

Universidade de São Paulo (USP)  
Escola de Engenharia de Lorena (EEL)  
Engenharia Ambiental



## Material Genético e Núcleo

Disciplina: Biologia Geral  
Prof: Tatiane da Franca Silva

### Material Genético

- ✓ DNA
- ✓ Replicação Semiconservativa
- ✓ Hereditariedade

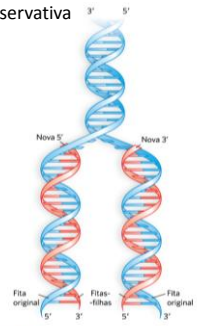
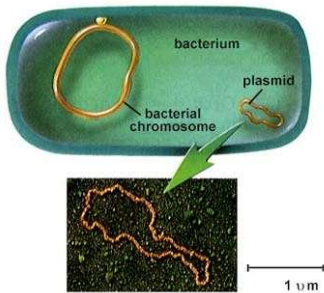


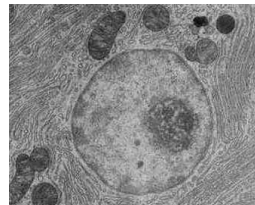
FIGURA 6-15 Mecanismo da replicação do DNA. As duas fitas complementares recém-sintetizadas (fitas-filhas) estão mostradas em vermelho.

### Procaríotos

- ✓ Material Genético: Cromossomo e Plasmídeos



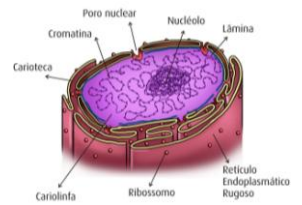
### Eucarioto – Núcleo



Núcleo = Centro

~ 6 µm de diâmetro

10% do volume celular



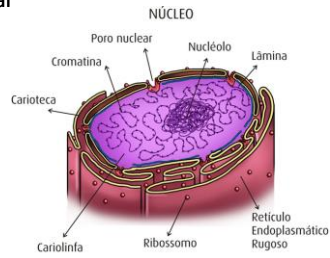
## Núcleo

### Estrutura

#### 1- Membrana Nuclear

#### 2- Nucléolo

#### 3- Cromatina

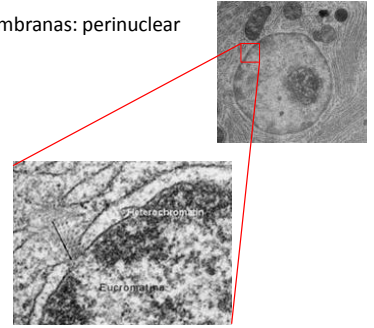
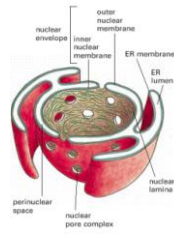


### Membrana Nuclear

❖ 2 membranas lipoproteicas

❖ Espaço entre as membranas: perinuclear

❖ Presença de poros



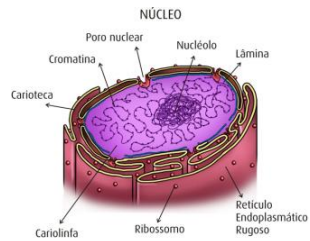
## Núcleo

### Estrutura

#### 1- Membrana Nuclear

#### 2- Nucléolo

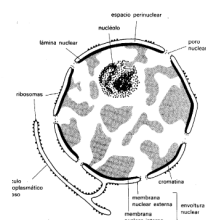
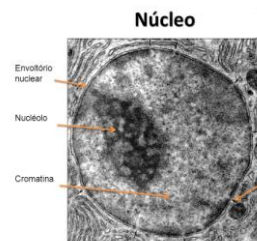
#### 3- Cromatina



### NUCLÉOLO

❖ Denso e não membranoso

❖ Rico em proteínas e RNA Ribossomal



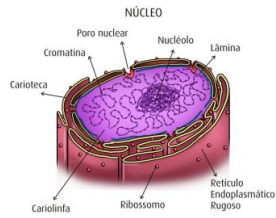
# Núcleo

## Estrutura

1- Membrana Nuclear

2- Nucléolo

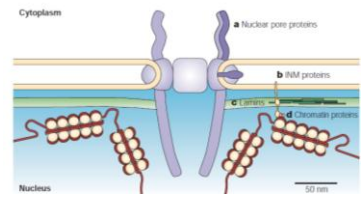
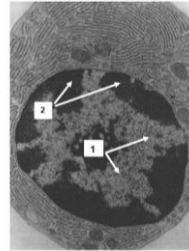
3- Cromatina



## CROMATINA

✓ Cromatina = DNA + proteínas

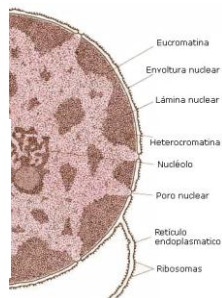
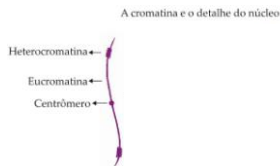
✓ Compactação do DNA



## Cromatina: Níveis de Compactação

✓ Heterocromatina: Mais compactada

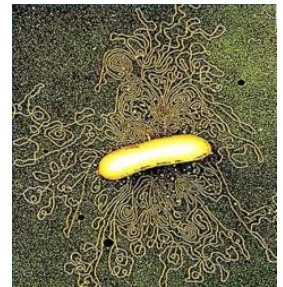
✓ Eucromatina: Menos compactada



## Necessidade de Compactar o DNA

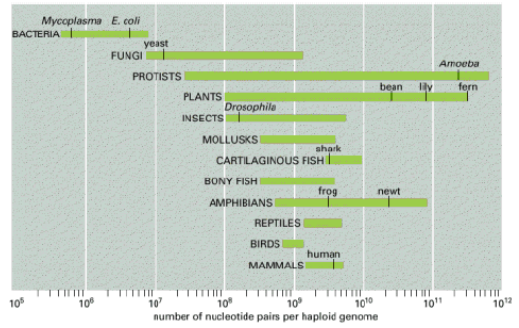
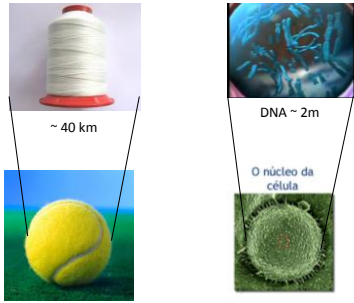
✓ Em Procarioto e Eucarioto

✓ Procarioto = 1 cromossomo



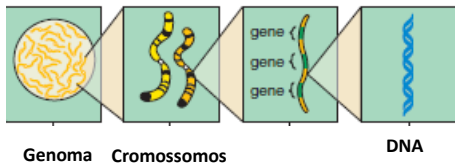
### Desafio do empacotamento do DNA

✓ Eucariotos: Genoma grandes ( Ex: Humano ~2m) dentro do núcleo de 6 µm .

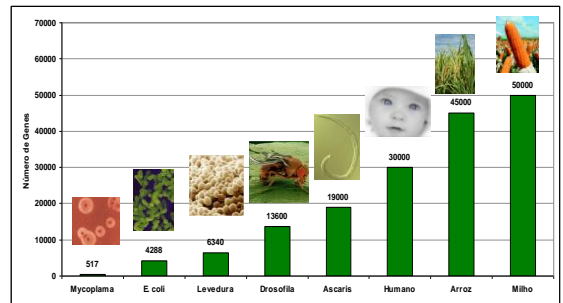


### Não vamos nos perder!

✓ Genoma : Conjunto de Cromossomos  
 ✓ Cada Cromossomo: contém 1 molécula de DNA+ proteínas

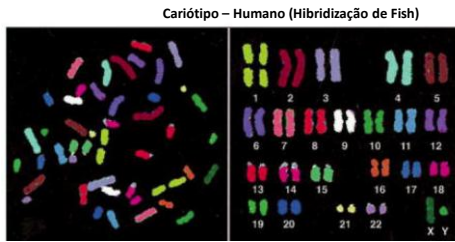


### Número de Genes

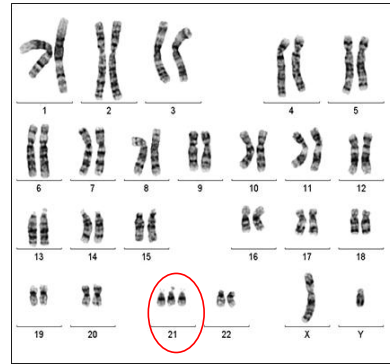


## DNA Eucarioto

- ✓ Empacotado em um grupo de cromossomo
  - ✓ Cópias do mesmo tipo de cromossomo (Homólogos)
- Ex: Homem – diploide (22 pares, 2 sexuais)



✓ Ex: Trissomia do 21



## Cariótipo dem Diferentes espécies

❖ Sapo

❖ Diferentes espécies de Grilo

Fig. 1. Gryllus assimilis  
Fig. 2. Phyllotreta arvensis

7 pares, 2 sexuais

❖ Diferentes espécies de Cervo

Chinese muntjac  
Indian muntjac

11 pares  
22 pares, 2 sexuais  
2 pares, 2 sexuais

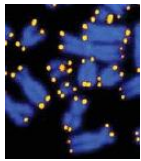
## Cariótipo dem Diferentes espécies

Todas estas espécies possuem no seu cariótipo 38 cromossomos

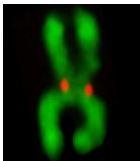
Leão – *Panthera leo*  
Tigre – *Panthera tigris*  
Chita ou leopardo caçador – *Acinonyx jubatus*  
Gato – *Felis catus*  
Puma – *Felis concolor*

## Estrutura dos Cromossomos Mitóticos

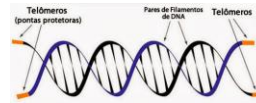
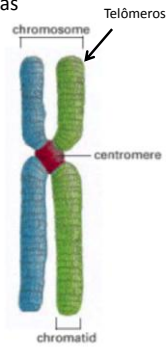
- ✓ Cromossomo duplicado – Cromátides irmãs
- ✓ Centrômero: mantém as cromátides
- ✓ Telômeros: proteção das extremidades



Telômeros



Centrômero



The Nobel Prize in Physiology or Medicine 2009  
Elizabeth H. Blackburn, Carol W. Greider, Jack W. Szostak

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## The Nobel Prize in Physiology or Medicine 2009



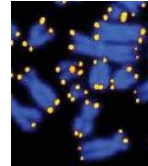
Photo: U. Montan  
Elizabeth H. Blackburn  
Prize share: 1/3



Photo: U. Montan  
Carol W. Greider  
Prize share: 1/3

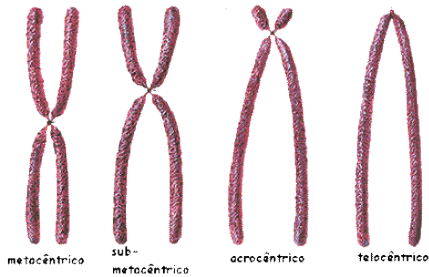


Photo: U. Montan  
Jack W. Szostak  
Prize share: 1/3



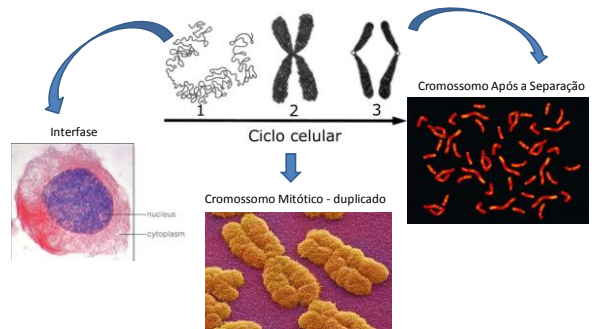
The Nobel Prize in Physiology or Medicine 2009 was awarded jointly to Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak "for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase".

## Tipos de Cromossomos

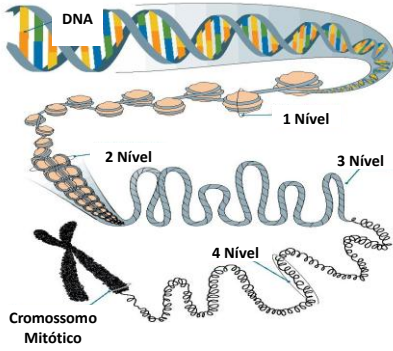


## TOPOLOGIA DO CROMOSSOMO EUKARIOTO

- ✓ Diferenças morfológicas ao longo do ciclo celular

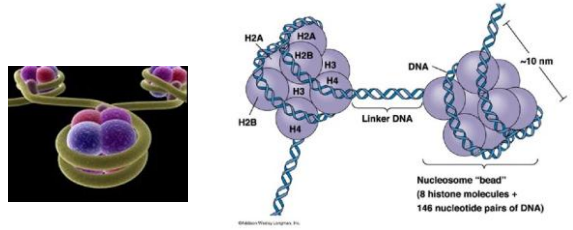


**Cromossomo Eucarioto: Níveis de Compactação do DNA**



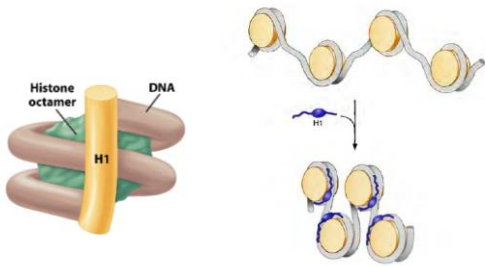
**1º Nível : Nucleossomo**

- ✓ Associação do DNA com proteínas Histonas
- ✓ Octâmero Histonas: dois tetrâmeros de H2A, H2B, H3 e H4.



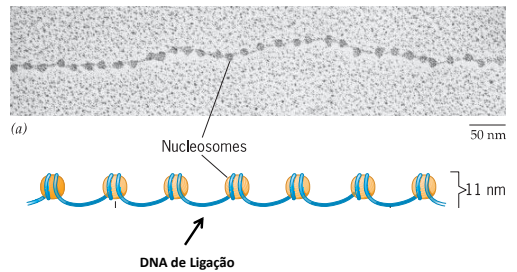
**1º Nível : Nucleossomo**

- ✓ Entrada da Histona H1



**1º Nível : Nucleossomo**

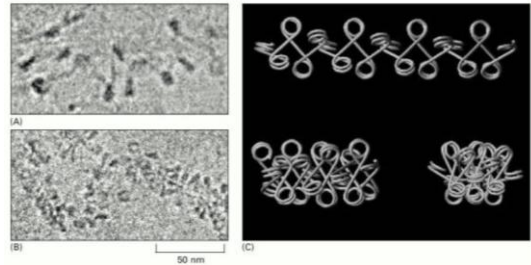
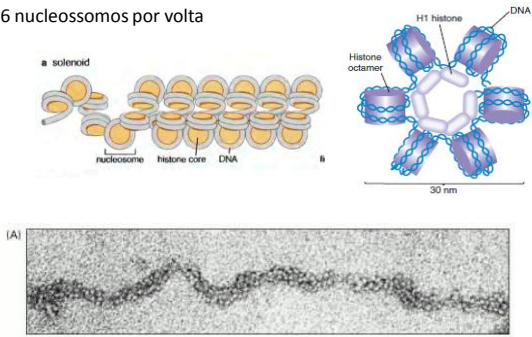
- ✓ Estrutura de "cordão de contas"



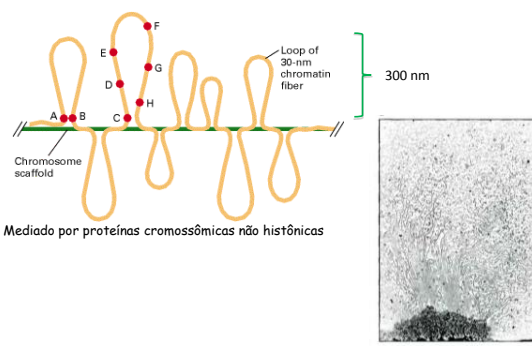


2º Nível : Solenóide

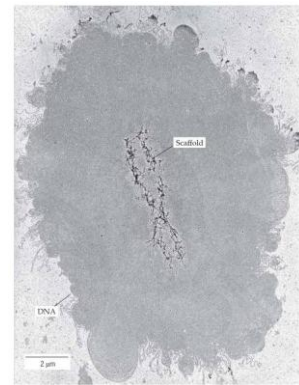
✓6 nucleossomos por volta



3º Nível : Arcabouço

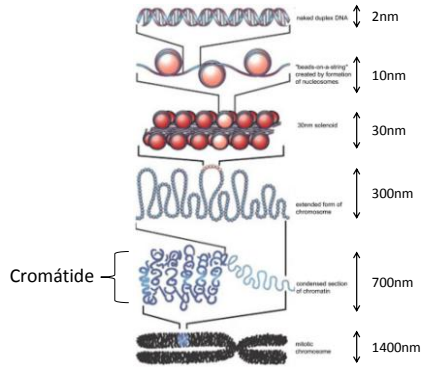


✓DNA sem histonas

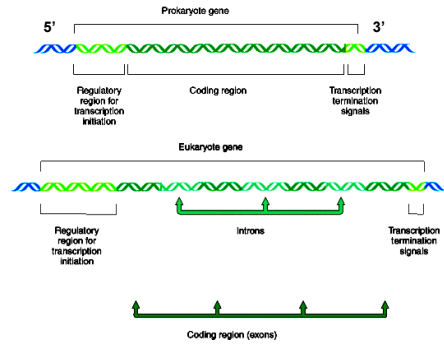




4º Nível - Cromátide

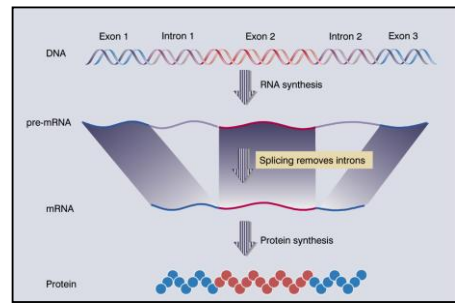
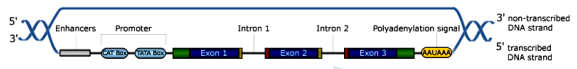


Estrutura Gênica: Eucarioto X Procaríoto



Estrutura Gênica: Eucarioto

Nem sempre há Colinearidade: Gene ↔ Proteína



3n nucleotídeos ≠ n aminoácidos