

Biologia Molecular I

BFB 705

Programação da disciplina

- Estrutura do DNA e organização da cromatina
- Replicação do DNA
- Reparo do DNA
- Transcrição e processamento
- Síntese de proteínas
- Estrutura de proteínas
- Regulação gênica em procariotos (2x)
- Regulação gênica transcricional em eucariotos
- Regulação gênica pós-transcricional em eucariotos
- RNAs não codificantes
- Seminário 1
- Seminário 2
- Seminário 3
- Seminário 4
- PROVA

Histórico

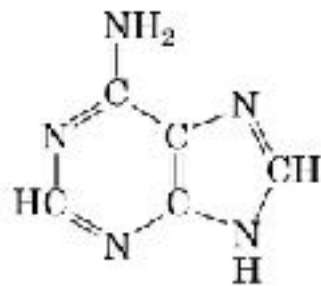
- 1865 - Leis de Mendel (G. Mendel)
- 1869 - Isolamento do DNA ("nucleína") (F. Miescher)
- 1910 - Teoria cromossômica da hereditariedade (T. H. Morgan)
- 1913 - Primeiro mapa genético (A. Sturtevant)
- 1944 - Primeira evidência de que DNA é o material genético (O. Avery, M. McCarty & C. MacLeod)
- 1950 - Relação entre purinas e pirimidinas: 1:1 (Chargaff)
- 1952 - Demonstração definitiva de que o DNA é o material genético (A. Hershey & M. Chase)
- 1953 - Estrutura do DNA (J. Watson & F. Crick)
- 1955 - Sequenciamento de proteína (F. Sanger)
- 1958 - Replicação semi-conservativa (M. Meselson & F. Stahl)
- 1960 - Descoberta do RNA mensageiro (S. Brenner, F. Crick, F. Jacob & J. Monod)
- 1961 - Deciframento do código genético (M. Nirenberg, H. Mathaei & S. Ochoa)
- 1961 - Primeiro modelo de regulação gênica: operon *lac* (F. Jacob & J. Monod)
- 1969 - Primeiro isolamento de um gene (J. Beckwith)
- 1970 - Transcriptase reversa (H. Temin & D. Baltimore)
- 1970 - Enzima de restrição sítio-específica (H. O. Smith)
- 1972-3 - Tecnologia do DNA recombinante (H. Boyer, S. Cohen & P. Berg)
- 1977 - Sequenciamento de DNA (A. Maxam, W. Gilbert & F. Sanger)
- 1977 - Descoberta de exons e introns (R. Roberts & P. Sharp)
- 1981 - Descoberta de RNAs com atividade catalítica (S. Altman & T. Cech)
- 1983 - Reação em cadeia da polimerase: PCR (K. Mullis)
- 1993 - Descoberta de RNAs reguladores (V. Ambros, R. Lee & R. Feinbaum)
- 1995 - Sequenciamento completo do primeiro genoma celular (C. Venter *et al.*)
- 2003 - Sequenciamento completo do genoma humano (Consórcio Internacional)

Definição de gene

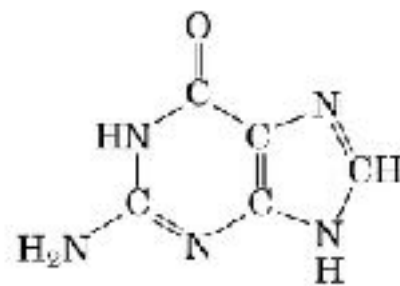
- Unidade de hereditariedade (1900)
- Locus cromossômico (1910)
- Um gene, uma enzima -> um gene, uma proteína (1940)
- Gene: segmento de ácido nucleico que dá origem a uma molécula de RNA funcional (~1990)
- Gene: união de sequências genômicas que dá origem a um conjunto coerente de produtos funcionais potencialmente sobrepostos (2007)

Estrutura do DNA

Nucleotídeos

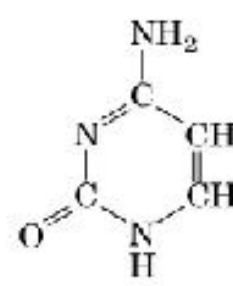


Adenine

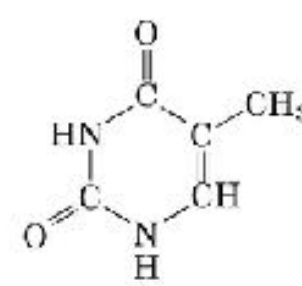


Guanine

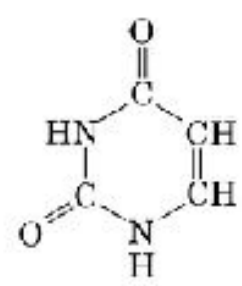
Purines



Cytosine

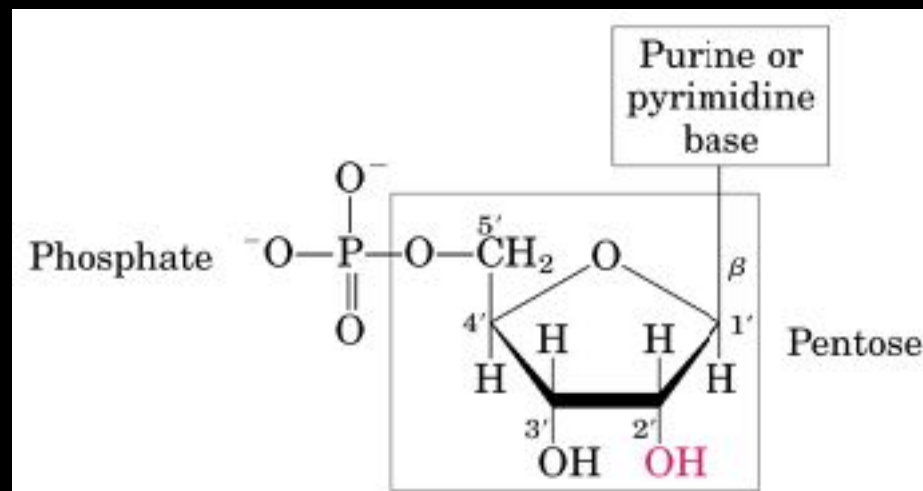


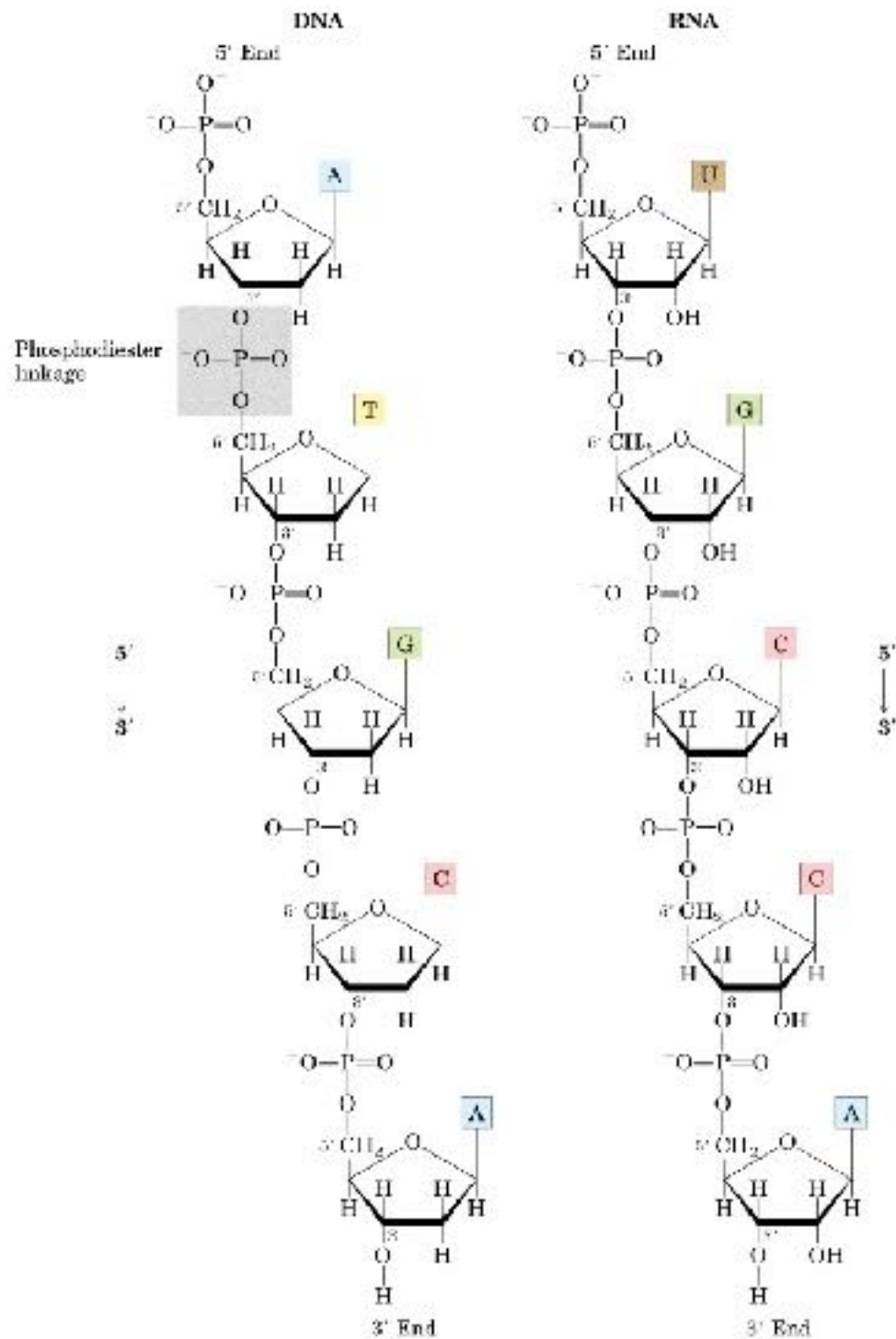
Thymine
(DNA)



Uracil
(RNA)

Pyrimidines



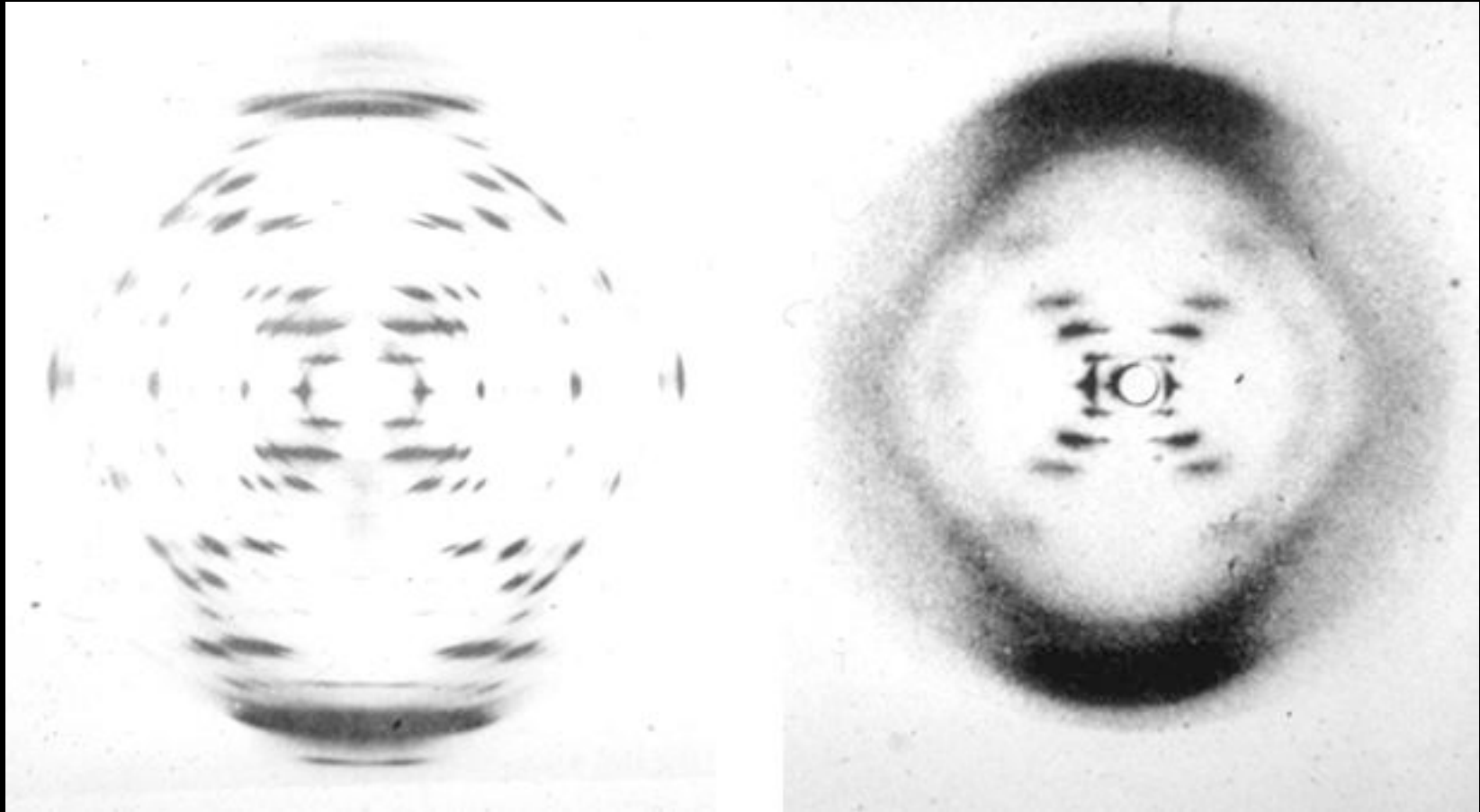


Composição de bases: Chargaff

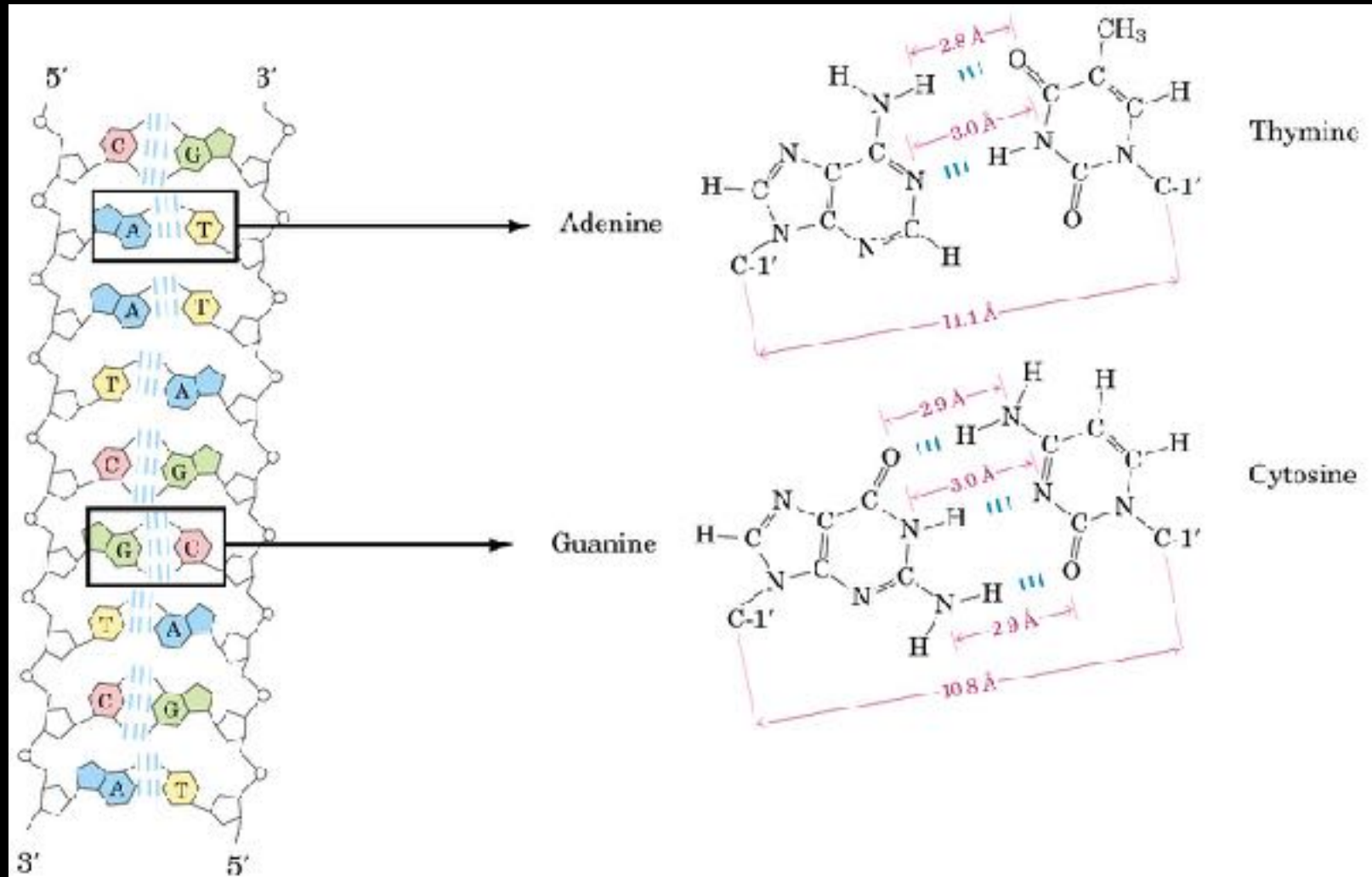
Nucleoside Base Distribution in DNA

Organism	Base Composition (mole %)				Base Ratios		Ratio (A+T)/(G+C)
	A	G	T	C	A/T	G/C	
Human	30.9	19.9	29.4	19.8	1.05	1.00	1.52
Chicken	28.8	20.5	29.2	21.5	1.02	0.95	1.38
Yeast	31.3	18.7	32.9	17.1	0.95	1.09	1.79
<i>Clostridium perfringens</i>	36.9	14.0	36.3	12.8	1.01	1.09	2.70
<i>Sarcina lutea</i>	13.4	37.1	12.4	37.1	1.08	1.00	0.35

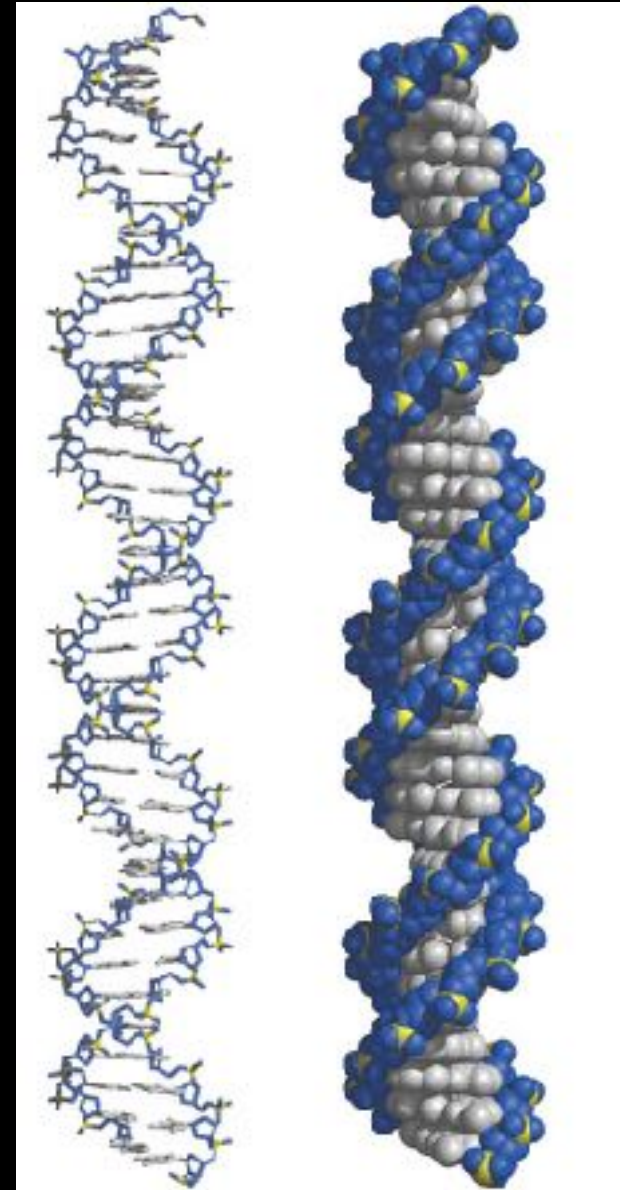
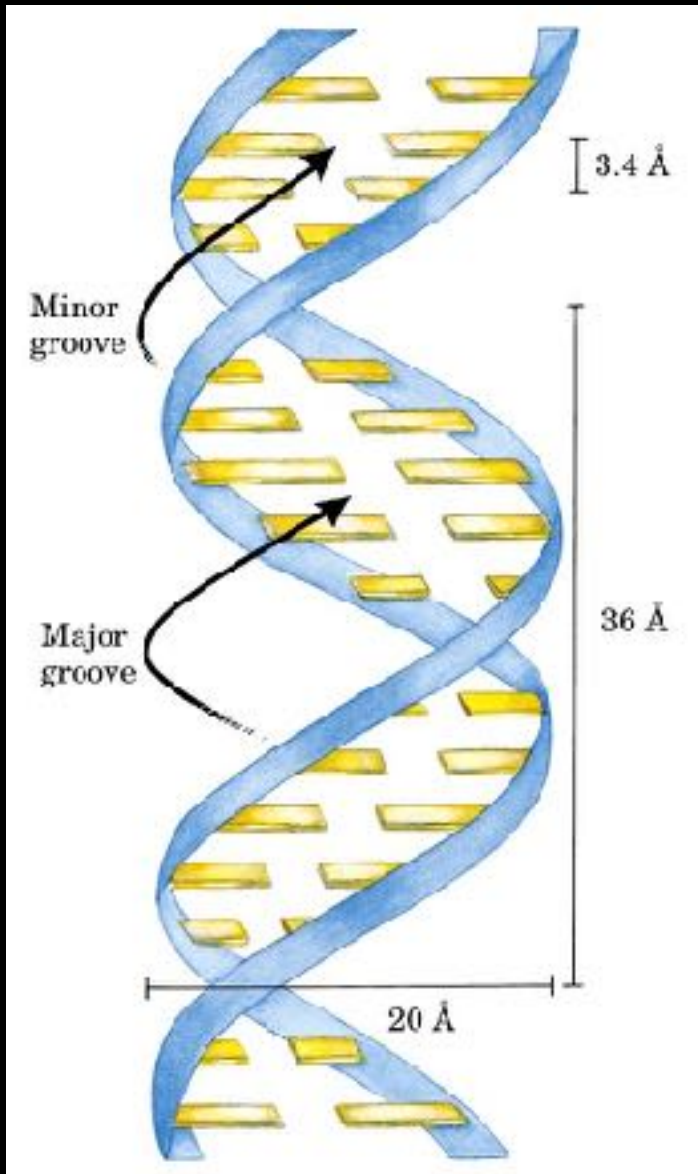
Análise por difração de raio-X



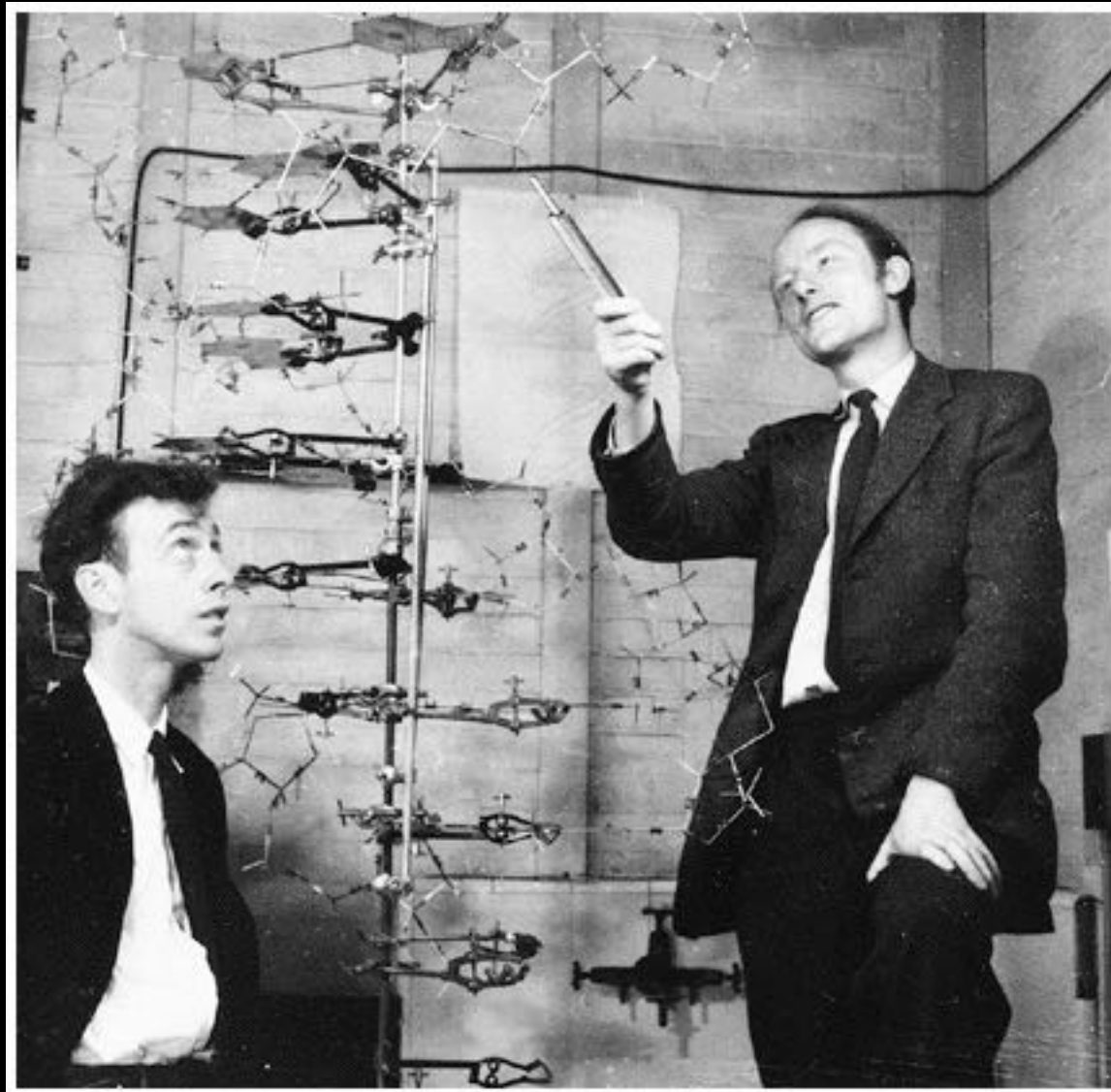
Pareamento de bases



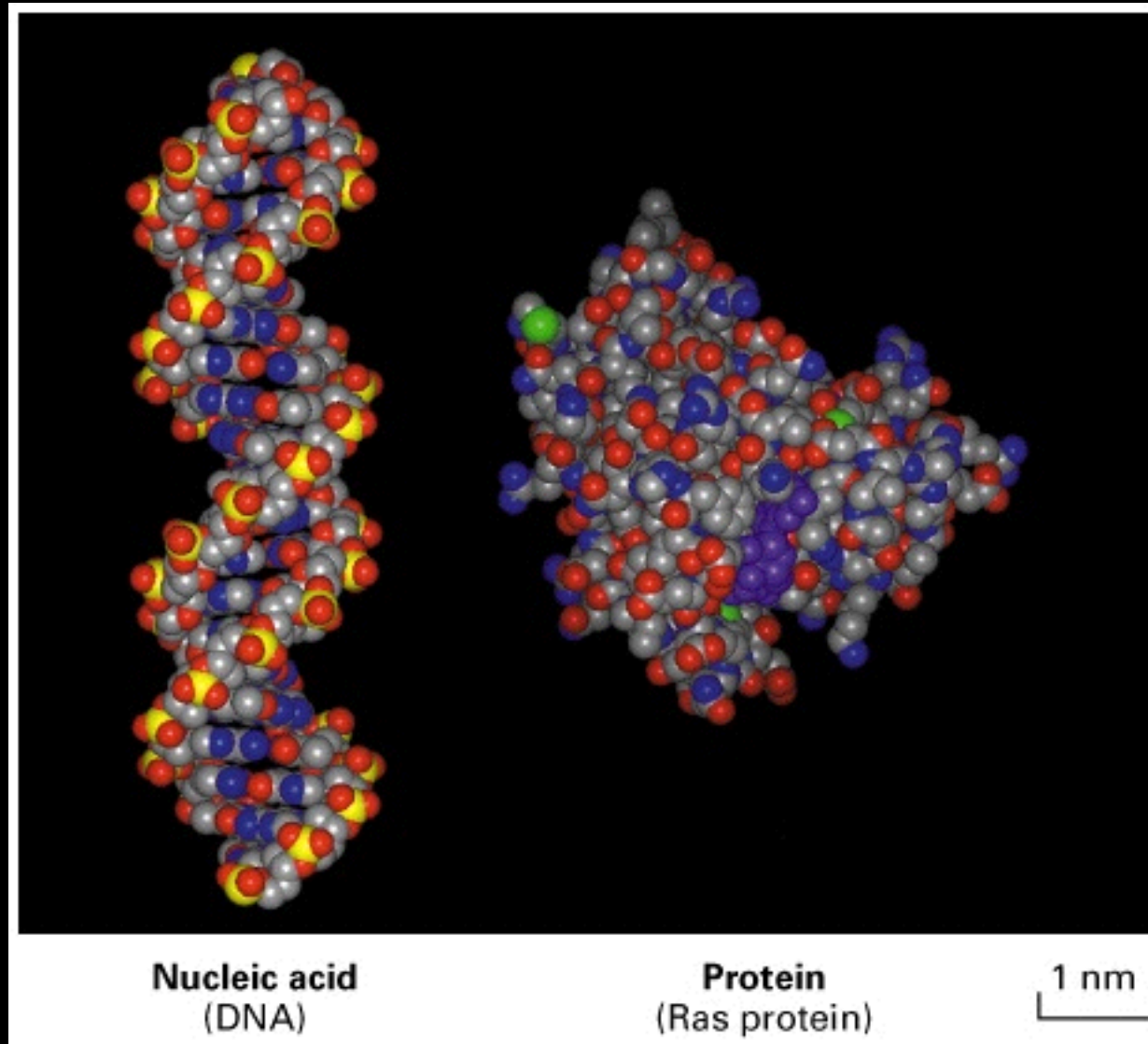
Estrutura tridimensional



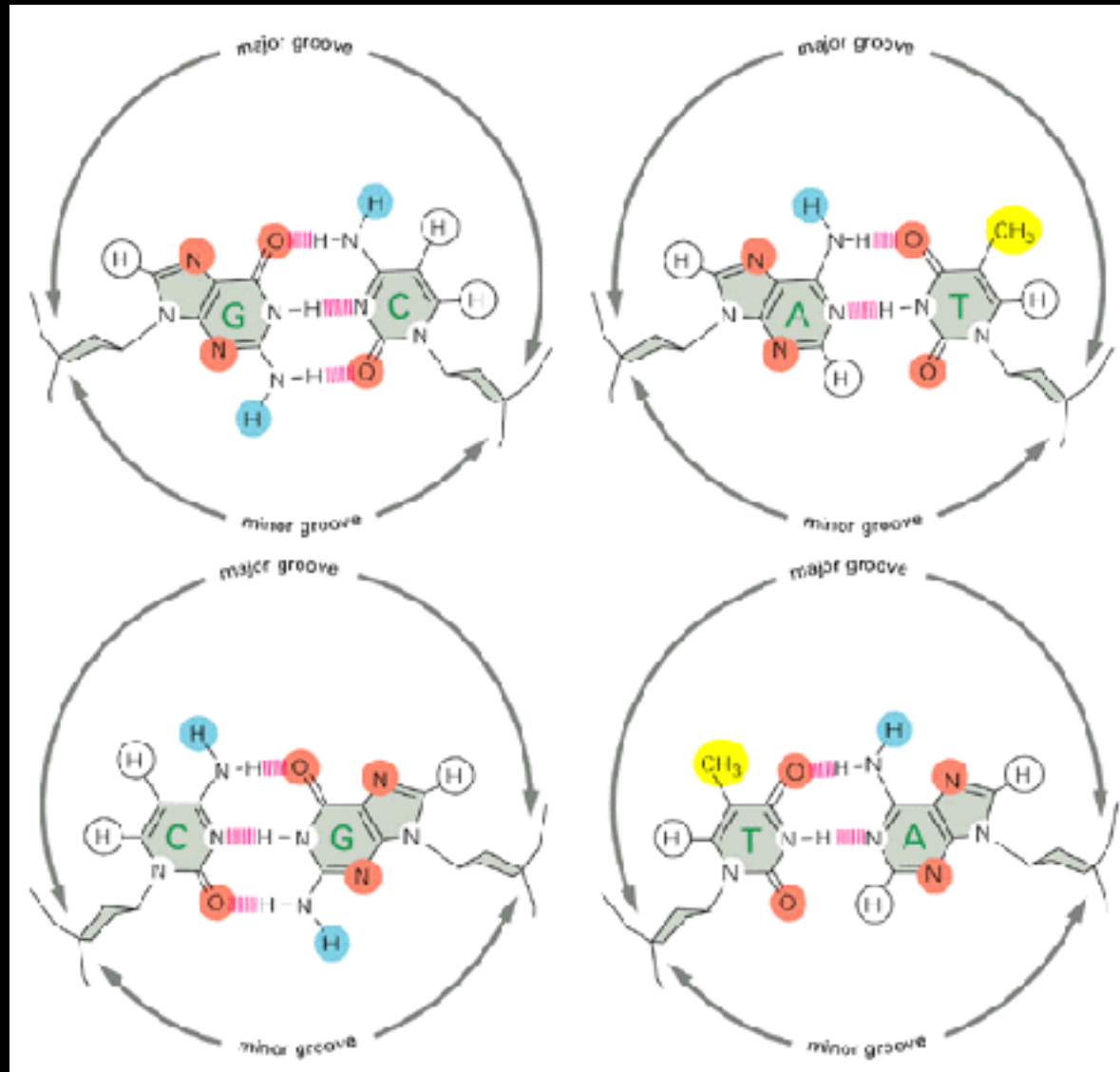
Modelo em escala do DNA



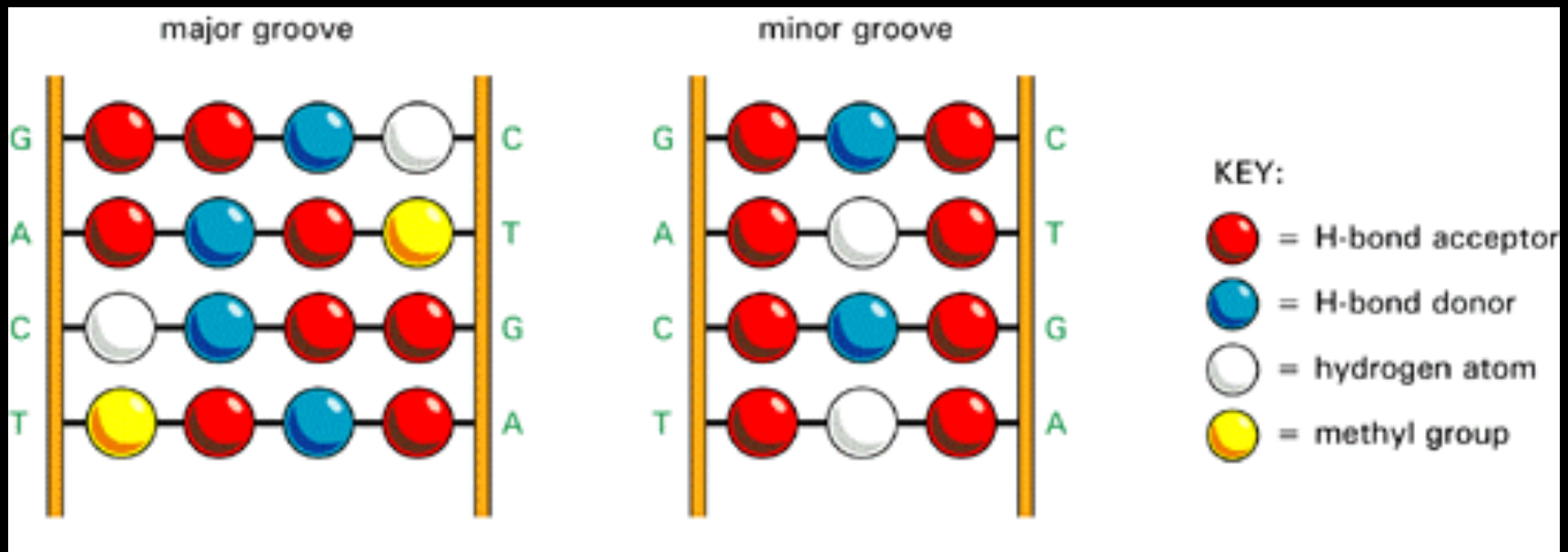
Interação proteína-DNA



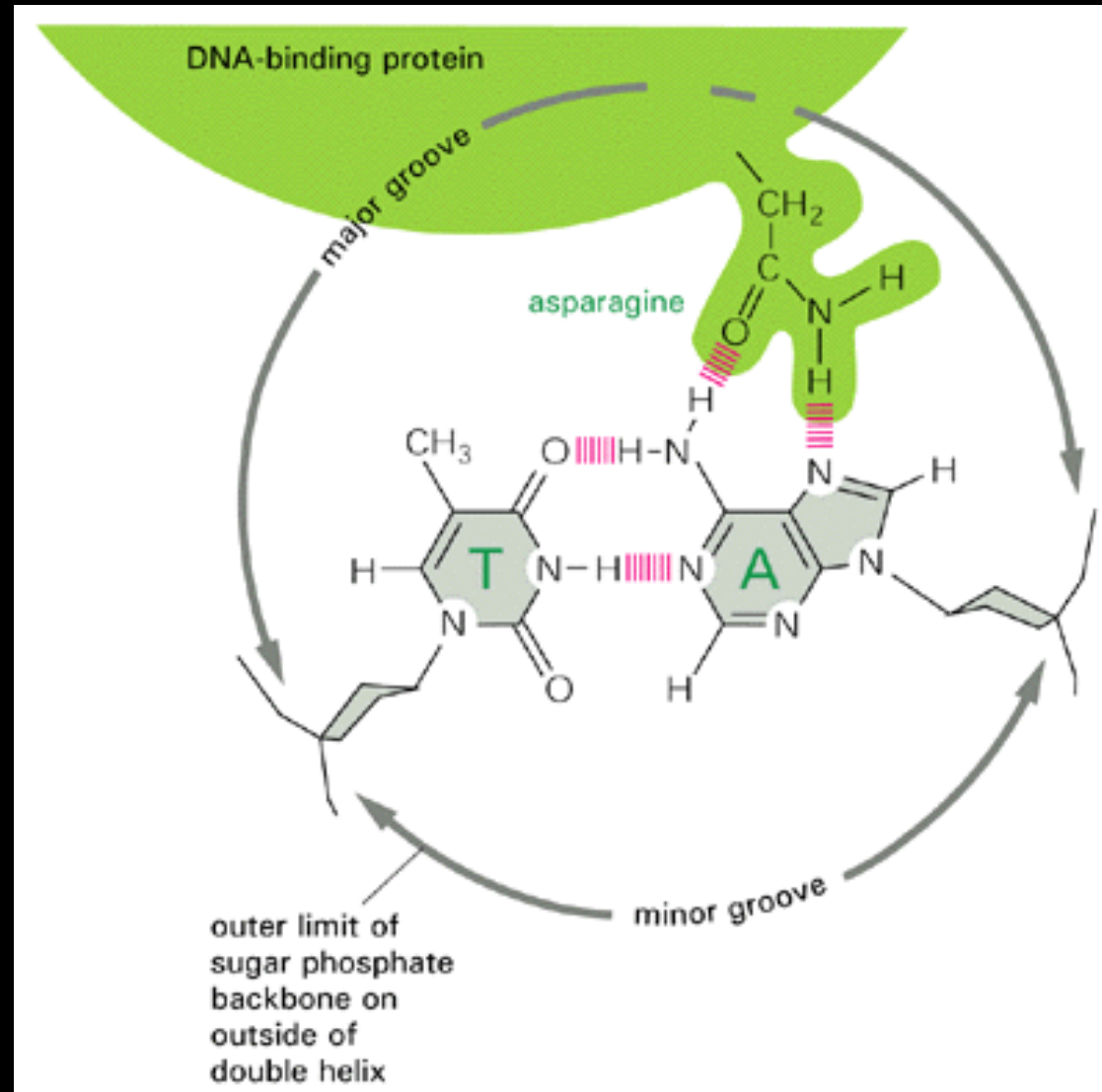
Interação proteína-DNA



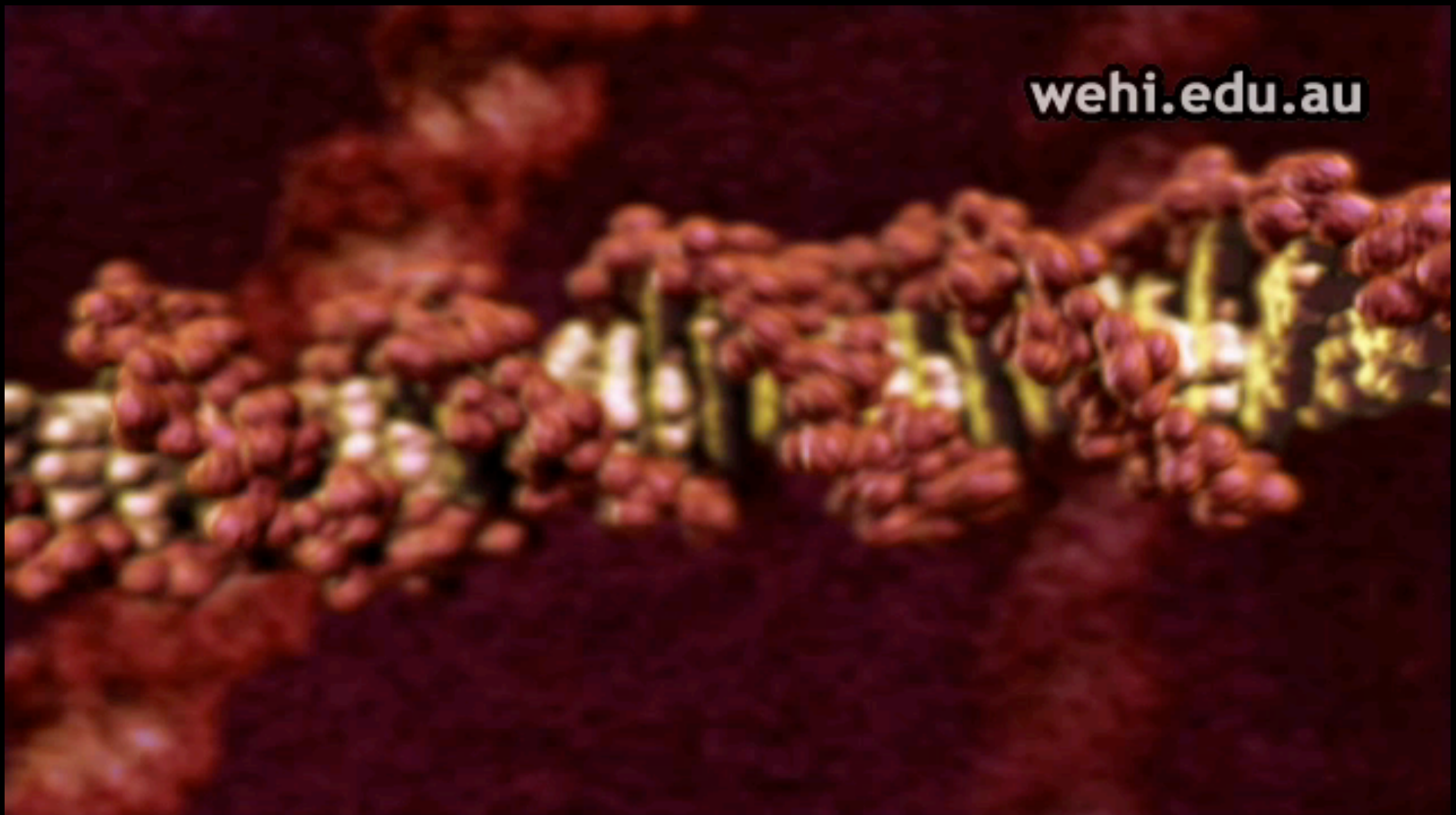
Interação proteína-DNA



Interação proteína-DNA

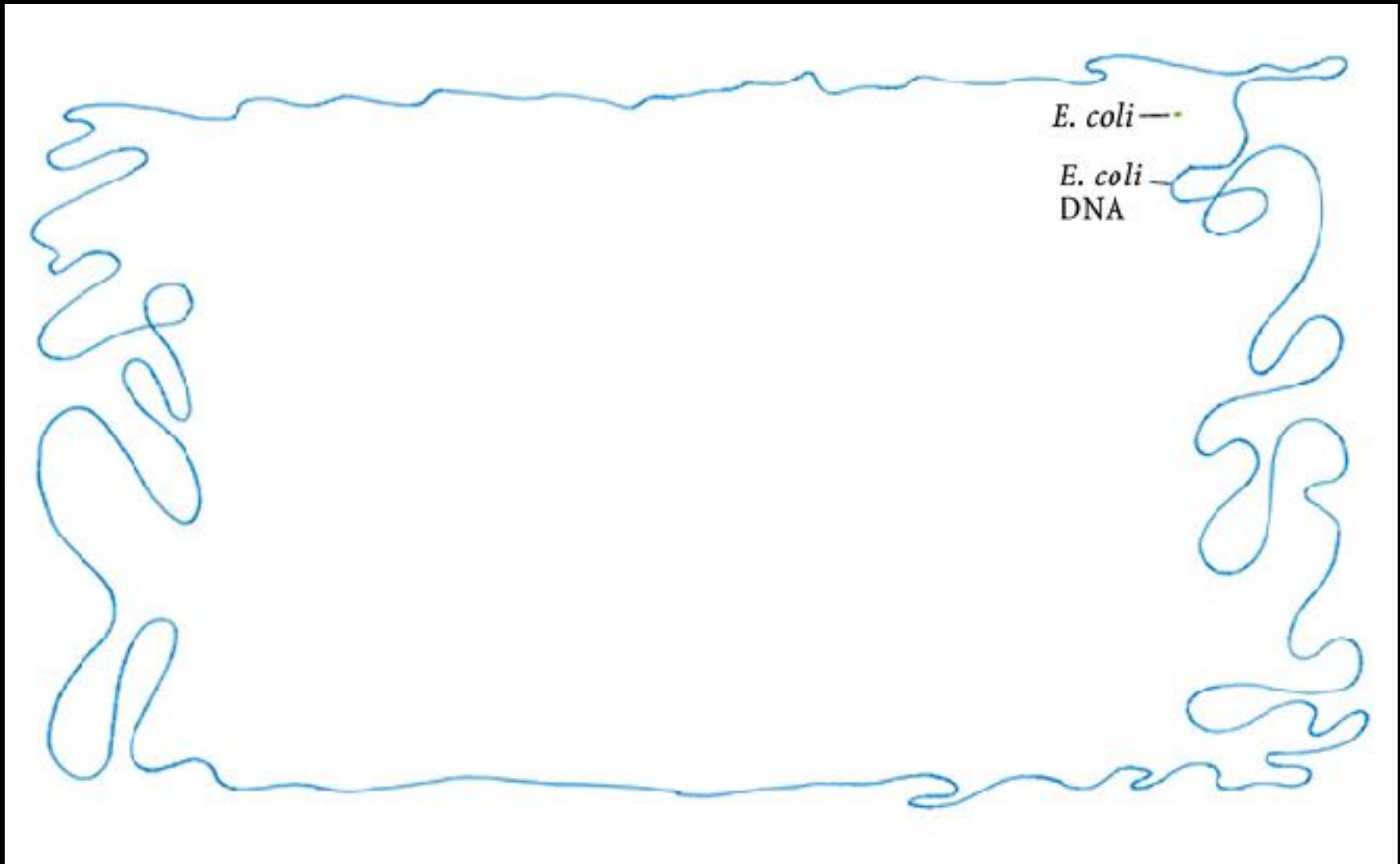


Estrutura do DNA: animação

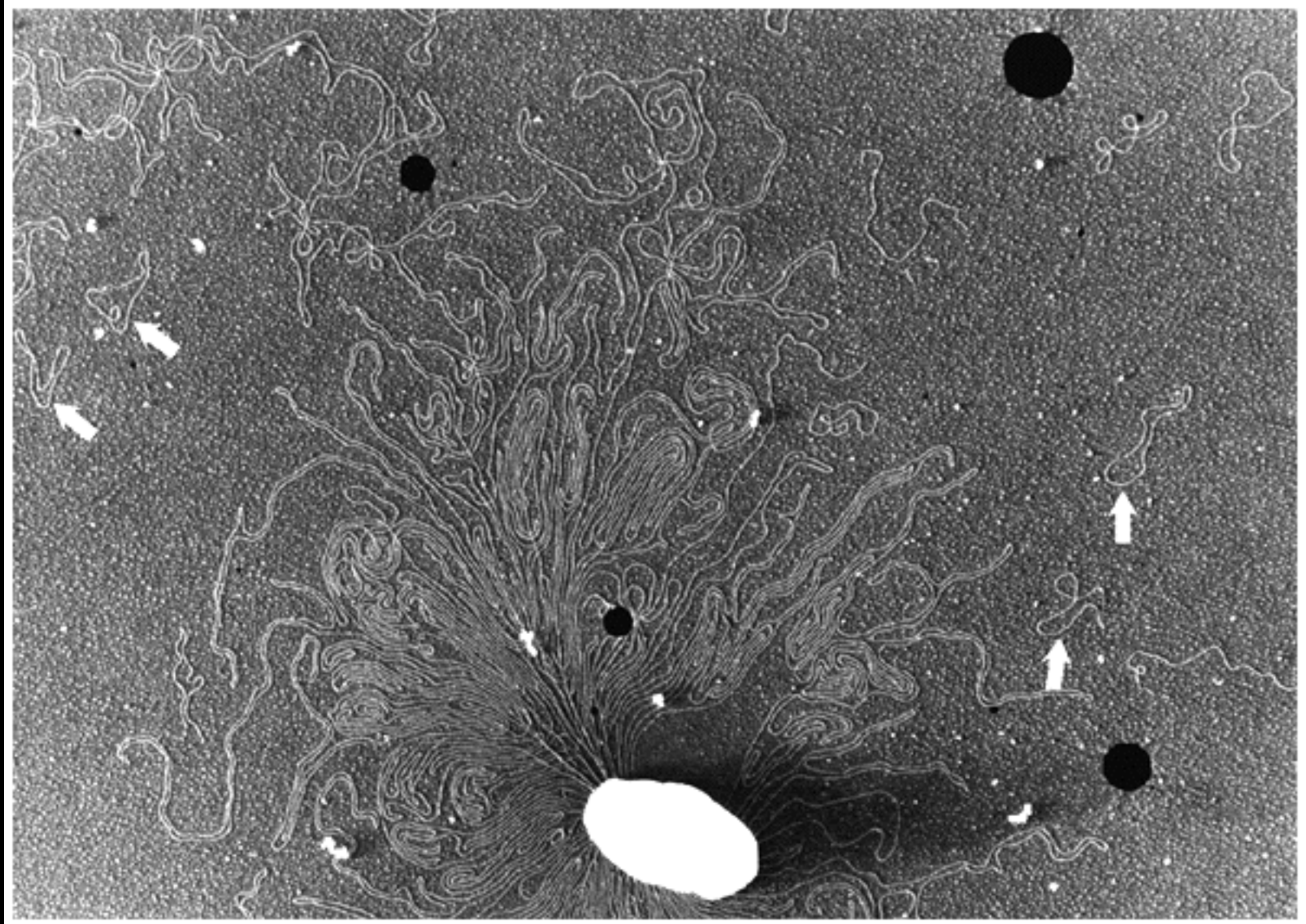


Cromatina

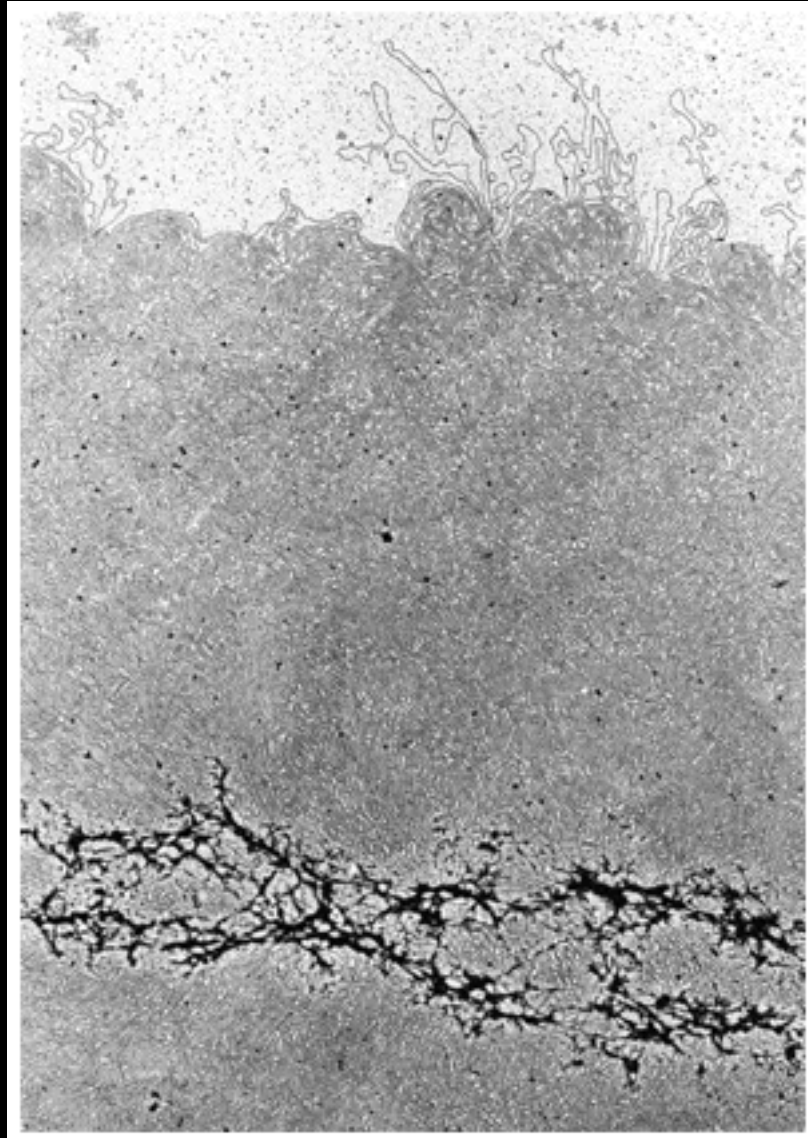
Problema da compactação



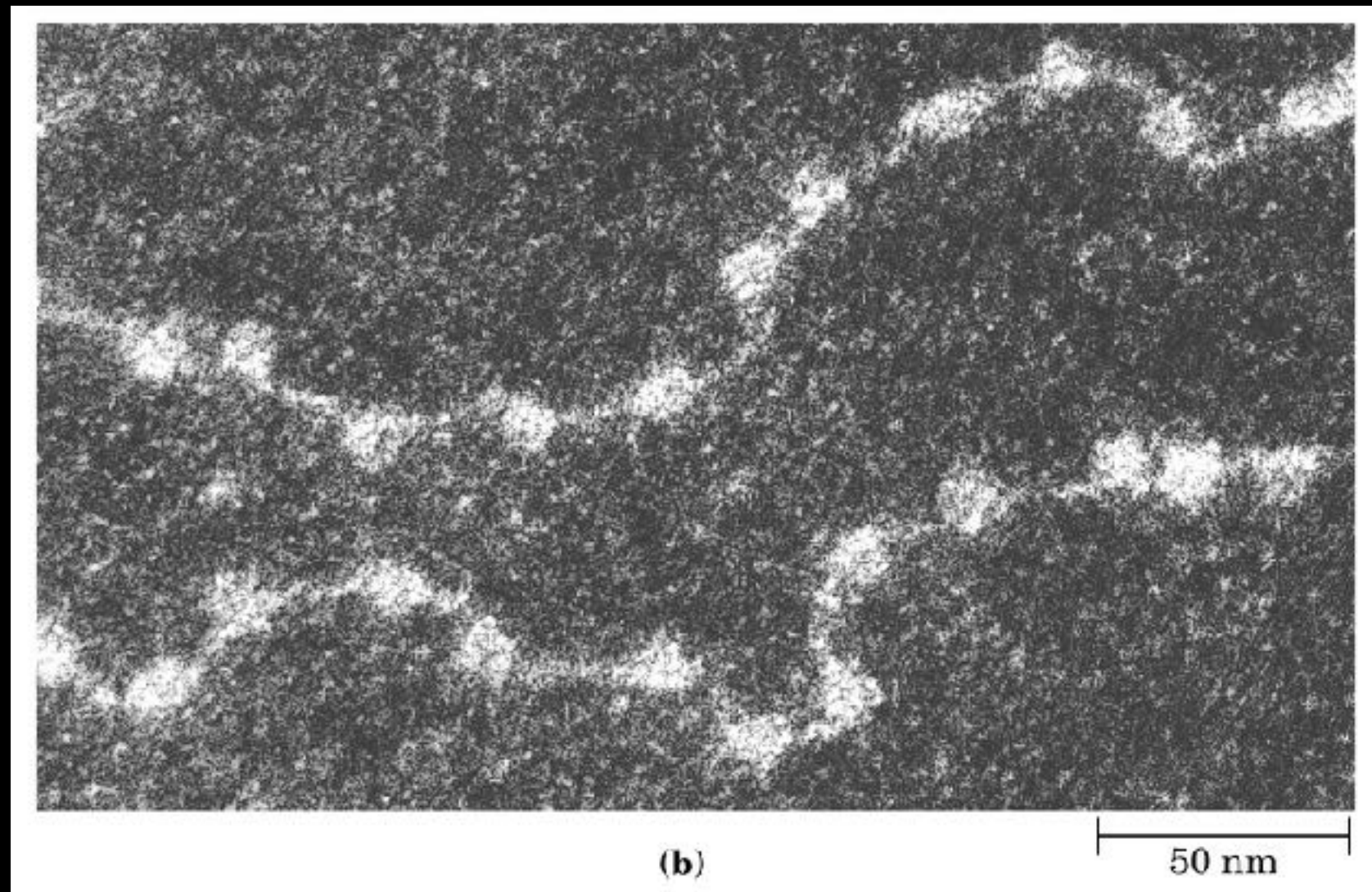
Problema da compactação



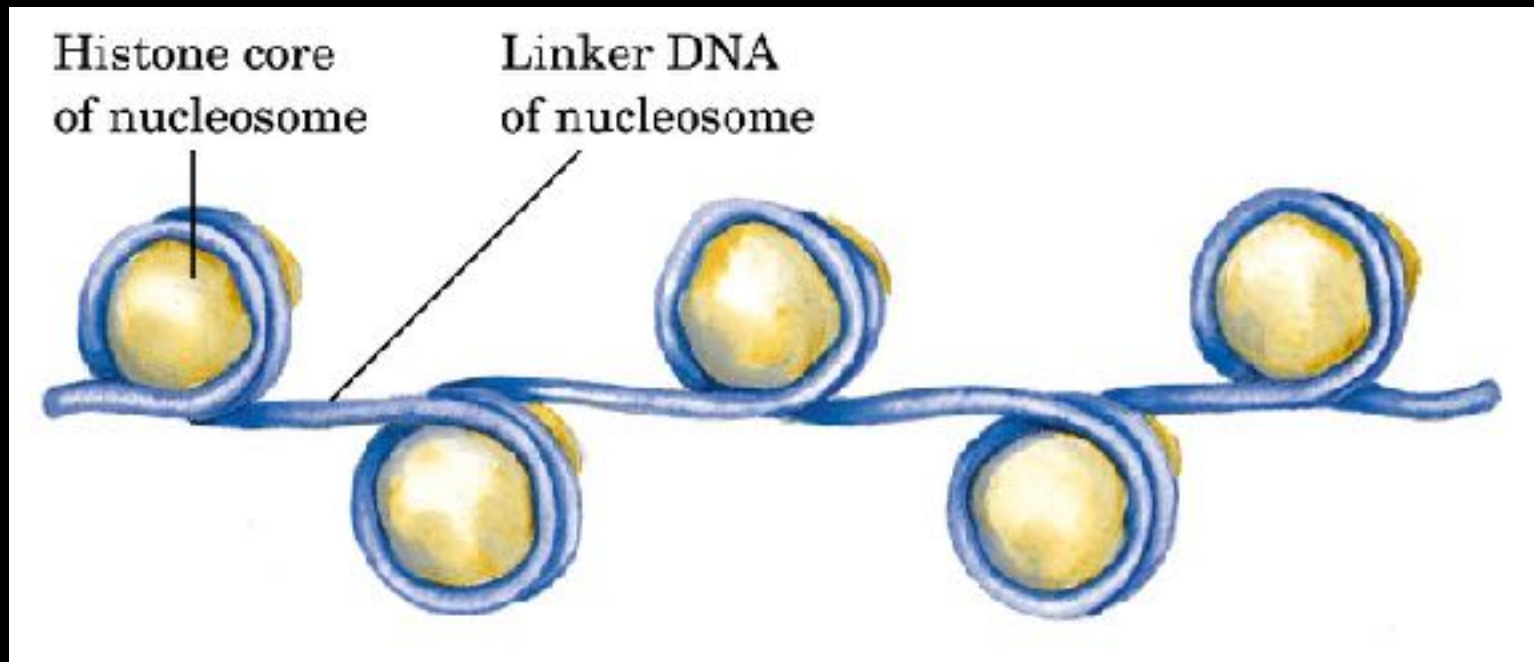
Problema da compactação



Estrutura “contas em colar”



Nucleosomo



Histonas

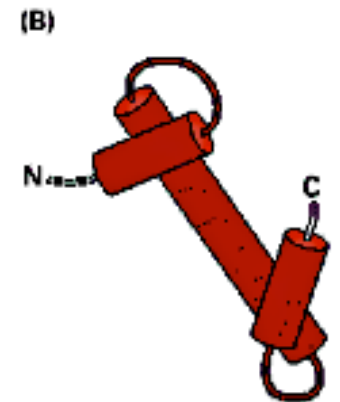
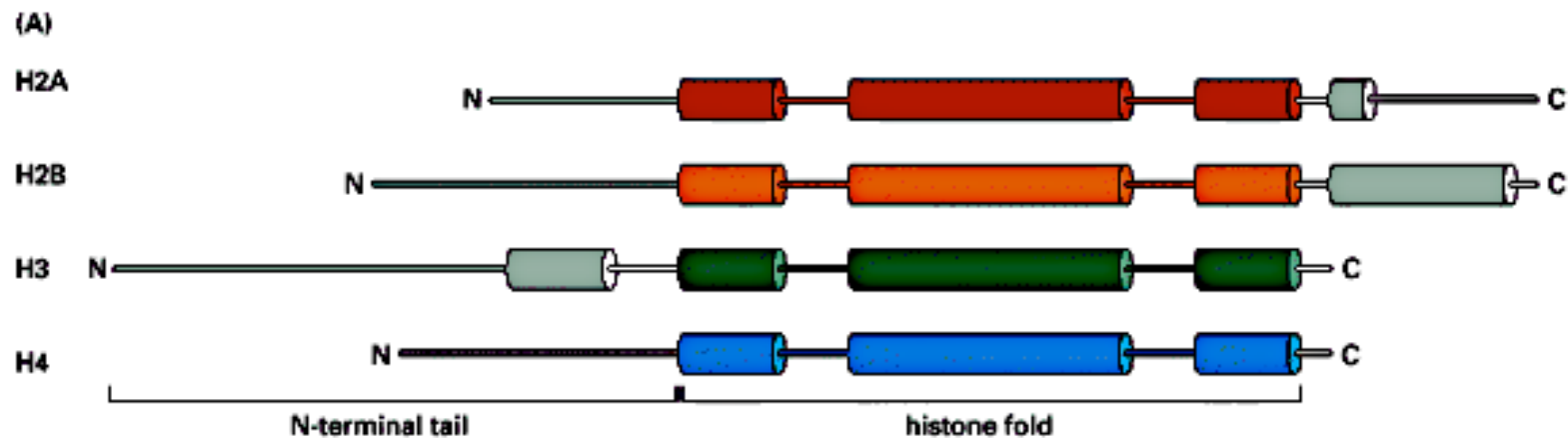


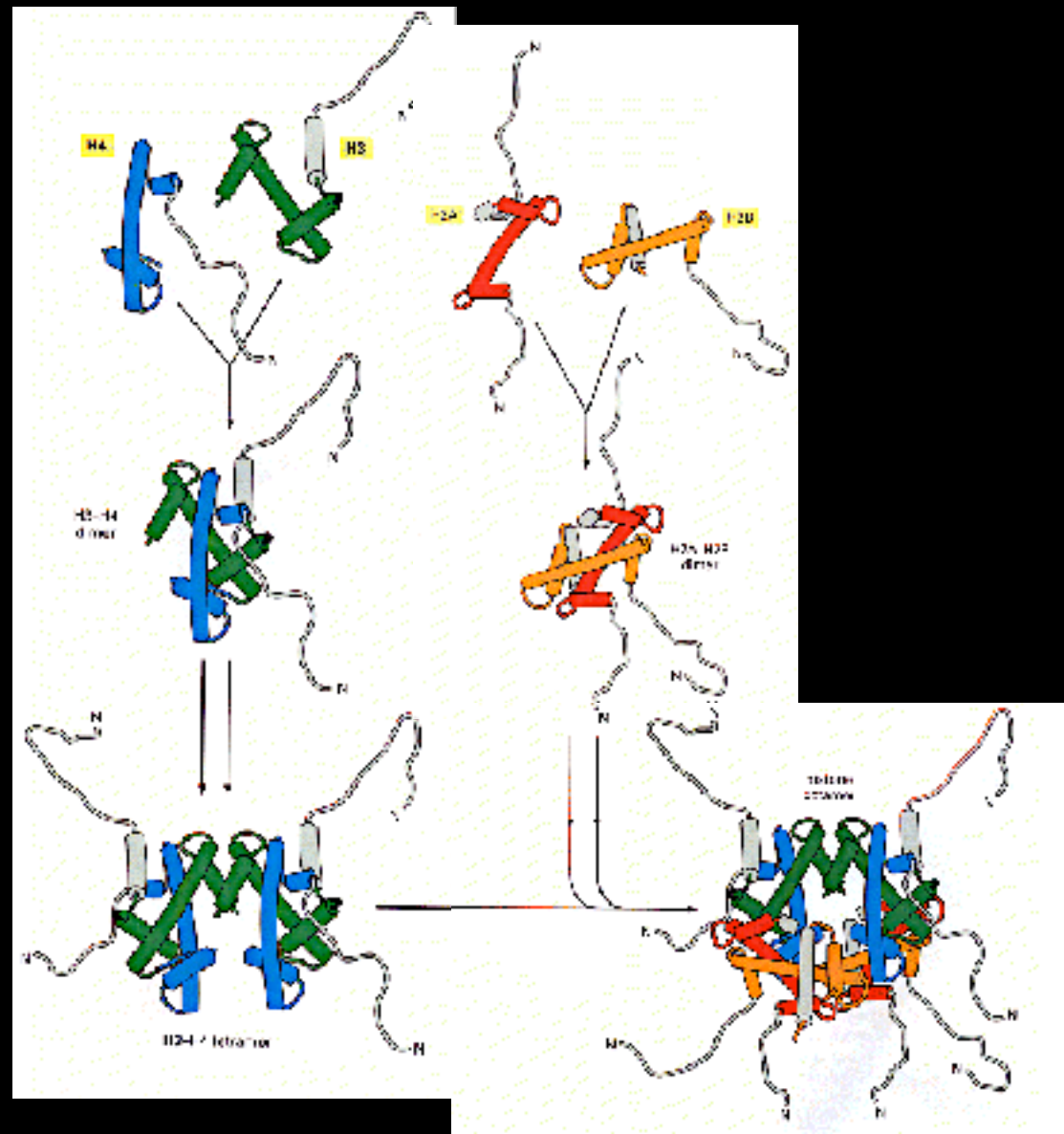
table 24-3

Types and Properties of Histones

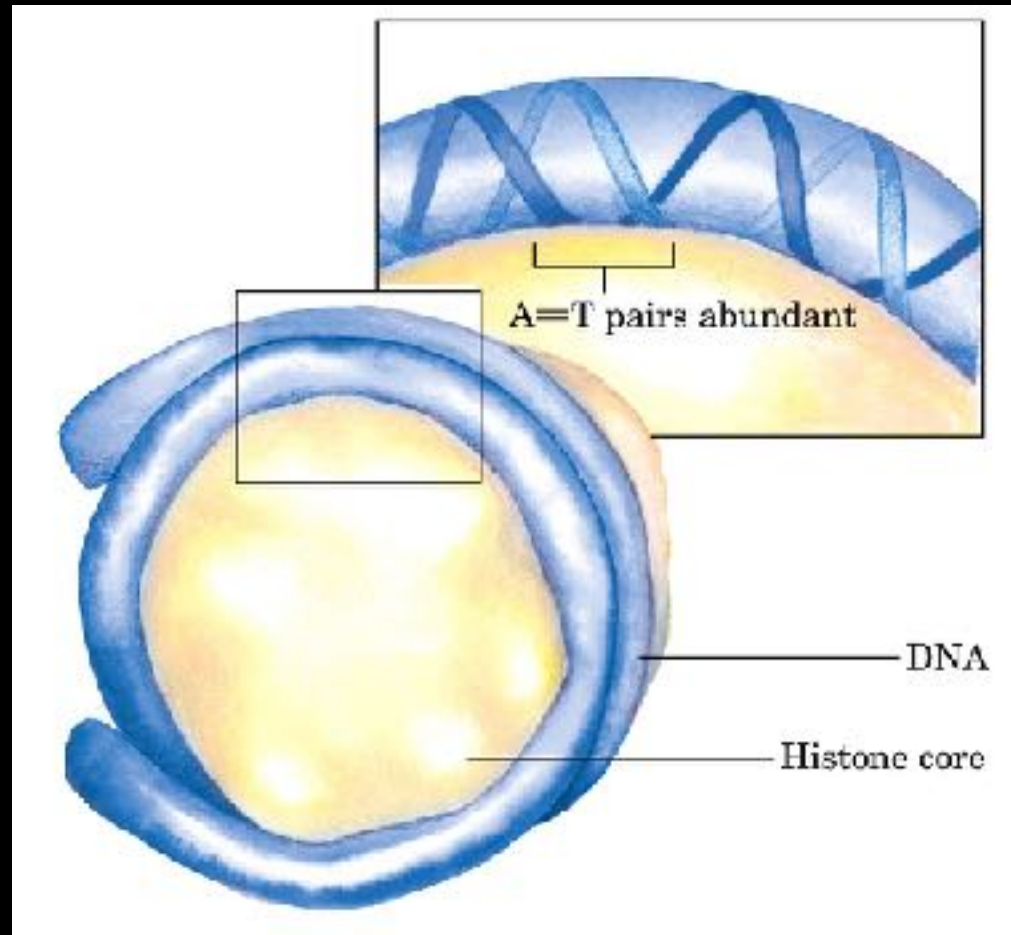
Histone	Molecular weight	Number of amino acid residues	Content of basic amino acids (% of total)	
			Lys	Arg
H1*	21,130	223	29.5	1.3
H2A*	13,960	129	10.9	9.3
H2B*	13,774	125	16.0	6.4
H3	15,273	135	9.6	13.3
H4	11,236	102	10.8	13.7

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

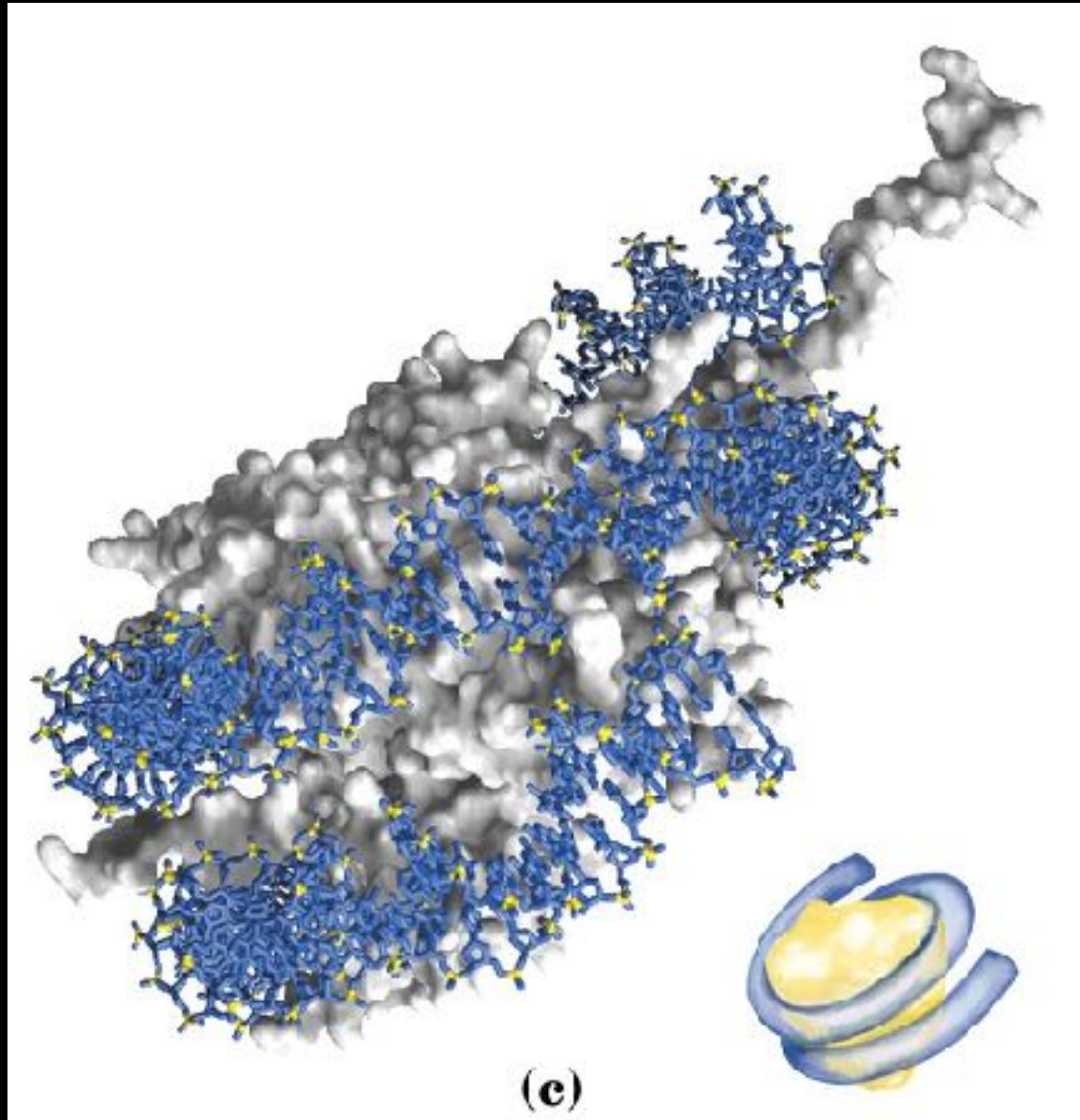
Formação do octâmero



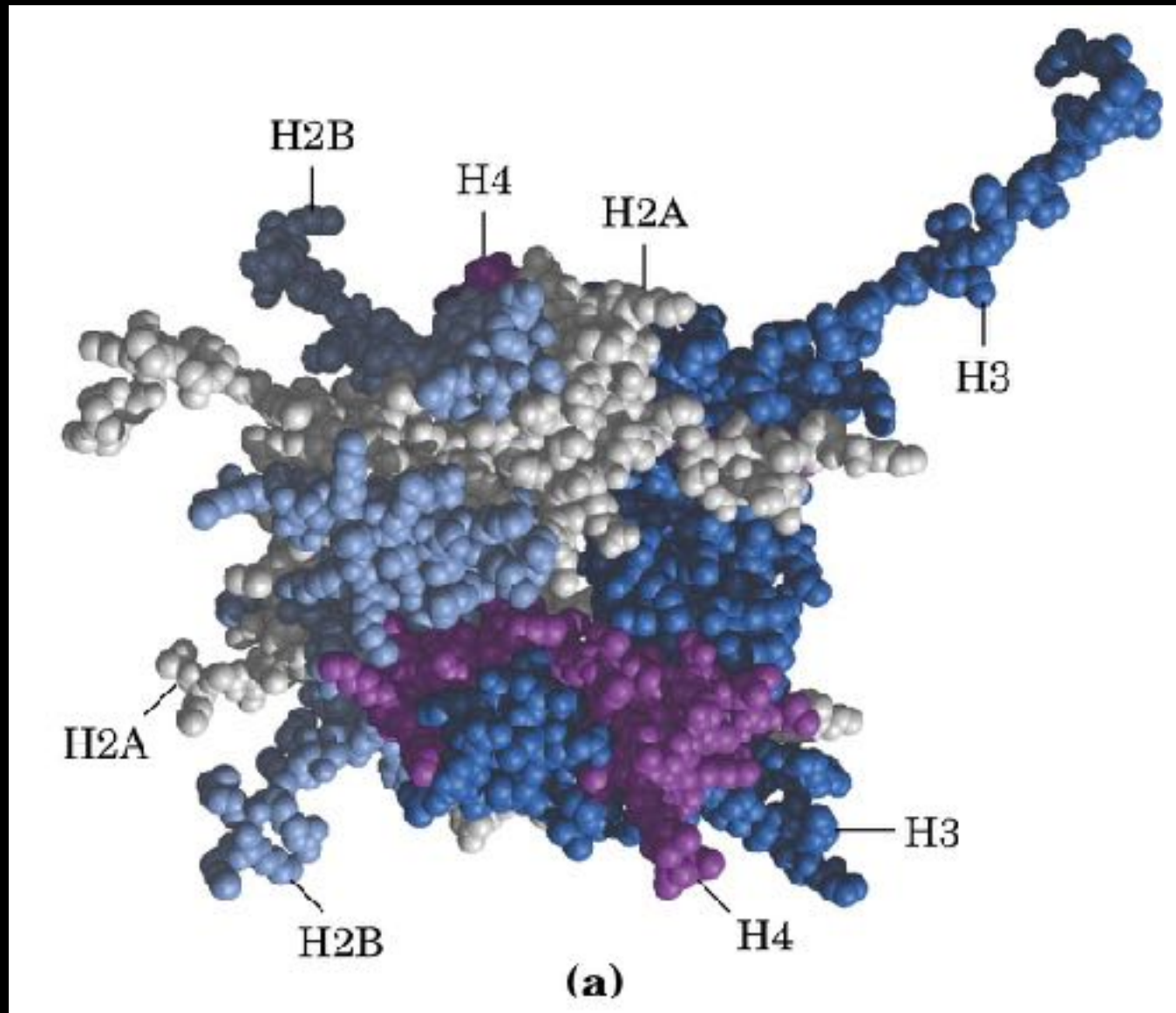
Interação histona-DNA



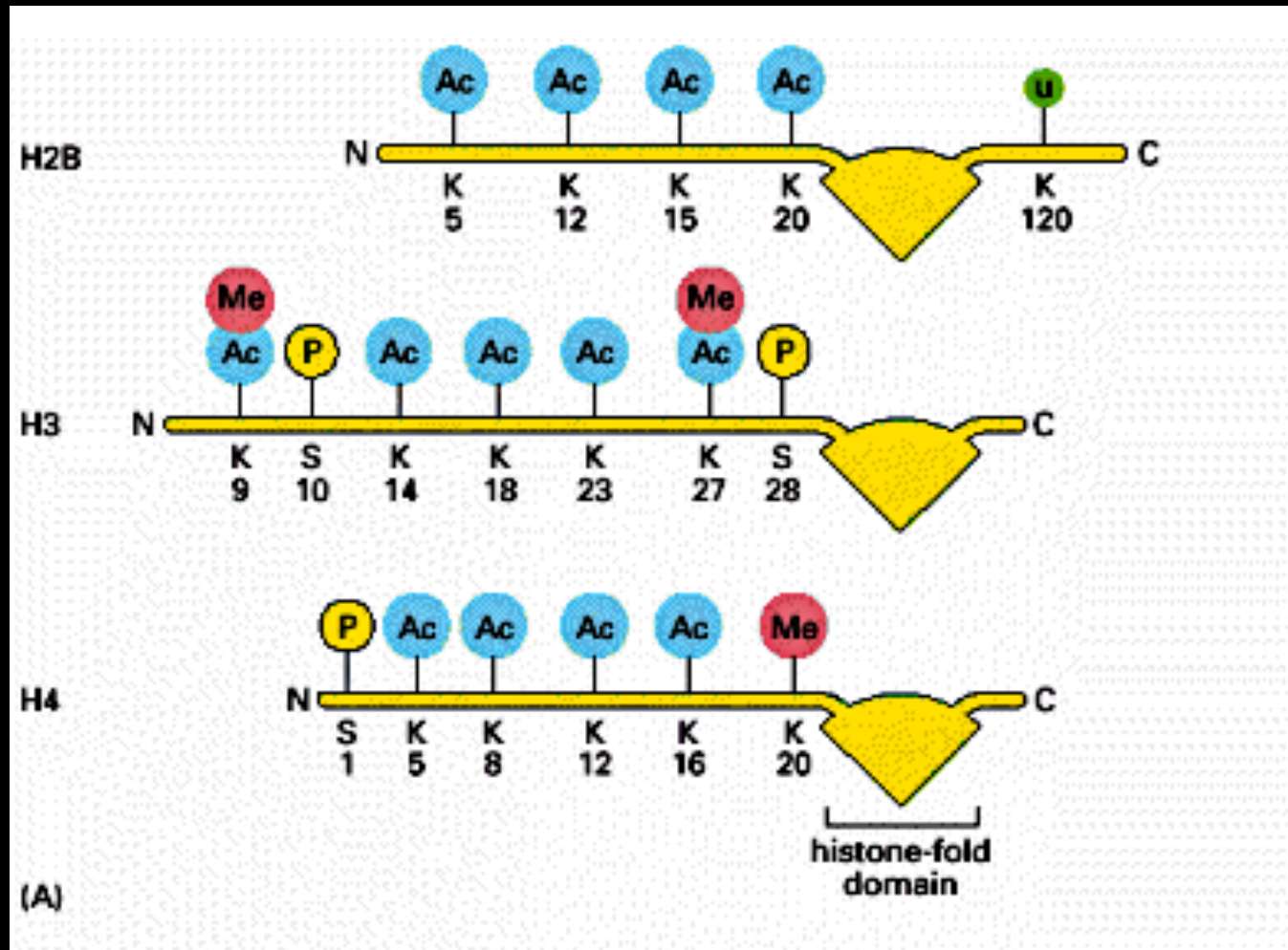
Estrutura do nucleossomo

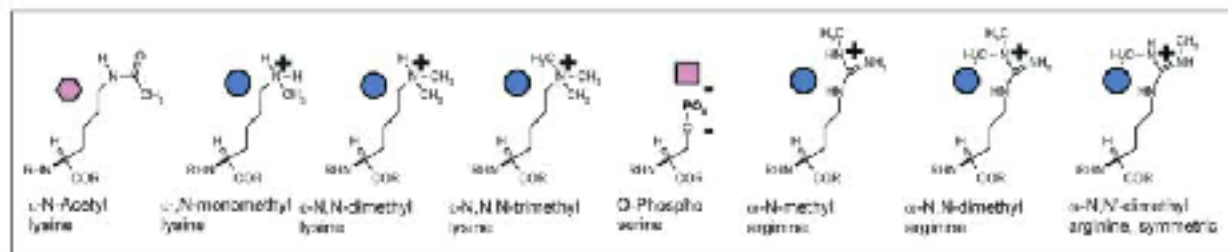
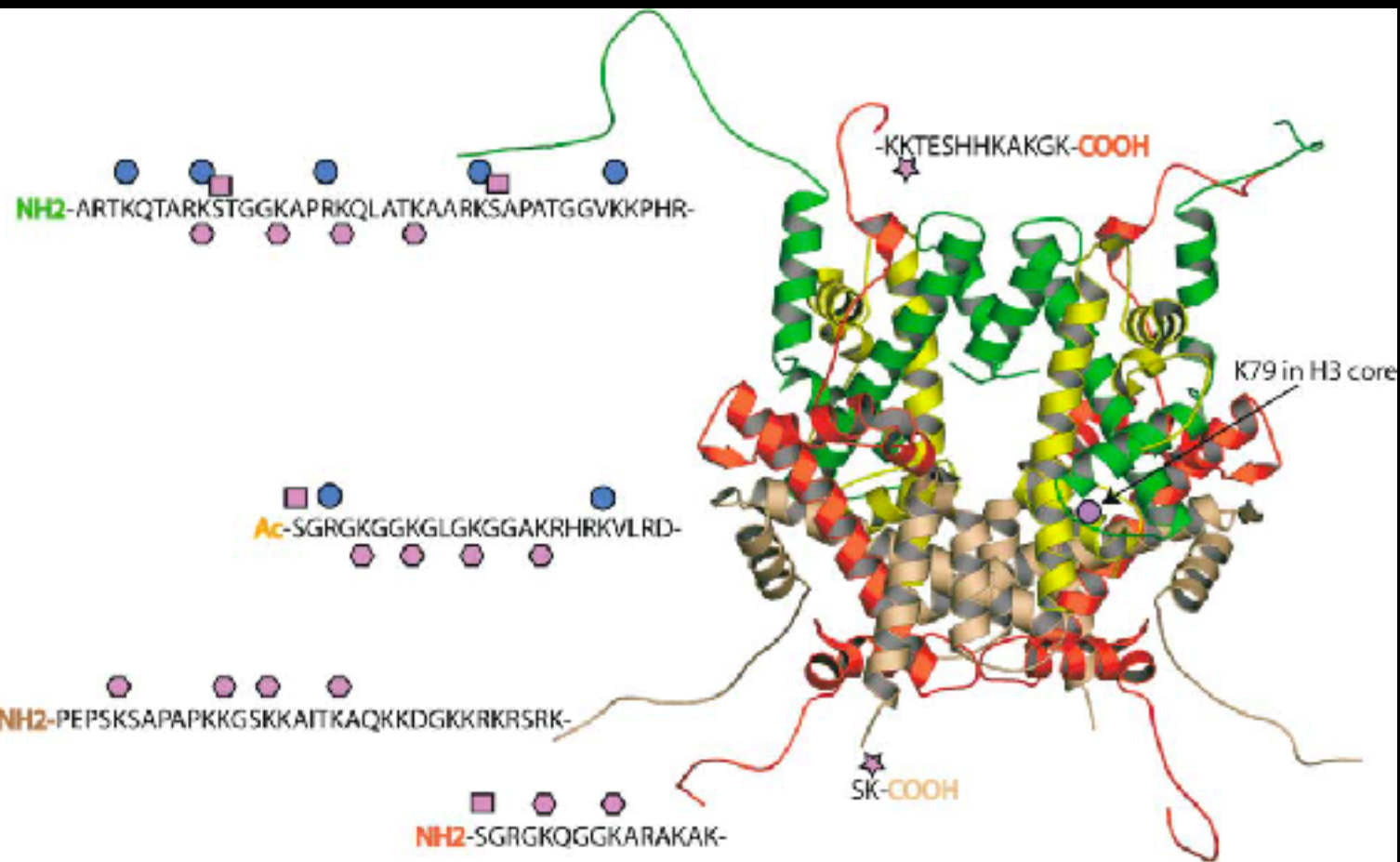


Caudas N-terminais de histonas

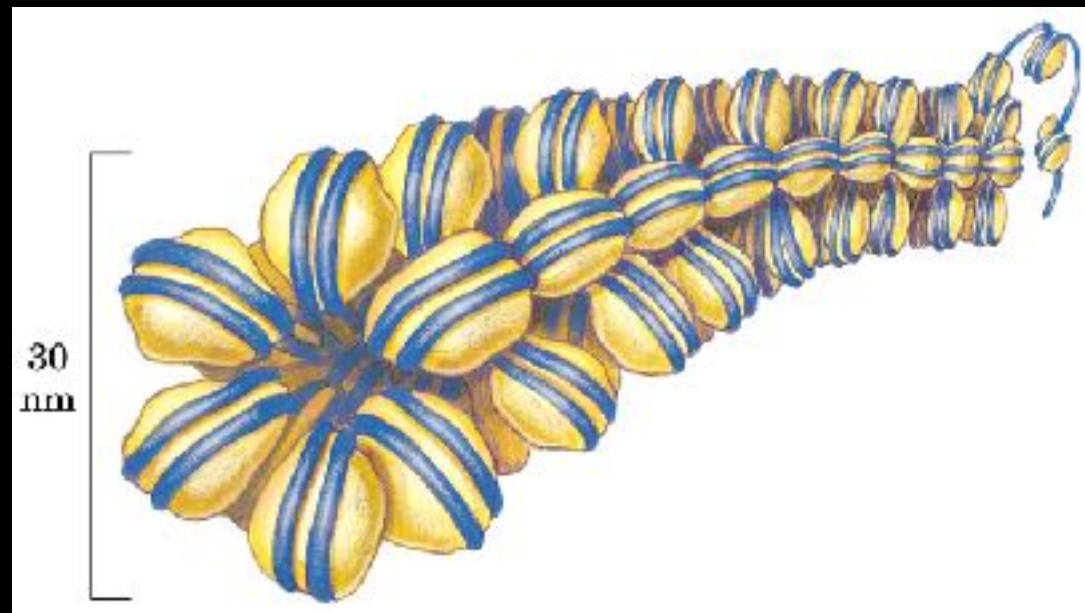


Modificações covalentes de histonas

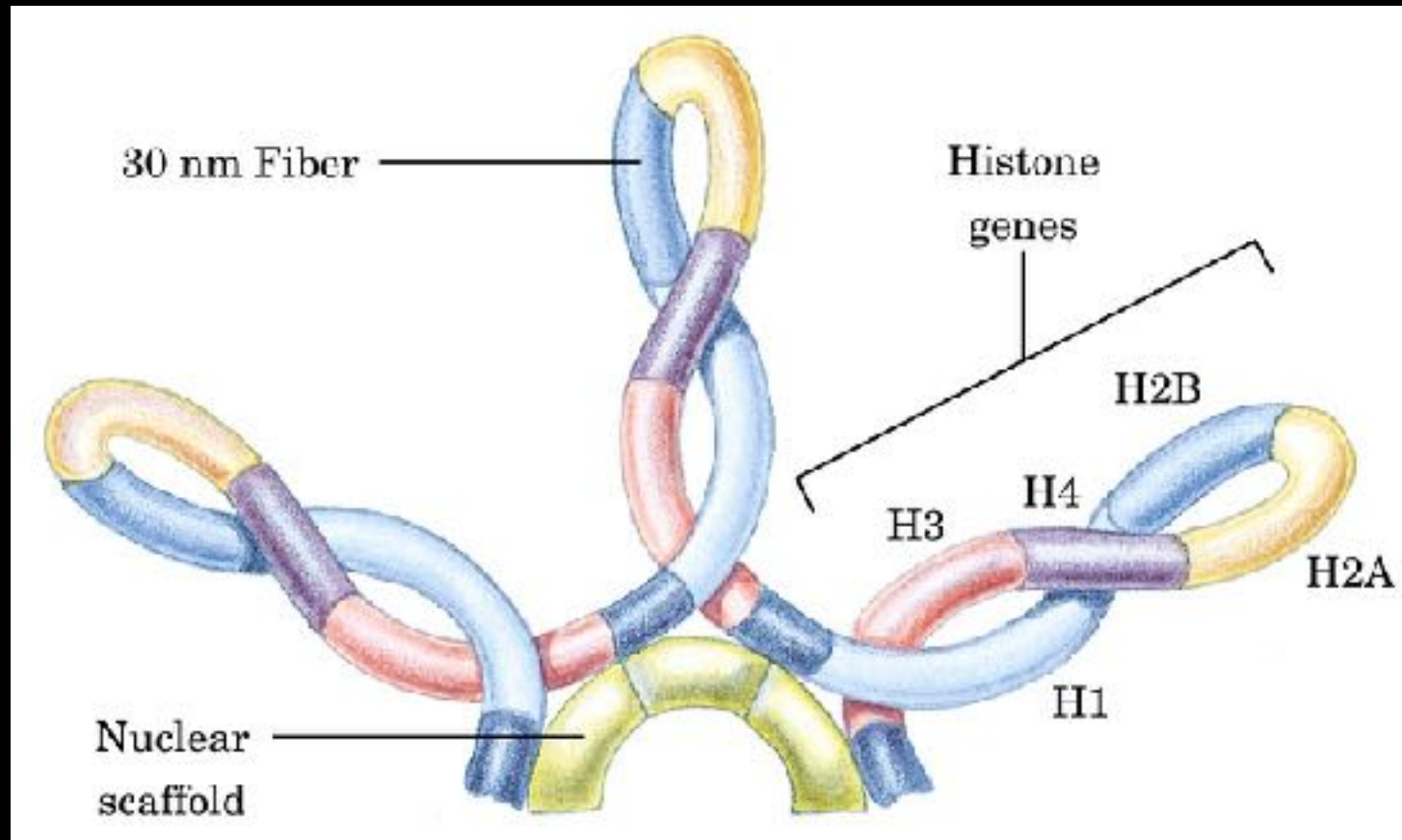


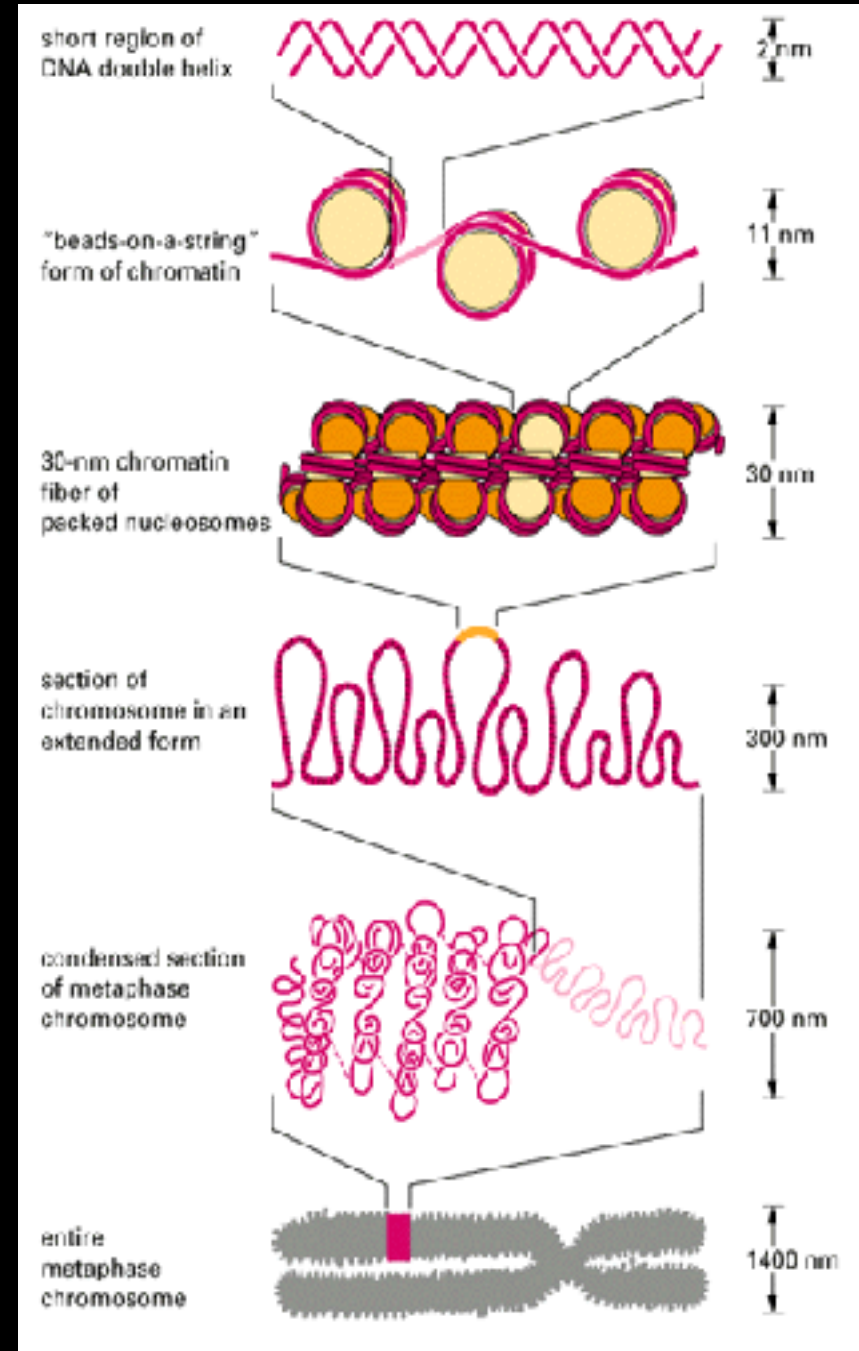
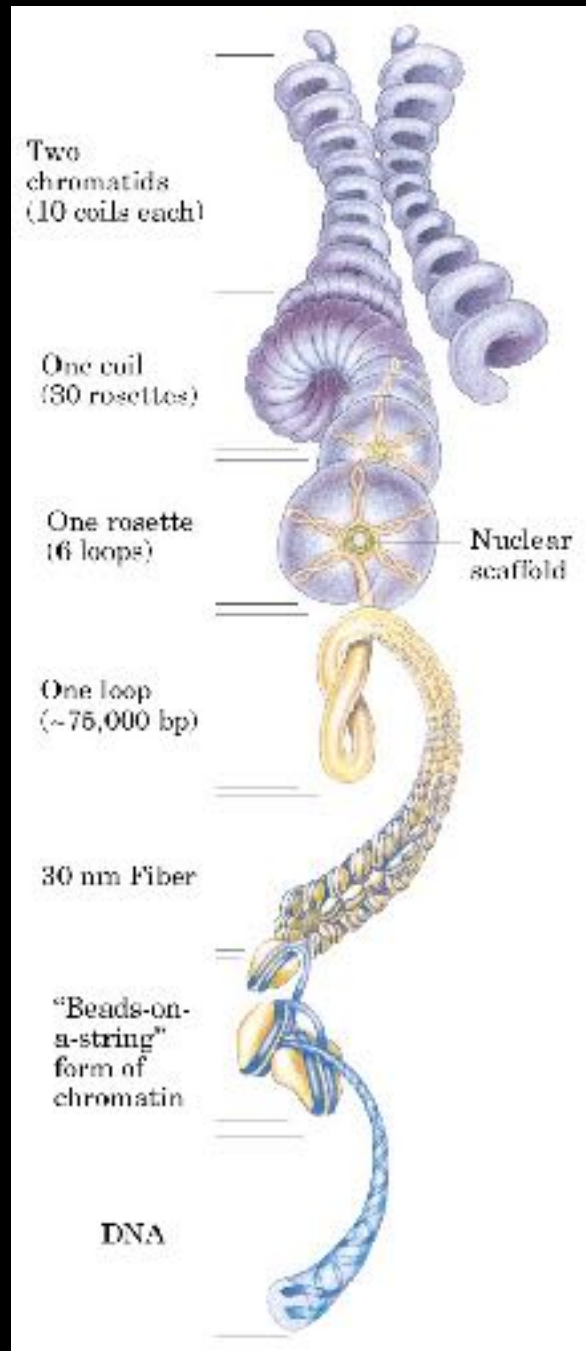


Fibra de 30 nm

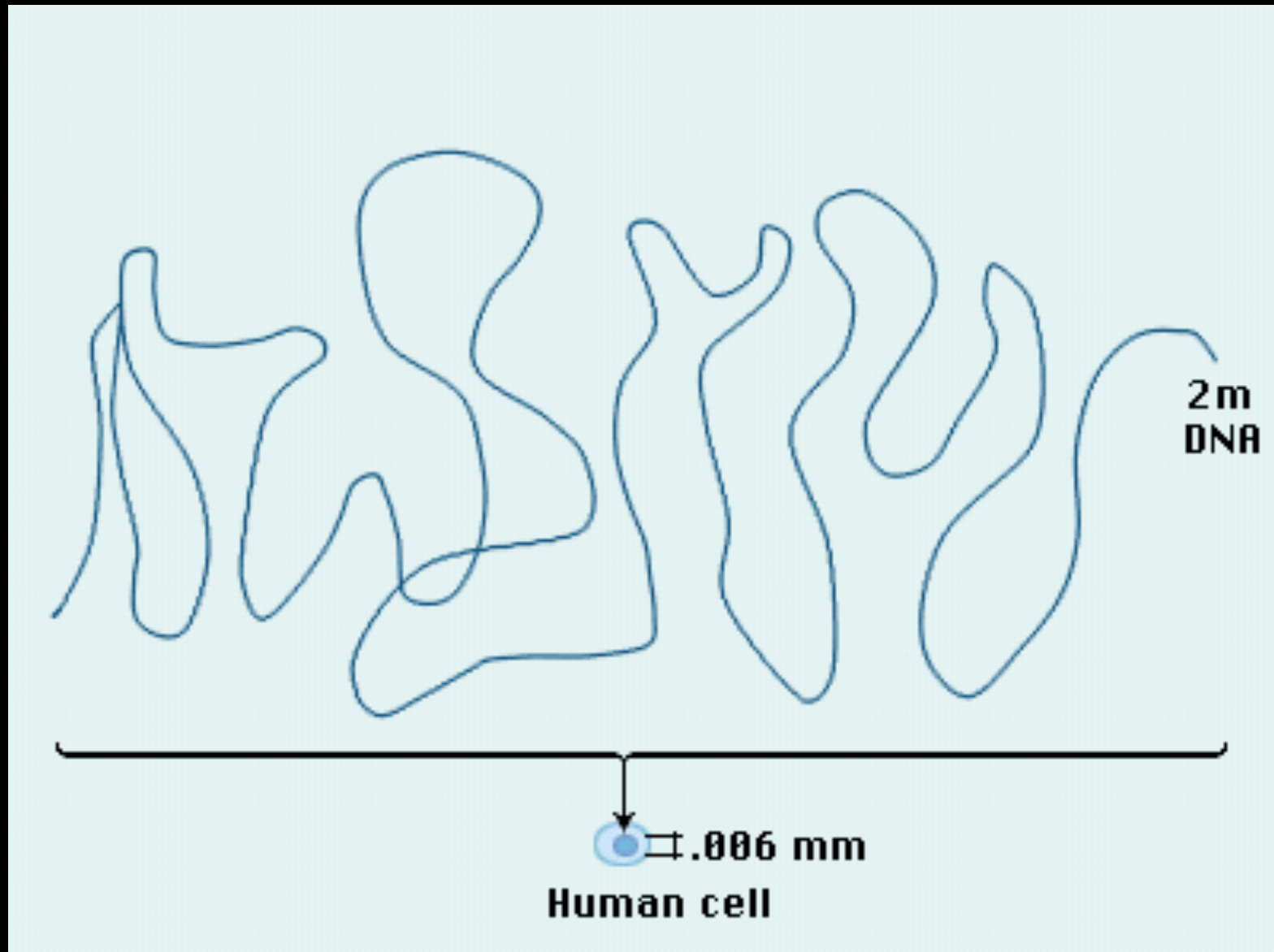


Domínios de cromatina





Compactação e cromatina: animação



Cromatina: animação

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