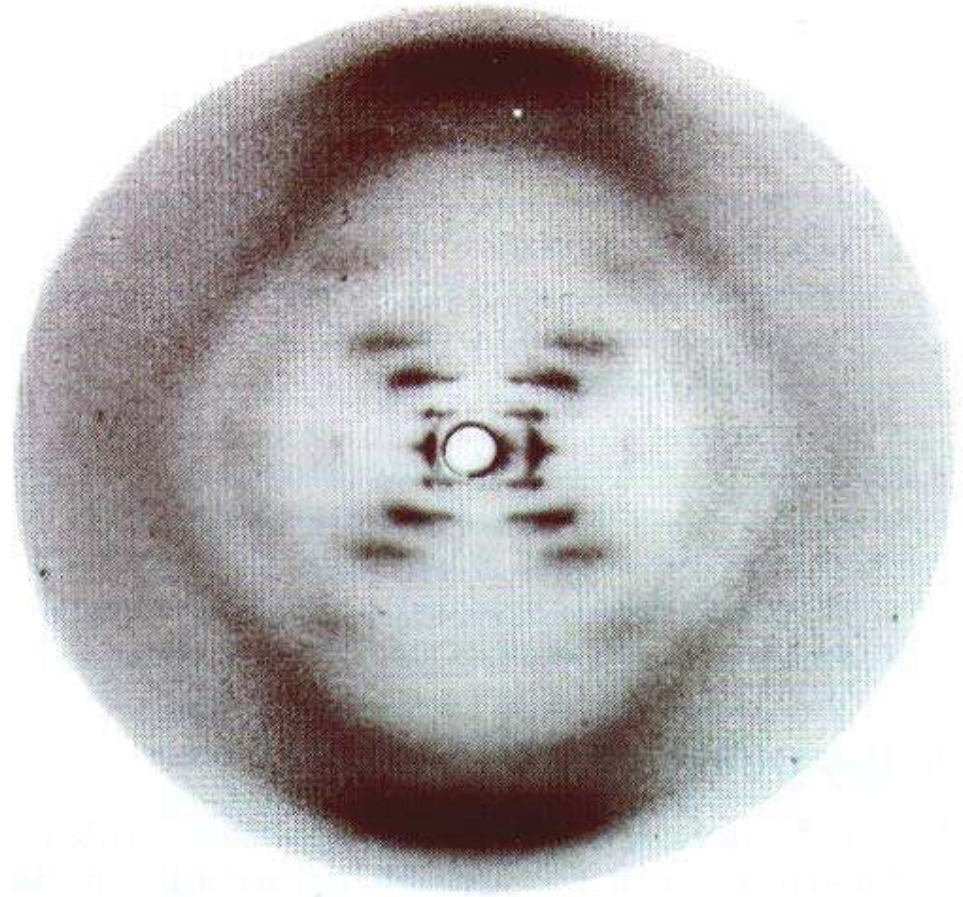
Organismo	% de Bases (baseado em molaridade)			
	Adenina	Timina	Guanina	Citosina
<i>Escherichia coli</i>	26.0	23.9	24.9	25.2
Pneumococcus (tipo III)	29.8	31.6	20.5	18.0
Levedura	31.7	32.6	18.3	17.4
Tartaruga	28.7	27.9	22.0	21.3
Salmão (esperma)	29.7	29.1	20.8	20.4
Frangos	28.0	28.4	22.0	21.6
Humanos (fígado)	30.8	30.3	19.5	19.9

# Estudos de difração de raios X

Rosalind Franklin &  
Maurice Wilkins  
(início da década de 50)



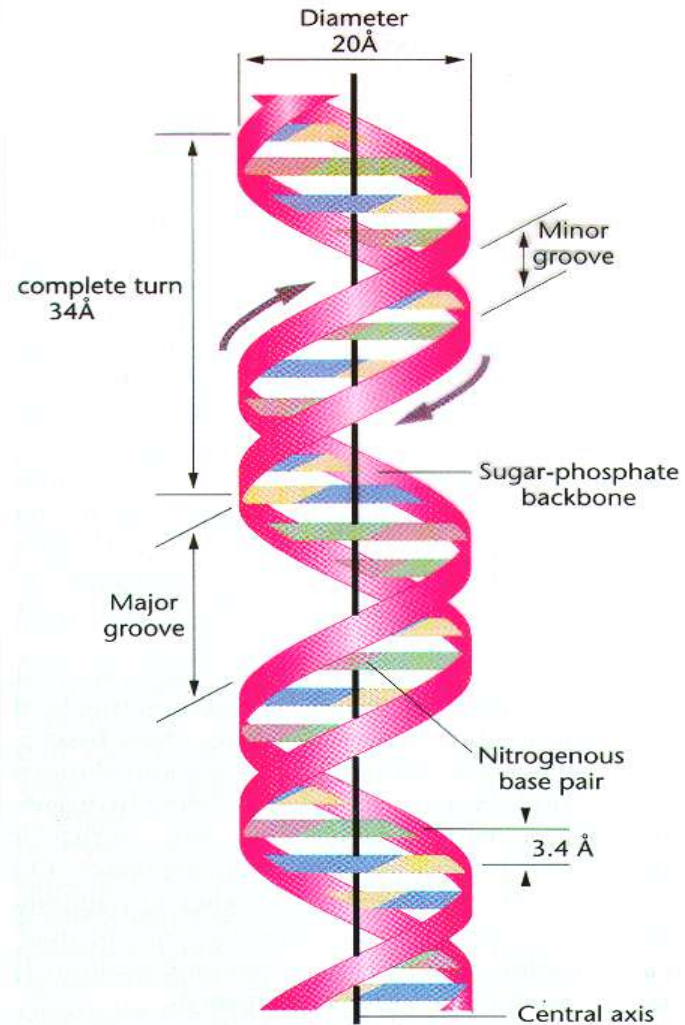
# Difração de raios X



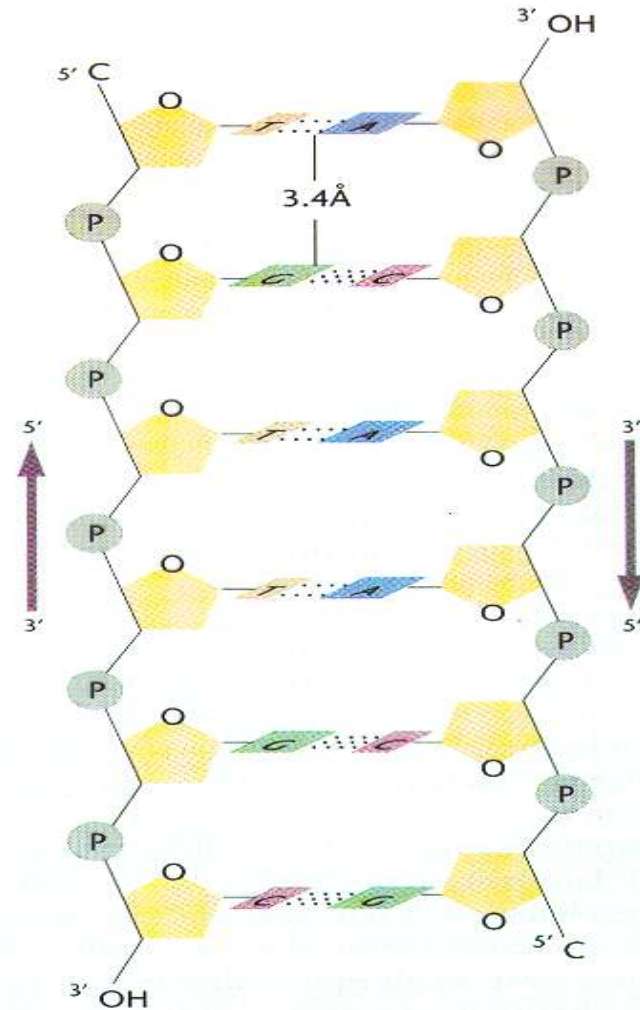
**FIGURE 10.13** An X-ray diffraction photograph of the B form of crystallized DNA. The dark patterns at the top and bottom provide an estimate of the periodicity of nitrogenous bases, which are 3.4 Å apart. The central pattern is indicative of the molecule's helical structure.

# Estrutura da molécula do DNA

- Watson & Crick (1953)
  - baseado em dados de:
    - composição em bases
    - difração de raios X



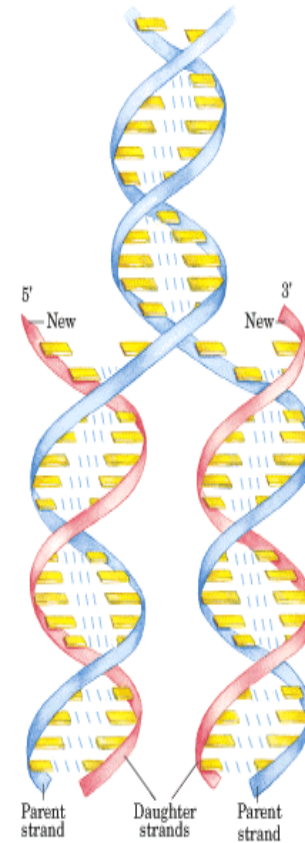
# Detalhamento da estrutura duplex



- medidas e ângulos

# Proposta de replicação do DNA

- modelo proposto por Watson & Crick (1953)





## The Nobel Prize in Physiology or Medicine 1962

"for their discoveries concerning the molecular structure of nuclear acids and its significance for information transfer in living material"

[Presentation Speech](#)

**Francis Harry Compton Crick**

Great Britain

Institute of Molecular Biology  
Cambridge, Great Britain

1916 -

[Biography](#)  
[Swedish Nobel Stamps](#)



**James Dewey Watson**

USA

Harvard University  
Cambridge, MA, USA

1928 -

[Biography](#)  
[Swedish Nobel Stamps](#)



**Maurice Hugh Frederick Wilkins**

Great Britain

University of London  
London, Great Britain

1916 -

[Biography](#)  
[Swedish Nobel Stamps](#)

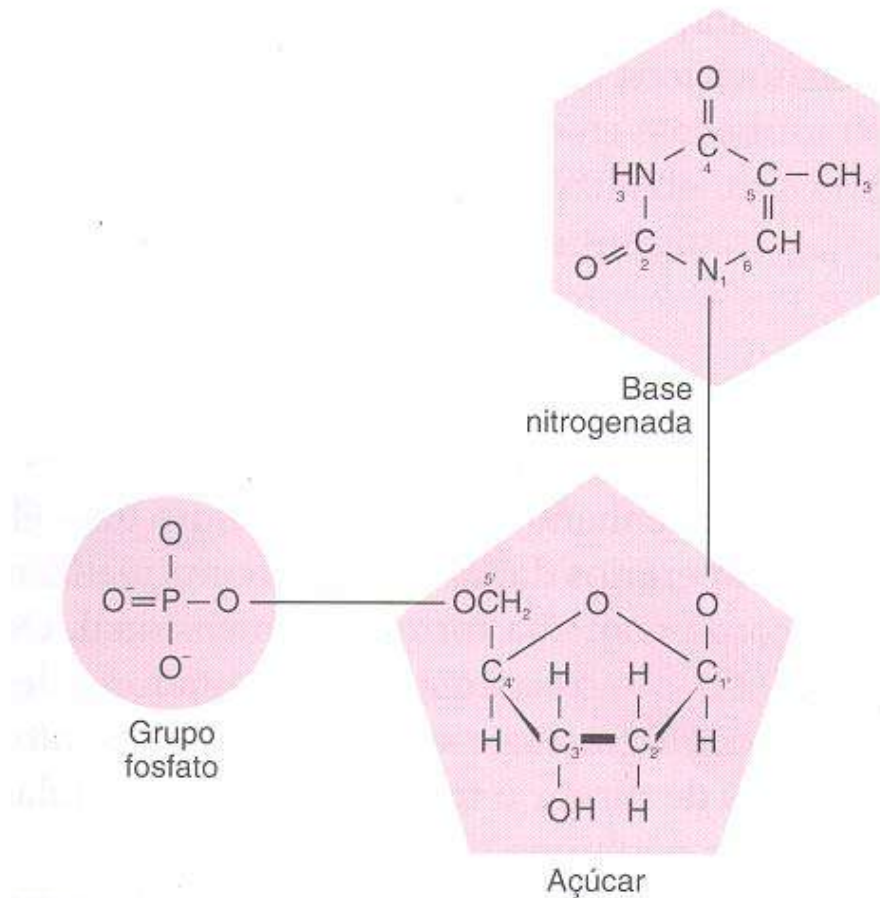
# Premio Nobel 1962

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# Detalhamento da composição química

- DNA e/ou RNA
  - polímeros
    - nucleotídeos
  - nucleotídeo
    - base nitrogenada
    - açúcar (pentose)
      - desoxirribose
      - ribose
    - ácido fosfórico



# Detalhamento da composição química

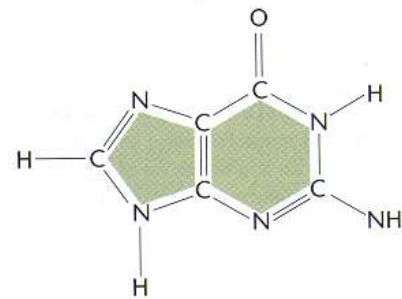
## ■ bases nitrogenadas

### □ púricas

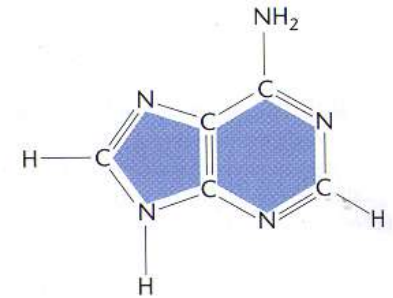
- adenina e guanina

### □ pirimidicas

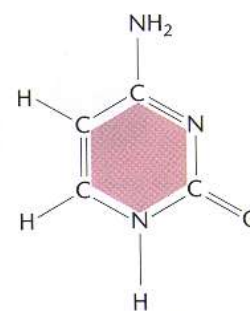
- citosina e timina



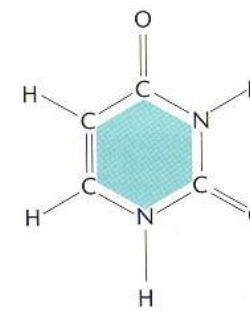
Guanine



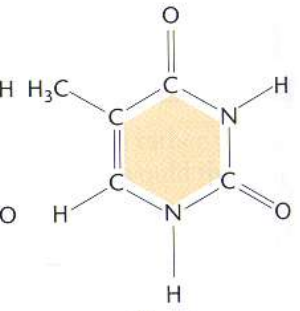
Adenine



Cytosine



Uracil



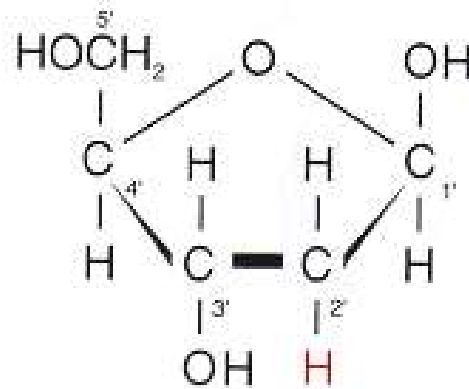
Thymine

# Detalhamento da composição química

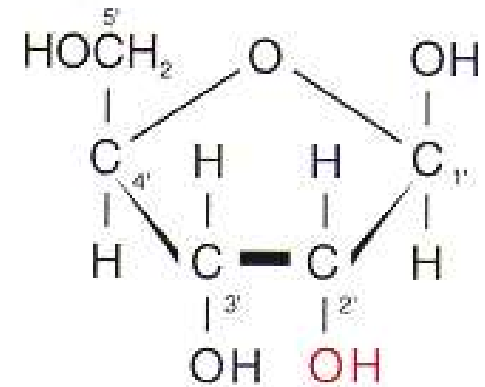
- açúcares (pentoses)

- desoxirribose

- ribose



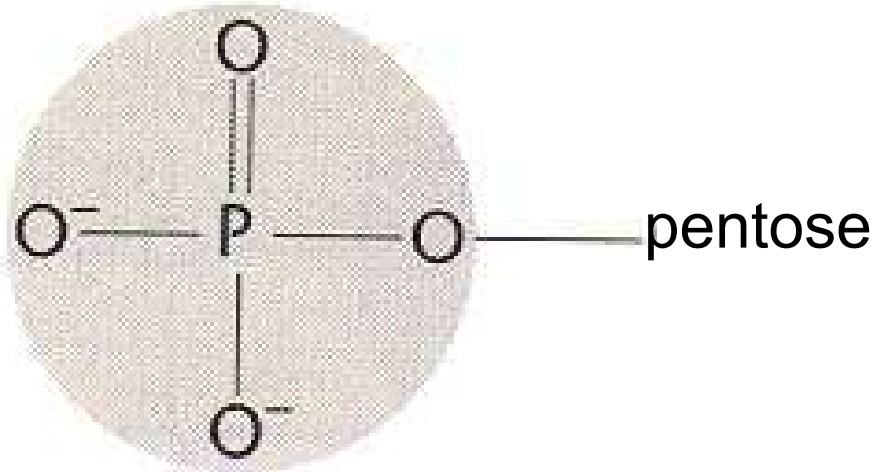
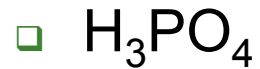
Desoxirribose



Ribose

# Detalhamento da composição química

- ácido fosfórico



# Polimerização:

nucleotideo 1



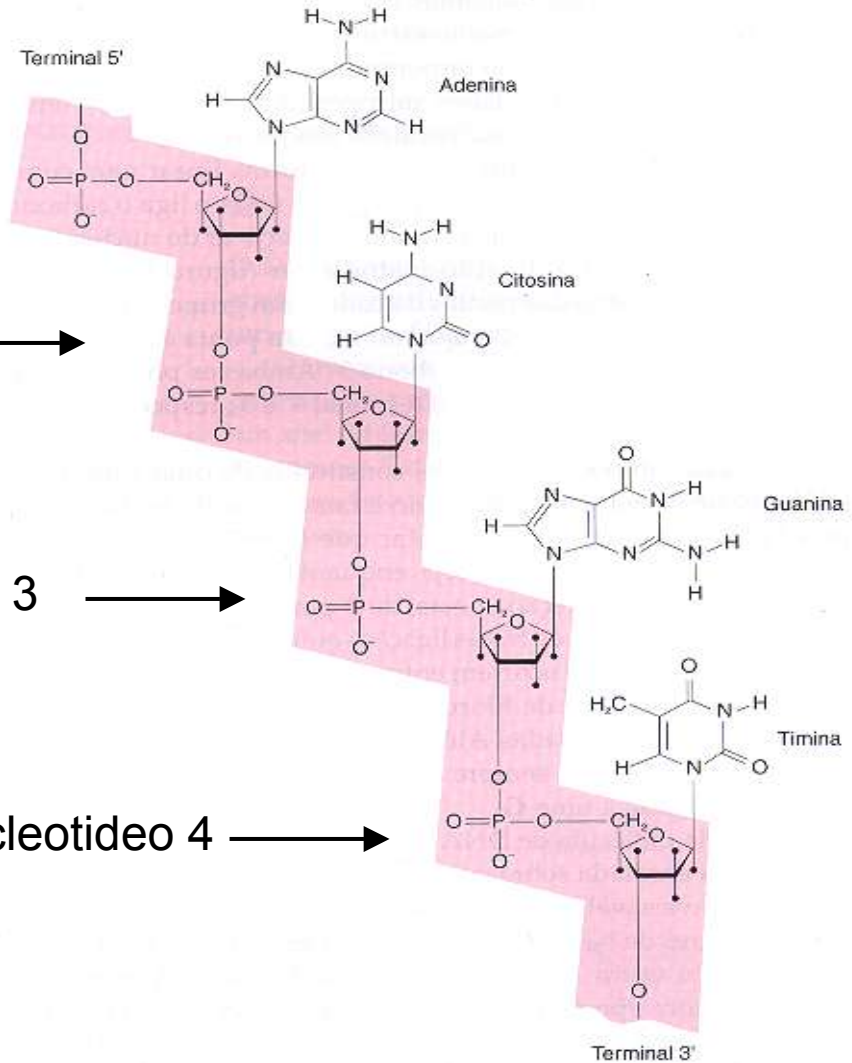
nucleotideo 2



nucleotideo 3

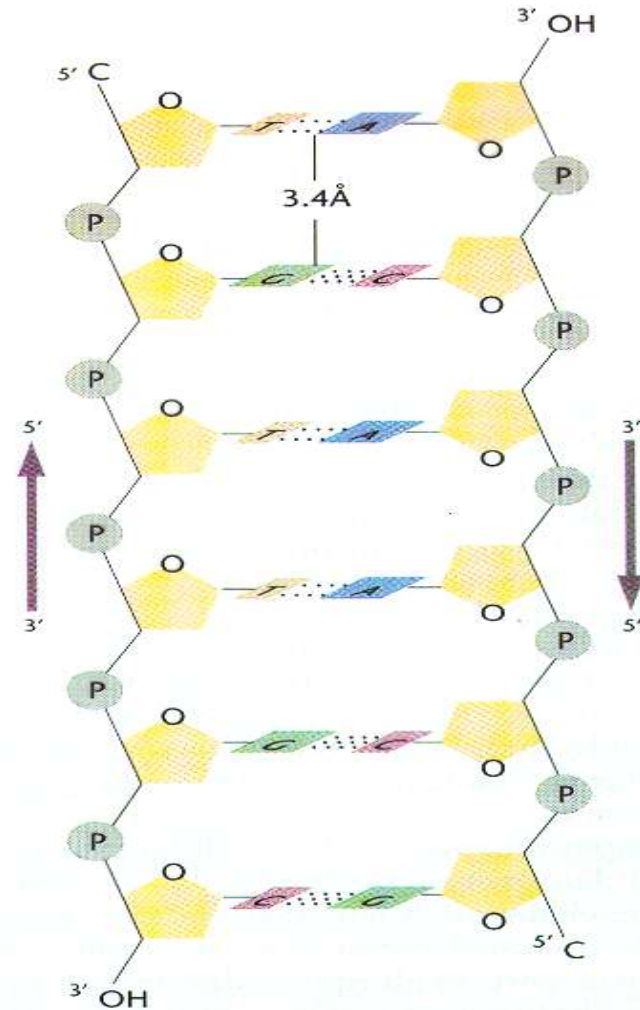


nucleotideo 4



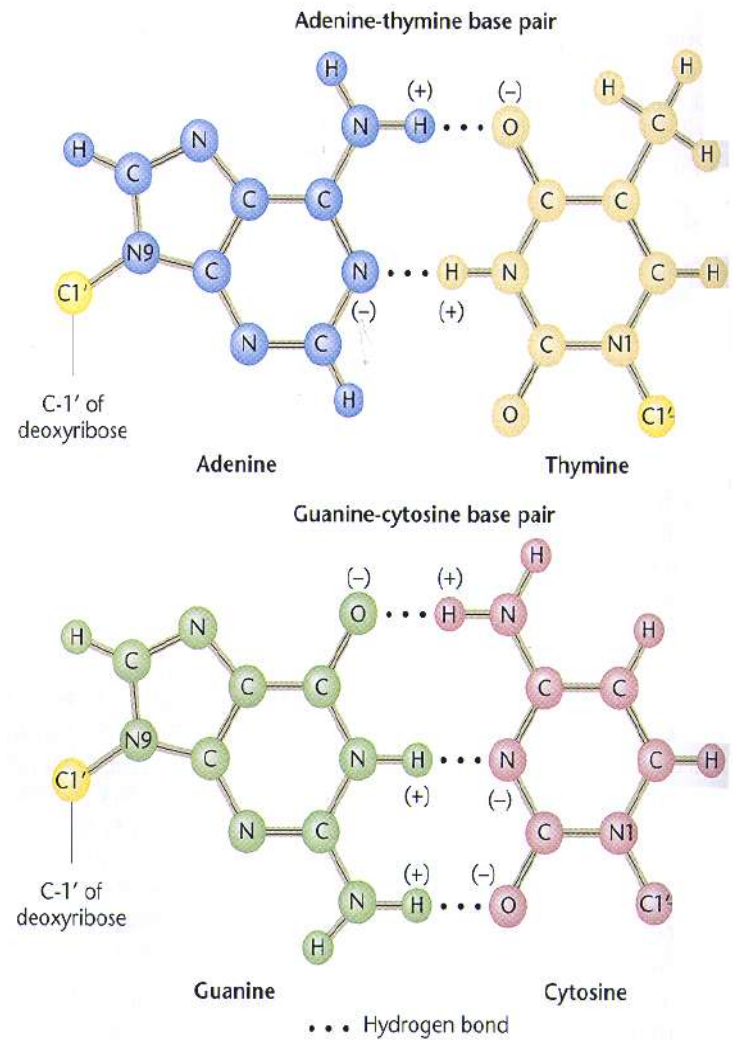
# Dupla cadeia:

- imposições da estrutura
  - o antiparalelismo
    - $5' \rightarrow 3'$  e  $3' \rightarrow 5'$
  - o ângulo de  $36^\circ$  entre os pares de nucleotídeos subsequentes
  - o plano dos pares é perpendicular ao eixo

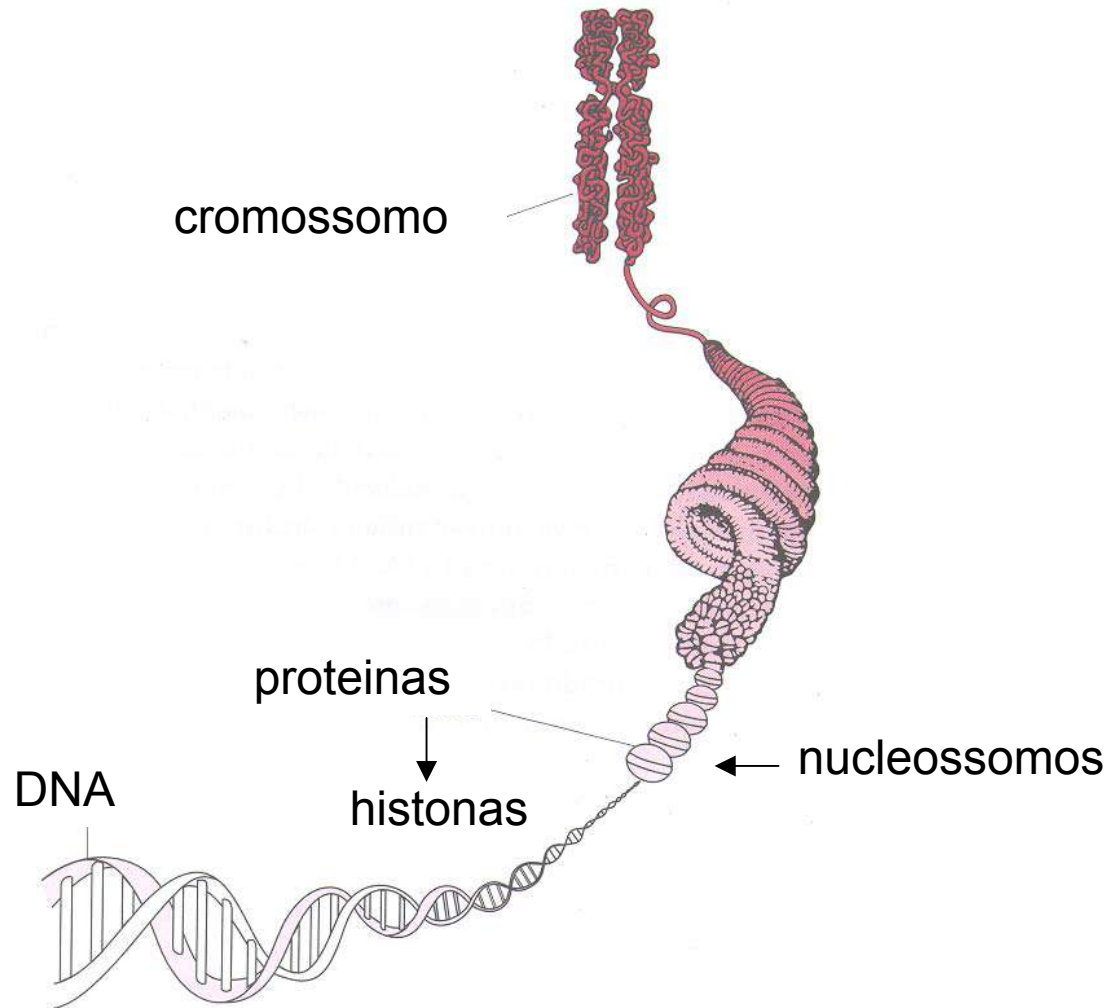


# Pontes de hidrogênio:

- pares A T
  - duas pontes de H
- pares C G
  - três pontes de H



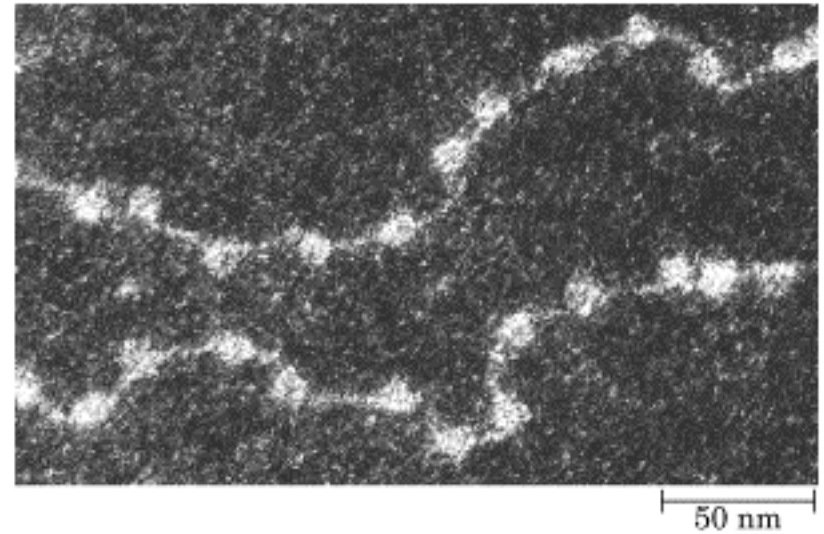
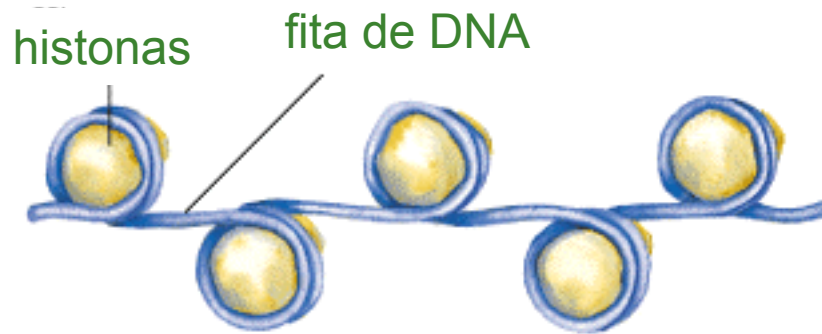
# Organização dos cromossomos





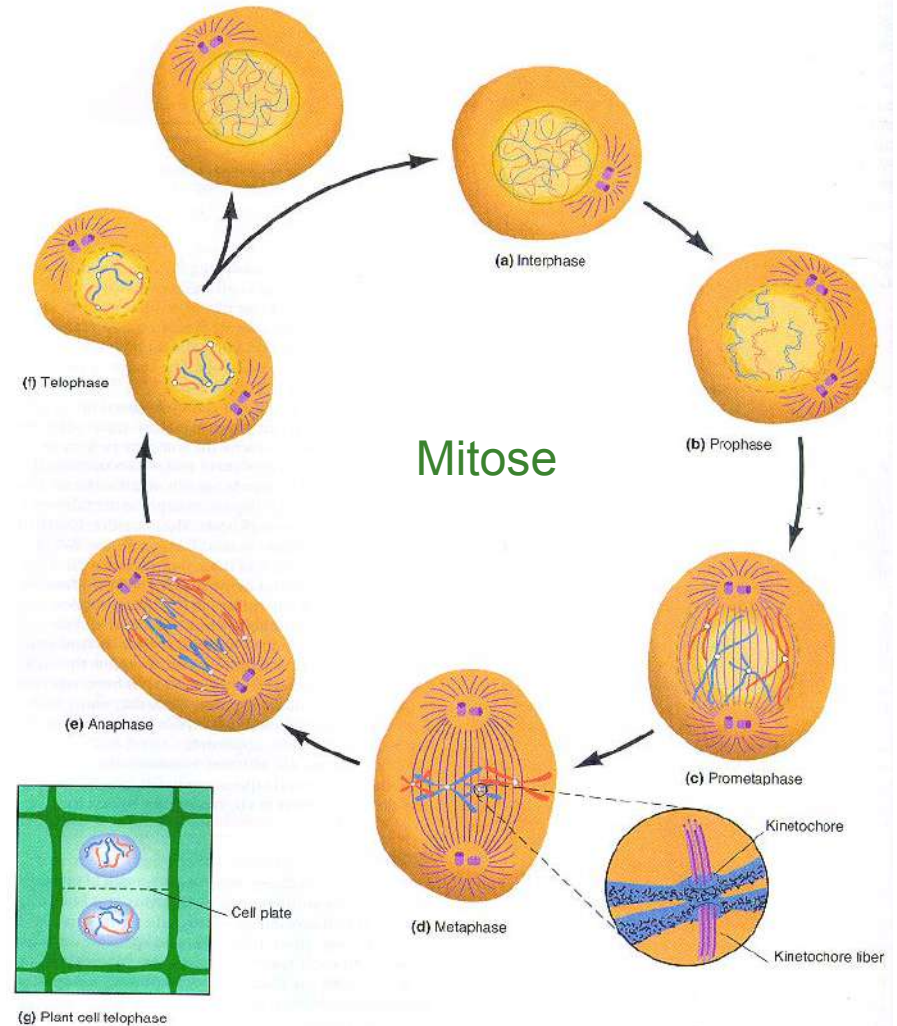
# Organização dos cromossomos

fotomicrografia eletrônica



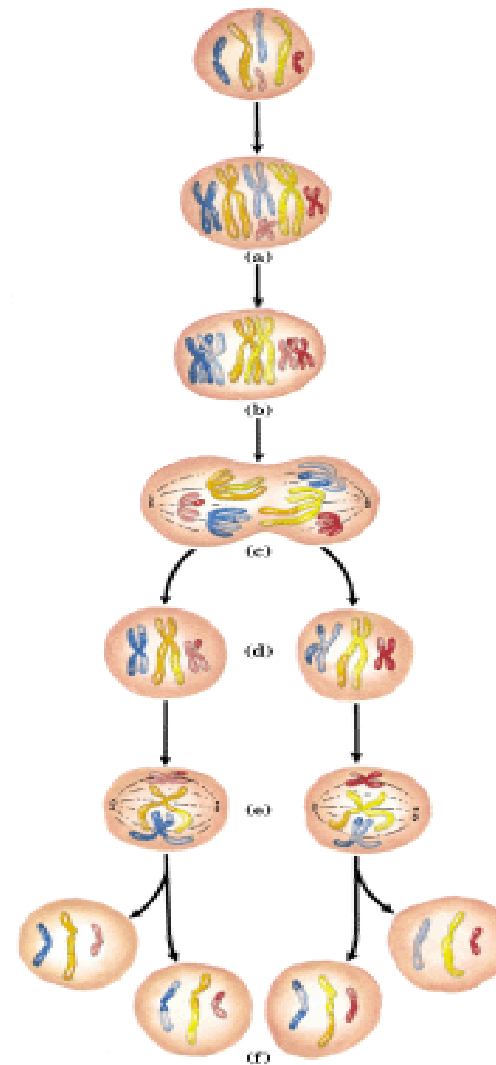
# Implicações nas divisões celulares

- manutenção do número de cromossomos



# Implicações nas divisões celulares

- redução do número de cromossomos
- recombinação devido a eventos de permuta genética



Meiose

