

El núcleo celular

José Sotelo Silveira PhD

Profesor Asistente Grado 3

Biología Celular

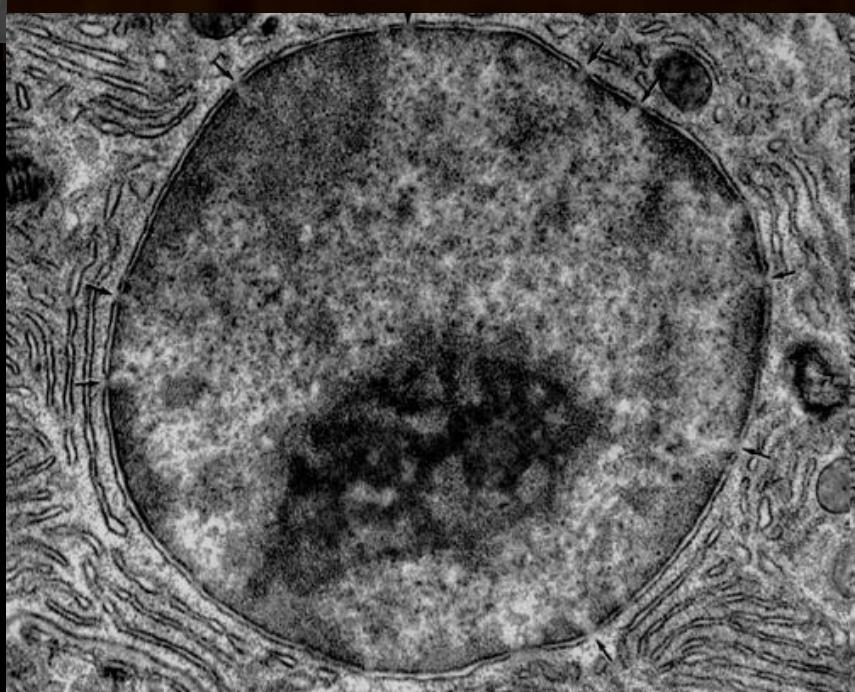
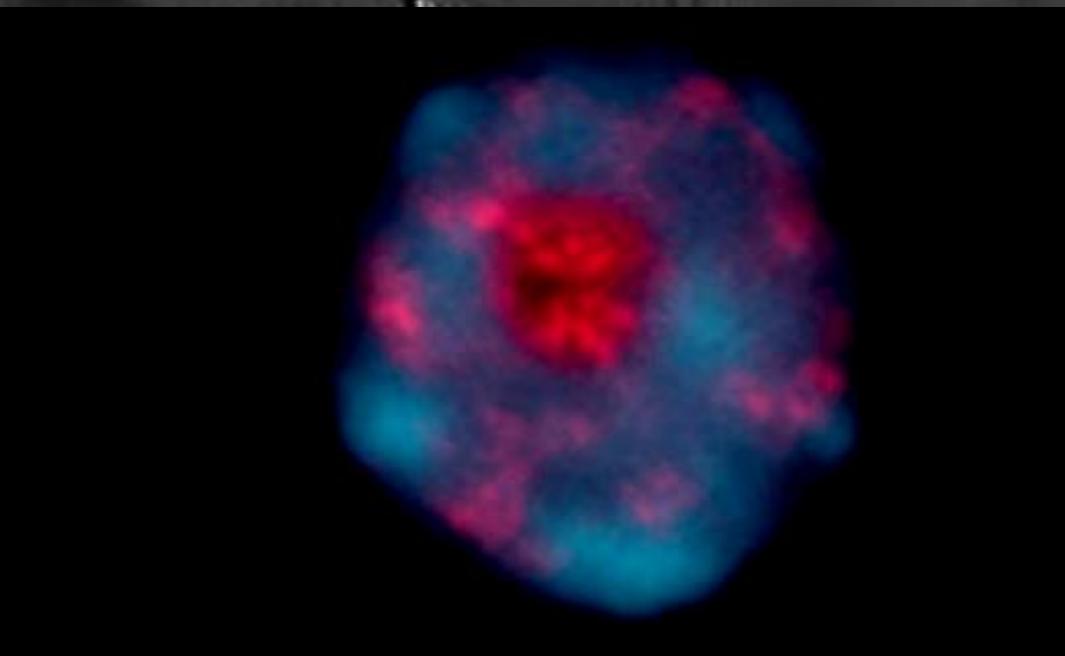
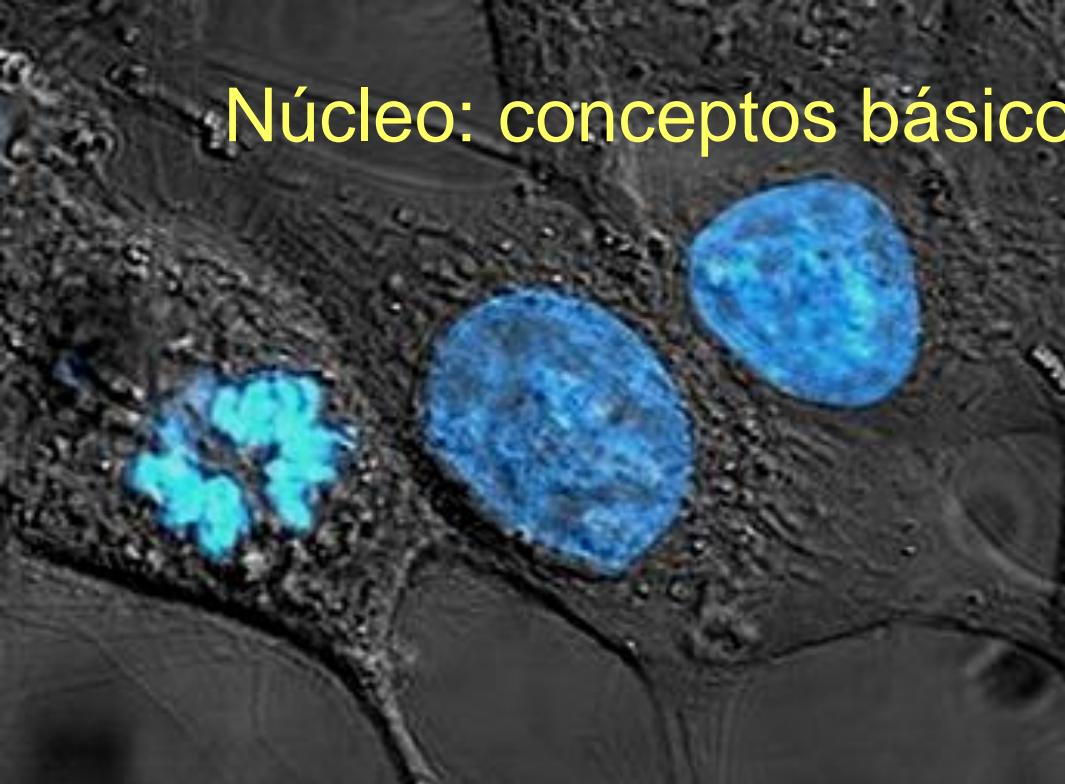
Facultad de Ciencias

Profesor Titular de investigación Grado 5

Dept de Genómica

Instituto de Investigaciones Biológicas Clemente Estable

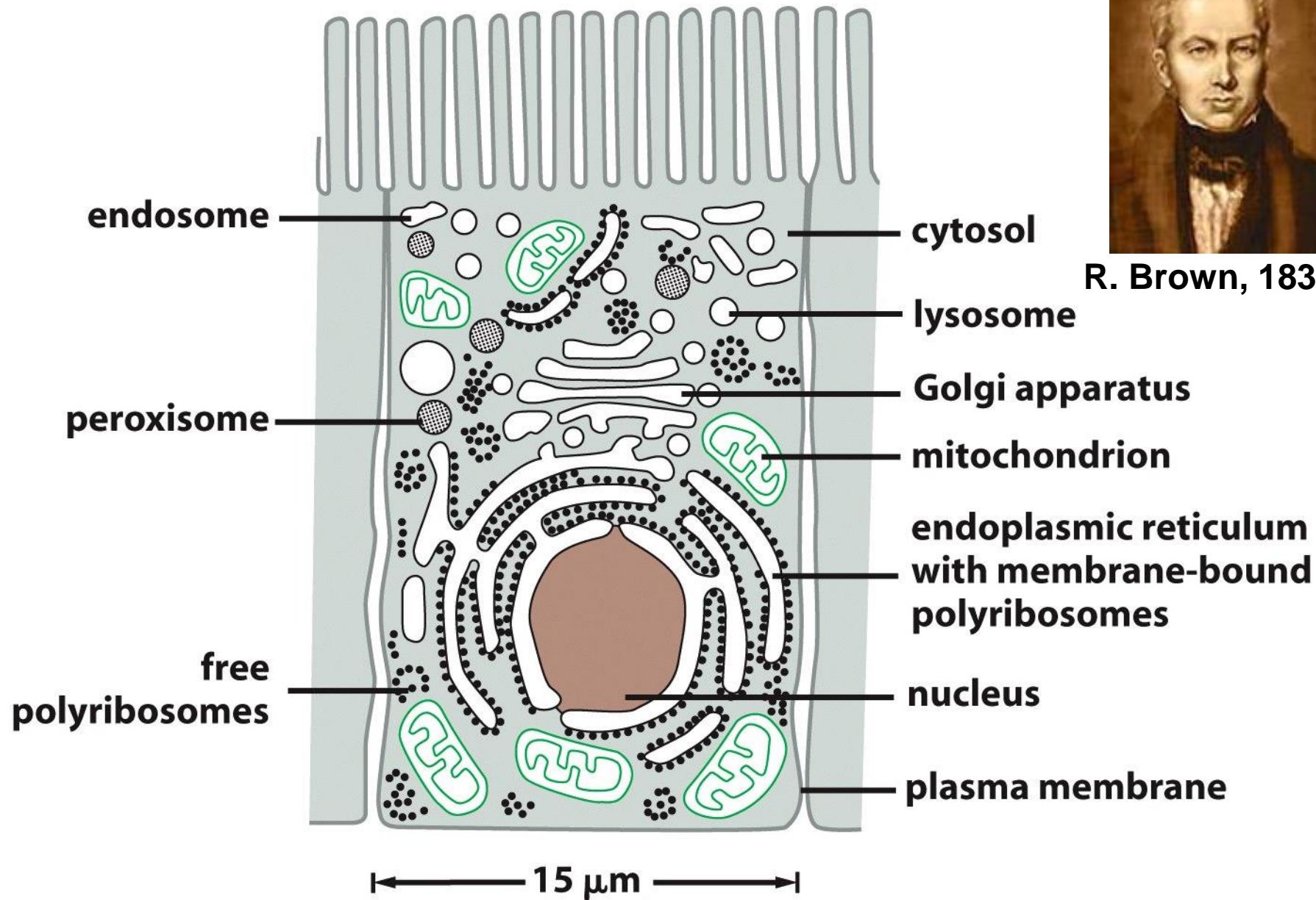
Núcleo: conceptos básicos y estructura general

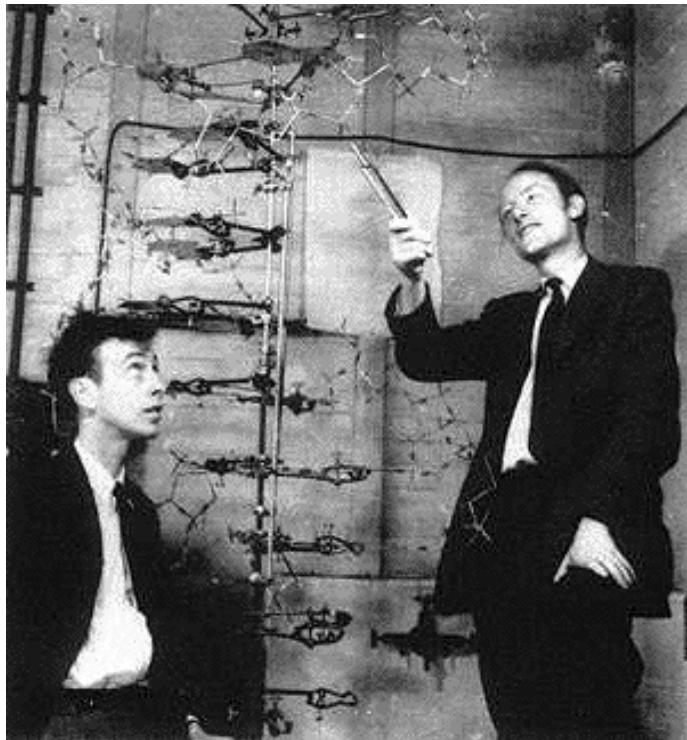


El n úcleo en el contexto celular

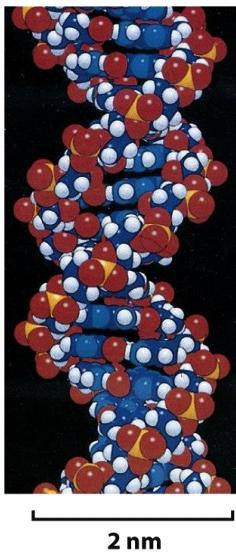
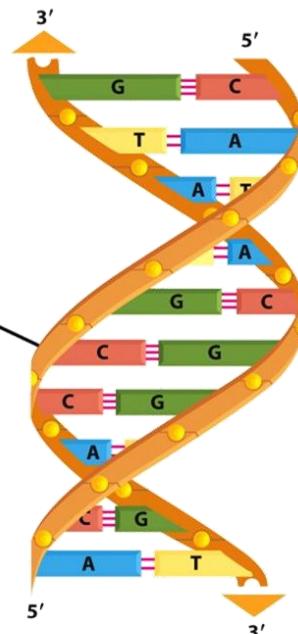


R. Brown, 1831

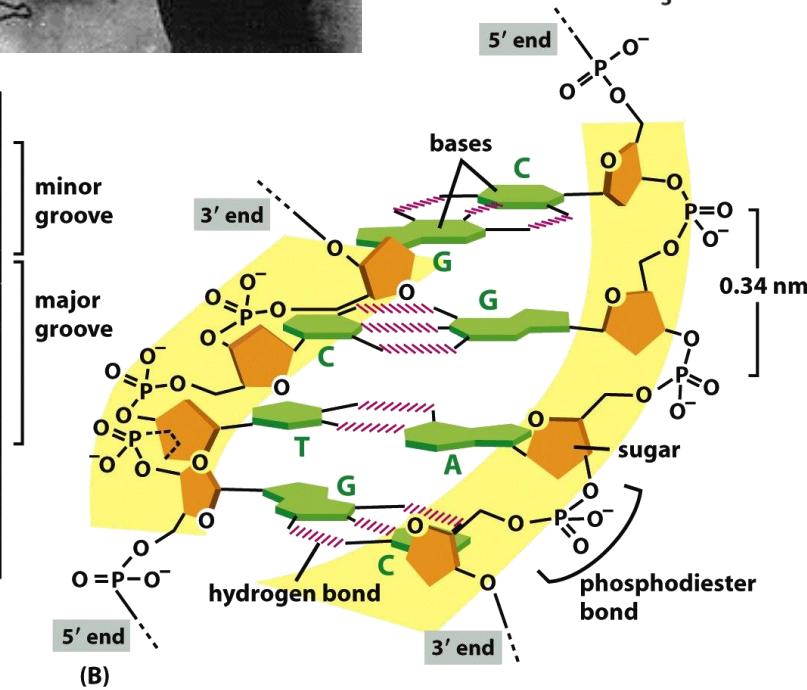




DNA double helix

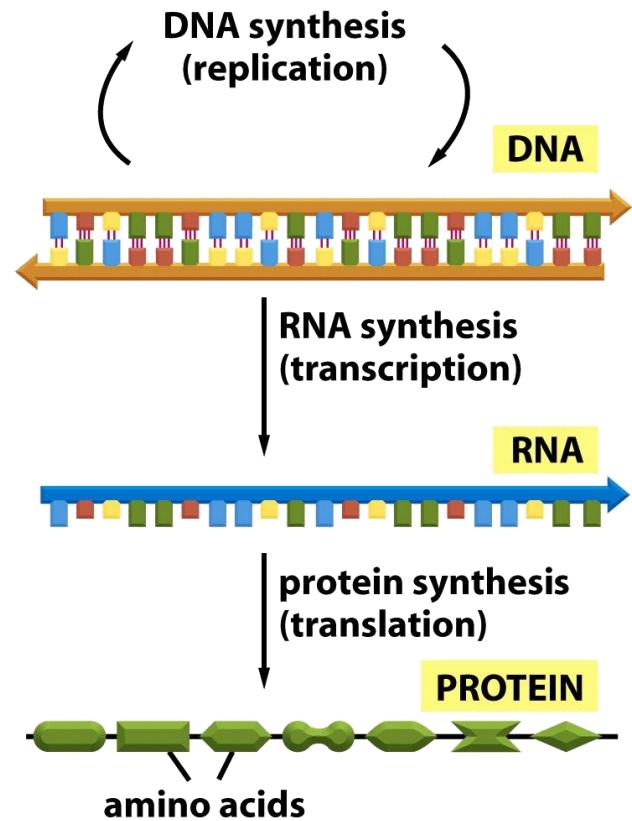


(A)



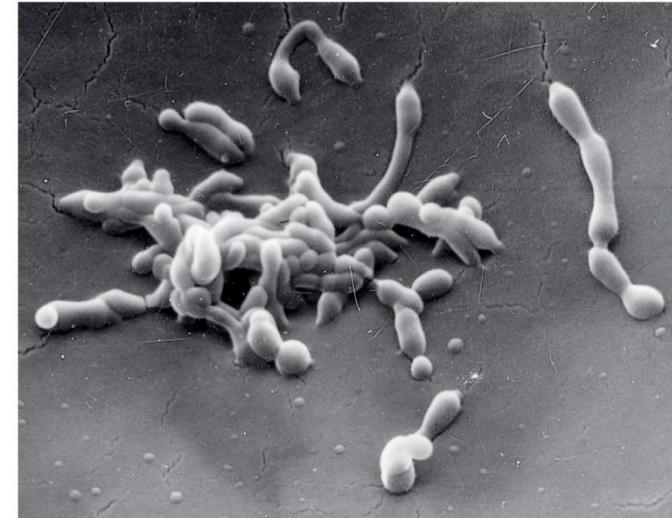
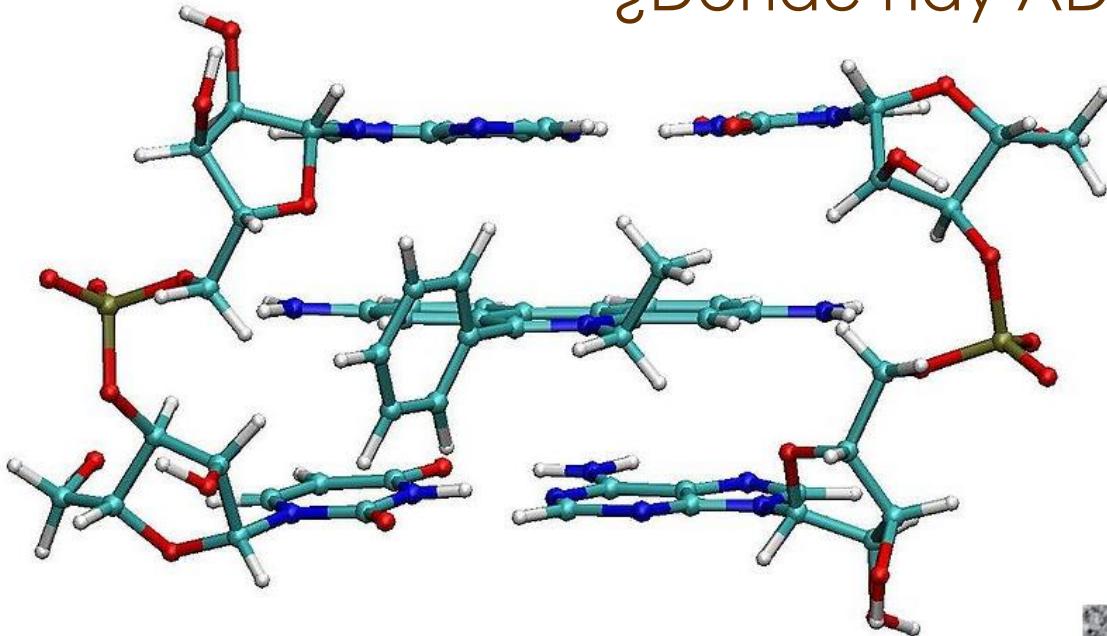
(B)

El ADN

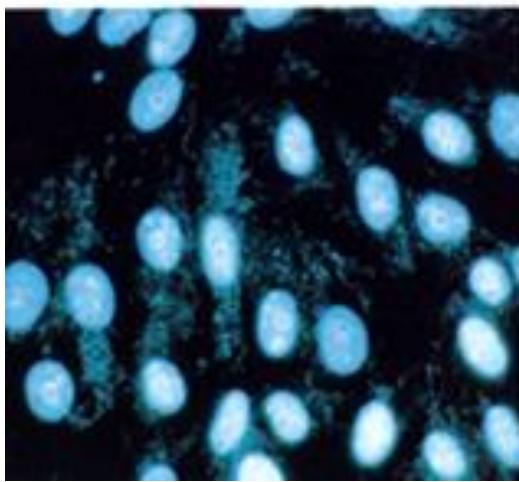
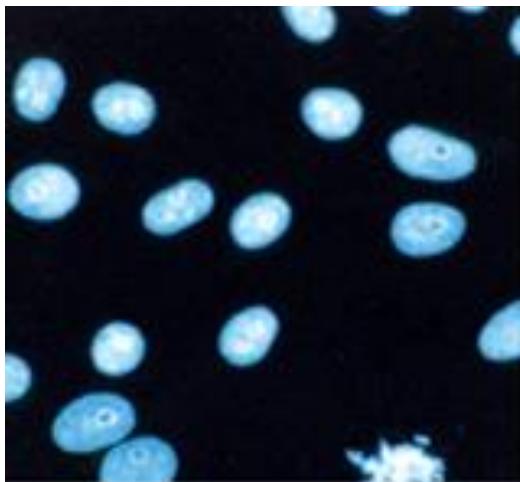


Watson y Crick, 1953

¿Dónde hay ADN?

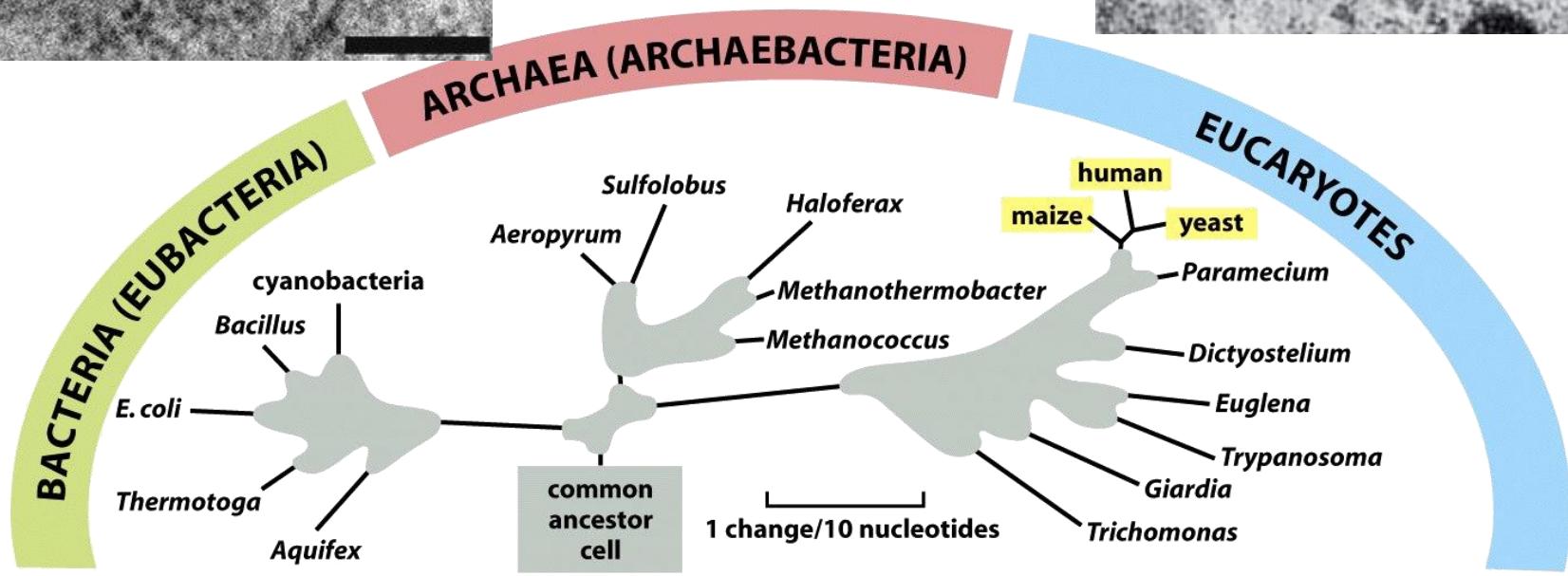
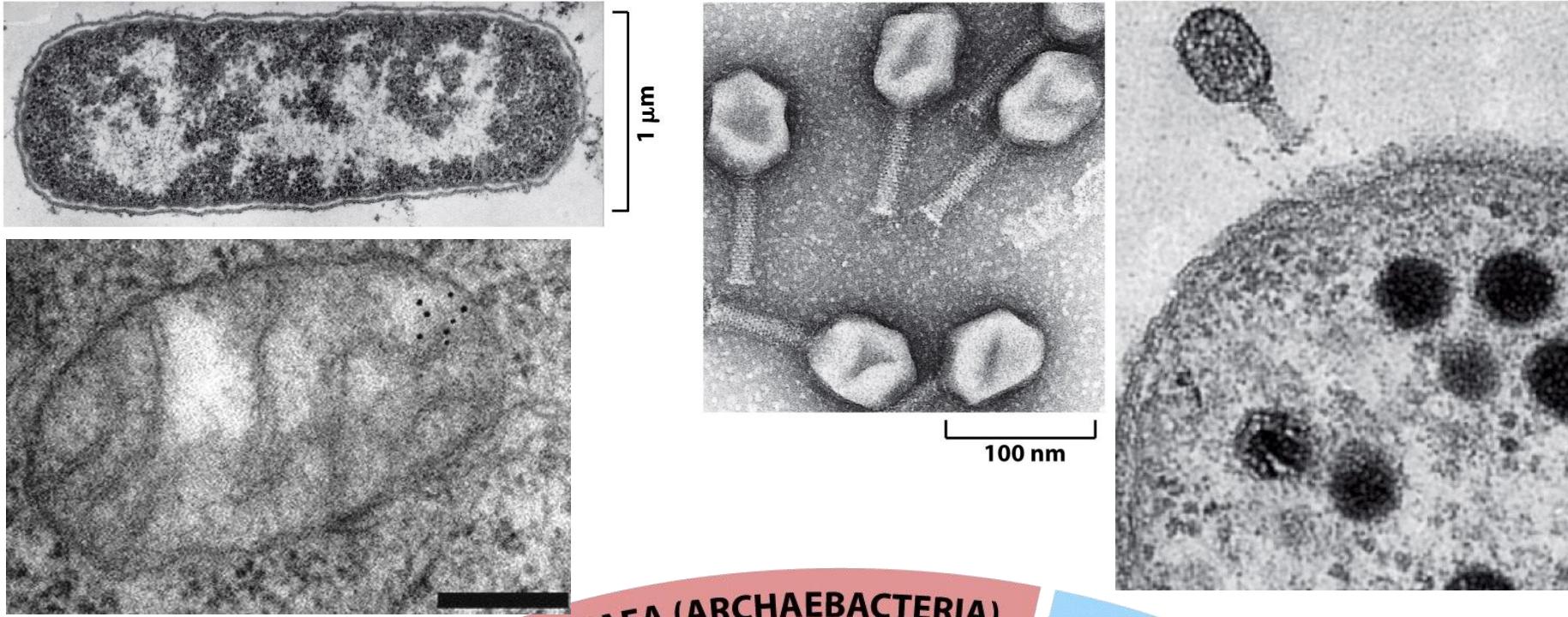


5 μm



0.2 μm

¿Dónde hay ADN?



¿Cuánto ADN hay en las células?

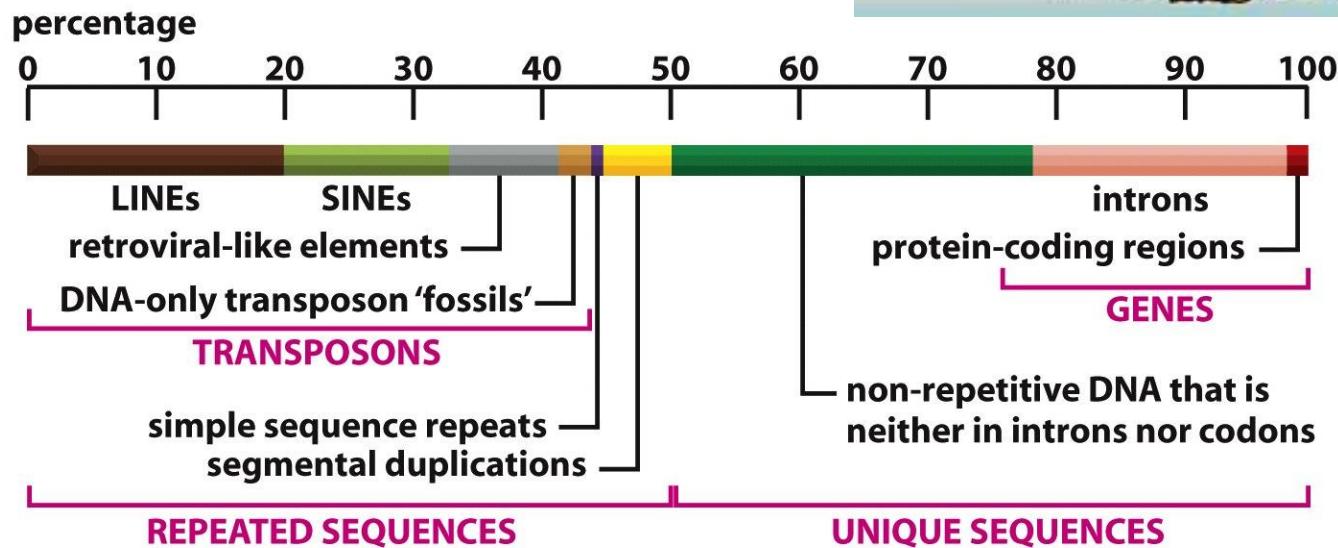
ESPECIE	CARACTERÍSTICAS ESPECIALES	HABITAT	TAMAÑO DEL GENOMA (x1000nt)	Nº DE GENES (ESTIMADO)
BACTERIA				
<i>Mycoplasma genitalium</i>	has one of the smallest of all known cell genomes	human genital tract	580	468
<i>Synechocystis</i> sp.	photosynthetic, oxygen-generating (cyanobacterium)	lakes and streams	3573	3168
<i>Escherichia coli</i>	laboratory favorite	human gut	4639	4289
<i>Helicobacter pylori</i>	causes stomach ulcers and	human stomach	1667	1590
ARCHAEA				
<i>Methanococcus jannaschii</i>	lithotrophic, anaerobic, methane-producing	hydrothermal vents	1664	1750
<i>Archaeoglobus fulgidus</i>	lithotrophic or organotrophic, anaerobic, sulfate-reducing	hydrothermal vents	2178	2493
<i>Nanoarchaeum equitans</i>	smallest known archaean; anaerobic; parasitic on another, larger archaean	hydrothermal and volcanic hot vents	491	552
EUCARYOTES				
<i>Saccharomyces cerevisiae</i> (budding yeast)	minimal model eucaryote	grape skins, beer	12,069	~6300
<i>Arabidopsis thaliana</i> (Thale cress)	model organism for flowering plants	soil and air	~142,000	~26,000
<i>Caenorhabditis elegans</i> (nematode worm)	simple animal with perfectly predictable development	soil	~97,000	~20,000
<i>Drosophila melanogaster</i> (fruit fly)	key to the genetics of animal development	rotting fruit	~137,000	~14,000
<i>Homo sapiens</i> (human)	most intensively studied mammal	houses	~3,200,000	~24,000

Genome size and gene number vary between strains of a single species, especially for bacteria and archaea. The table shows data for particular strains that have been sequenced. For eucaryotes, many genes can give rise to several alternative variant proteins, so that the total number of proteins specified by the genome is substantially greater than the number of genes.

El genoma humano

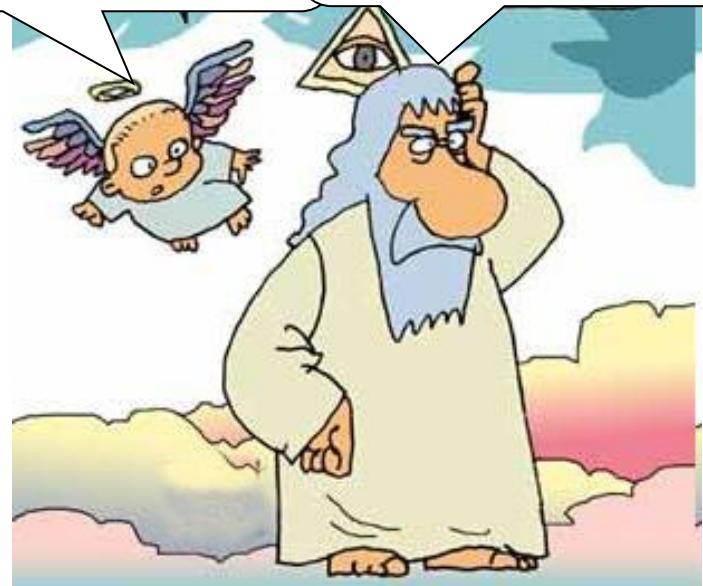


Craig Venter



DIOS... EL GENOMA HUMANO HA SIDO DEVELADO

MALDITOS HACKERS!!! AHORA TENDRÉ QUE CAMBIAR LA CLAVE!!!



Un problema de tamaños...

$3,2 \times 10^9$ pb

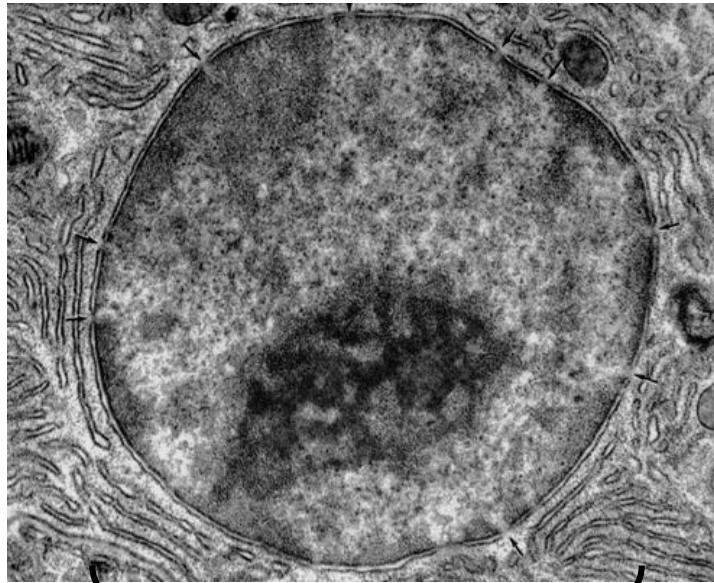
X

2n

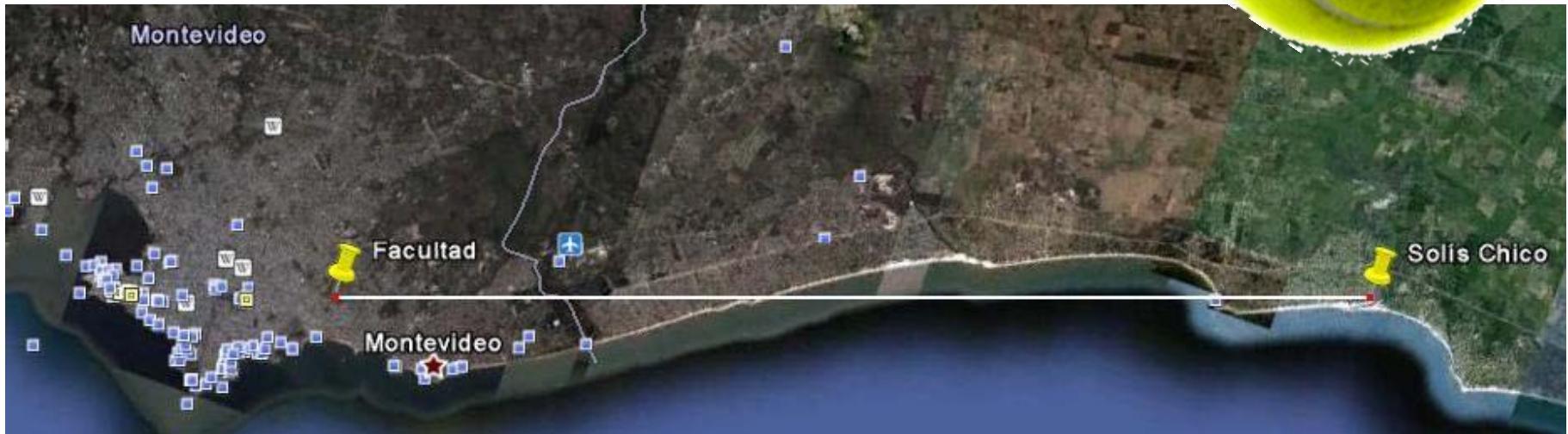
X

$0,34 \times 10^{-9}$ m/pb

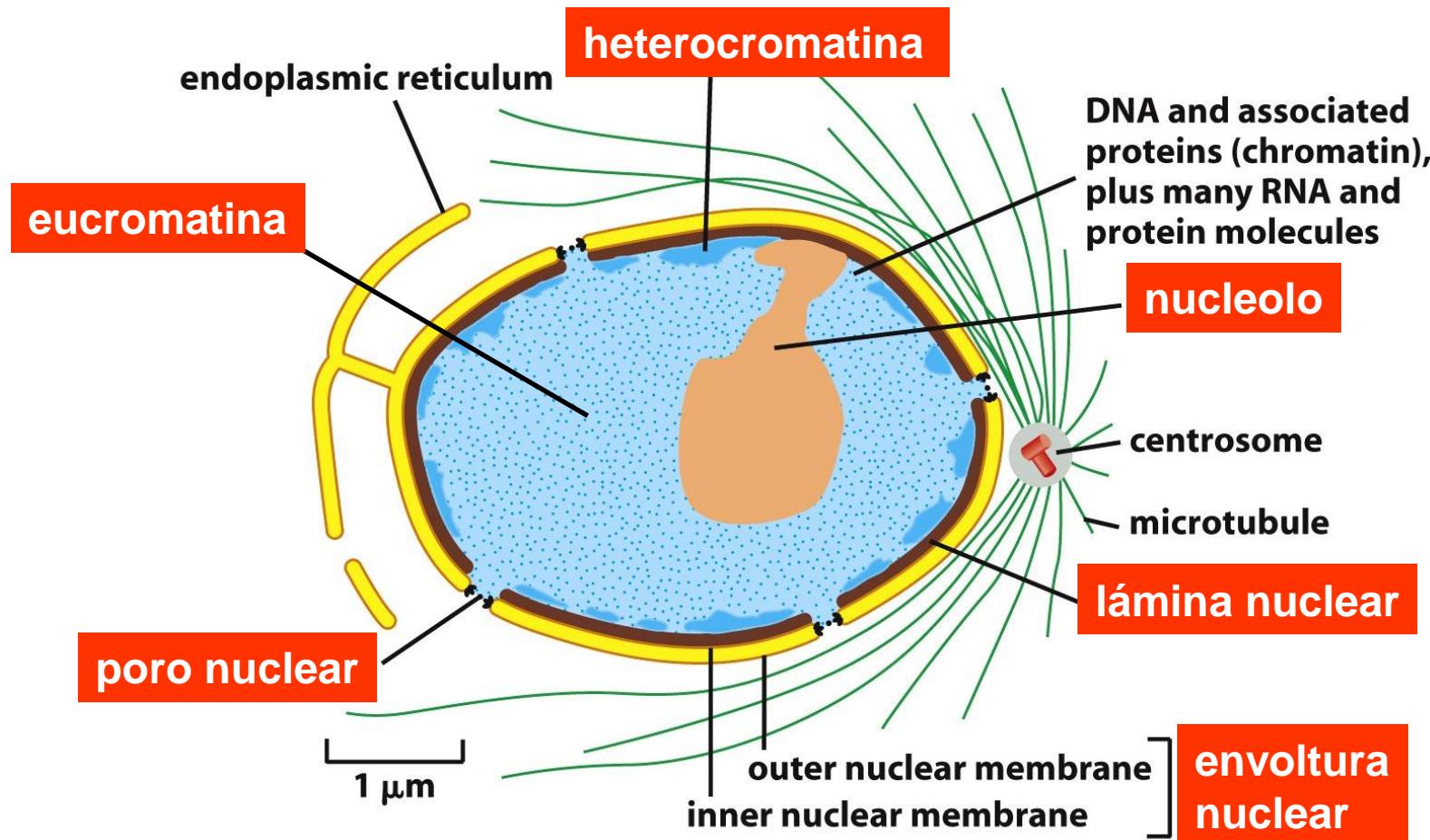
2,176 m



$5-10 \times 10^{-6}$ m



Estructura básica del núcleo



Cromatina: ADN + Proteínas:

- empaquetamiento del ADN (histonas)
- replicación
- transcripción
- reparación del ADN

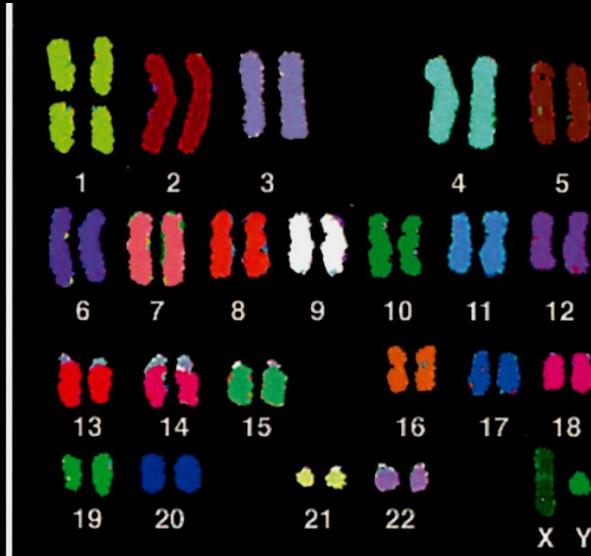
Tomemos un descanso mirando unas películas

http://www.garlandscience.com/garlandscience_resources/resource_detail.jsf?landing=student&resource_id=9780815342137_CH06_QTM01

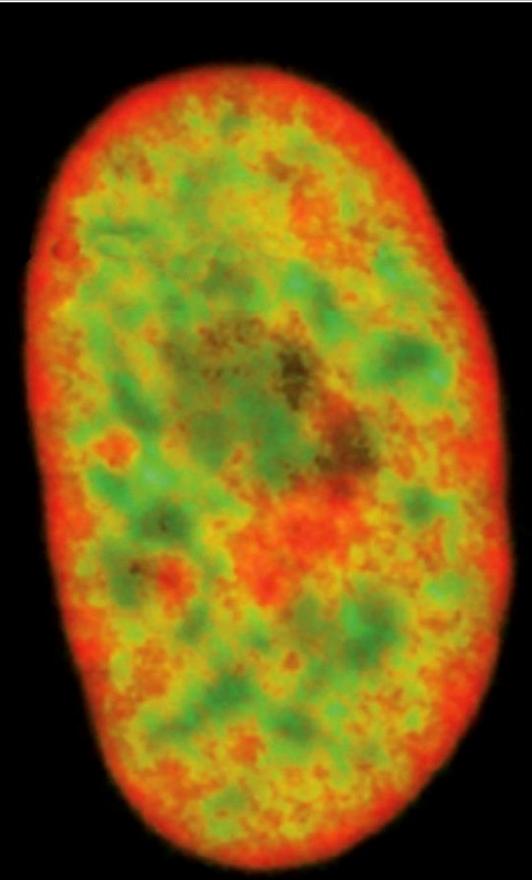
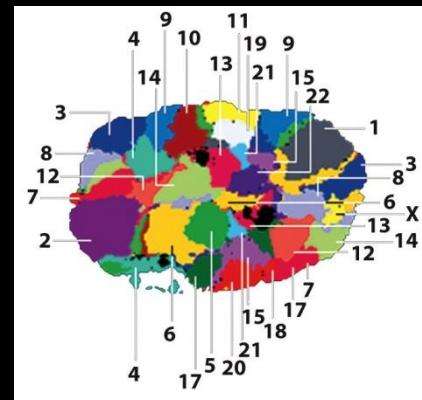
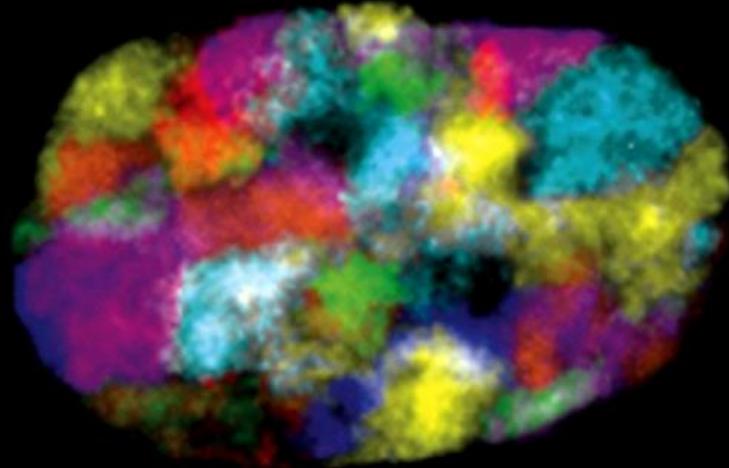
http://www.garlandscience.com/garlandscience_resources/resource_detail.jsf?landing=student&resource_id=9780815344544_CH18_QTM08

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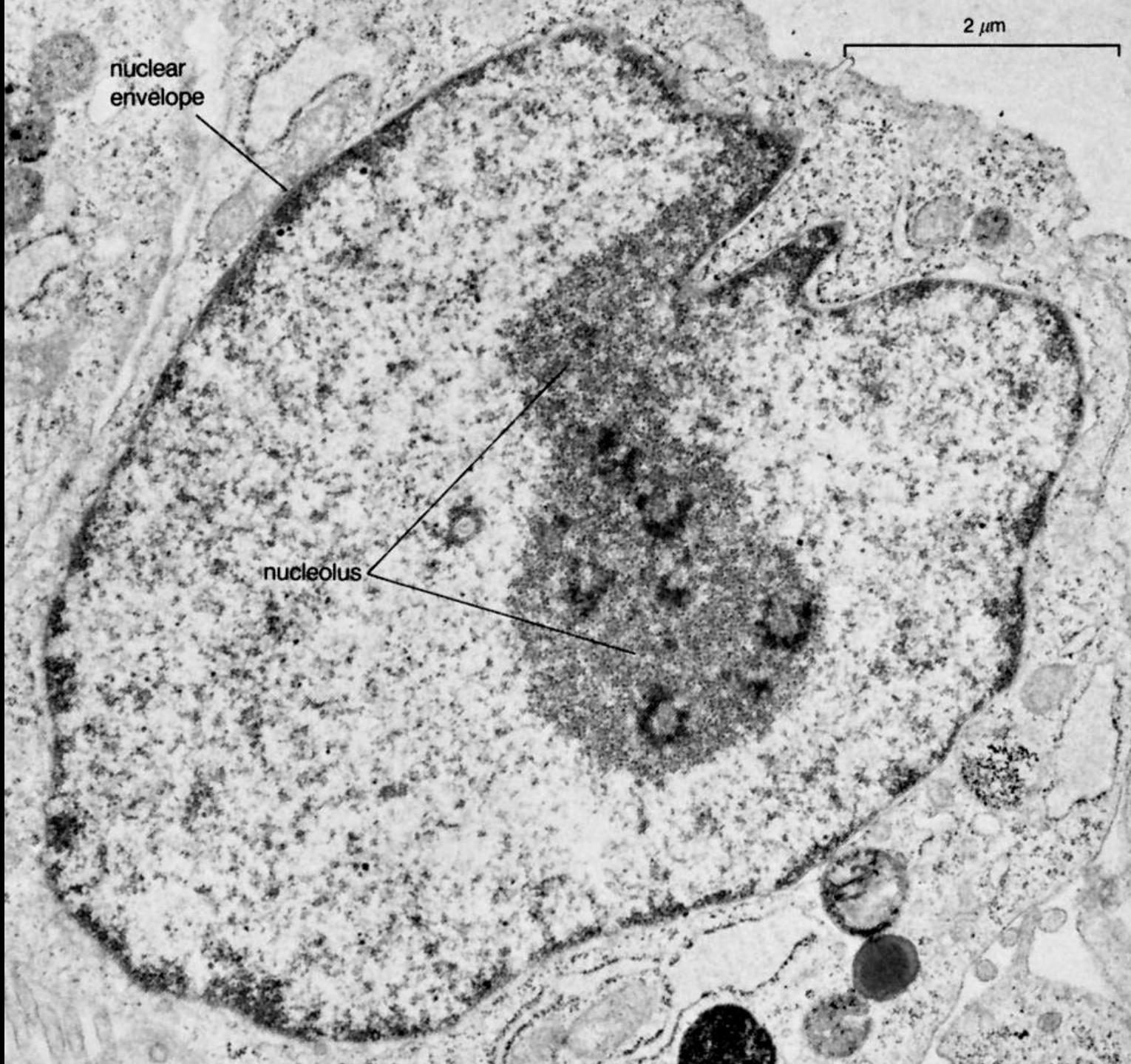
Organización del núcleo



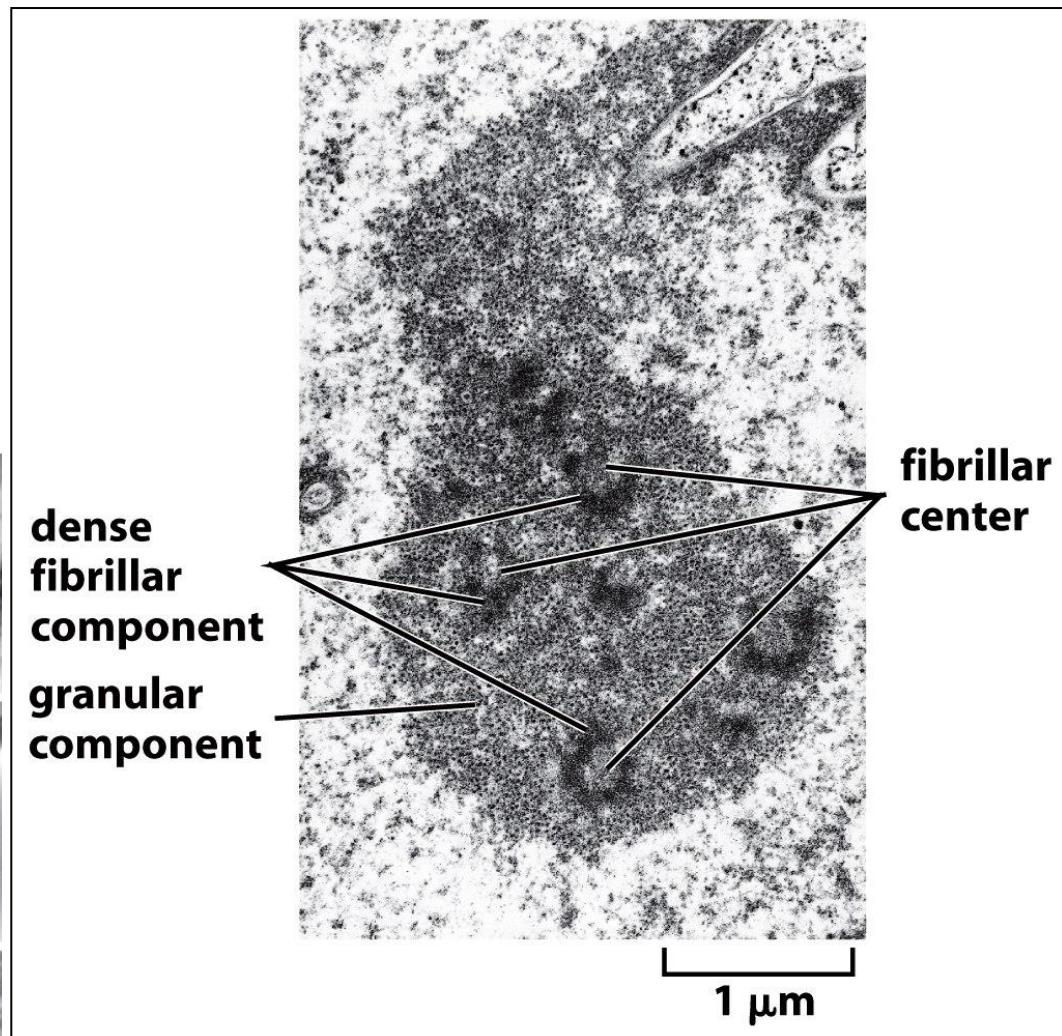
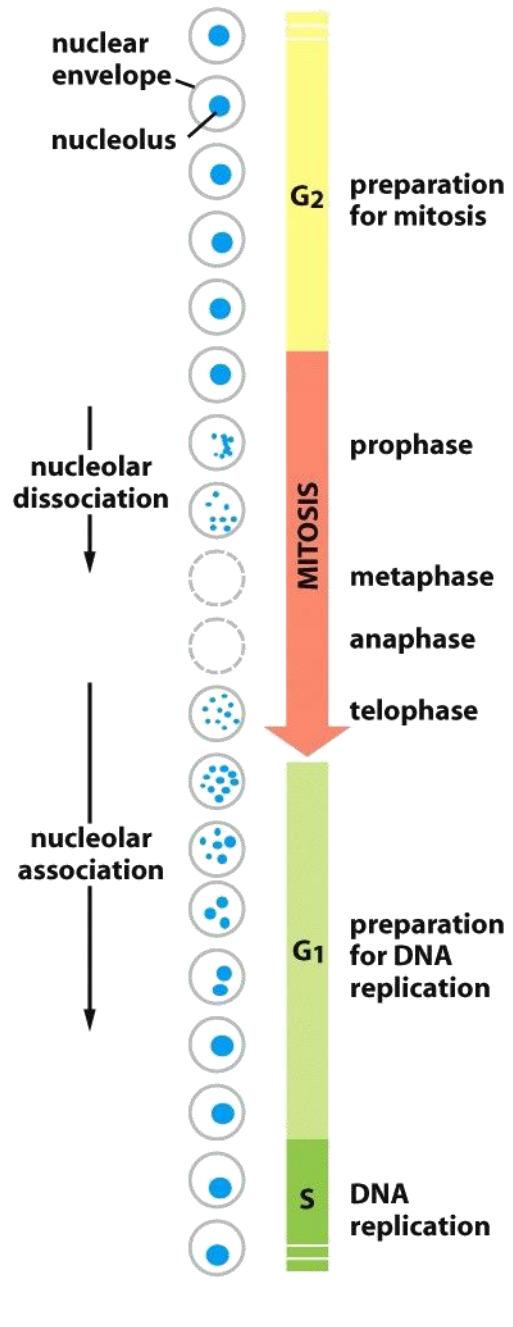
“Chromosome painting”



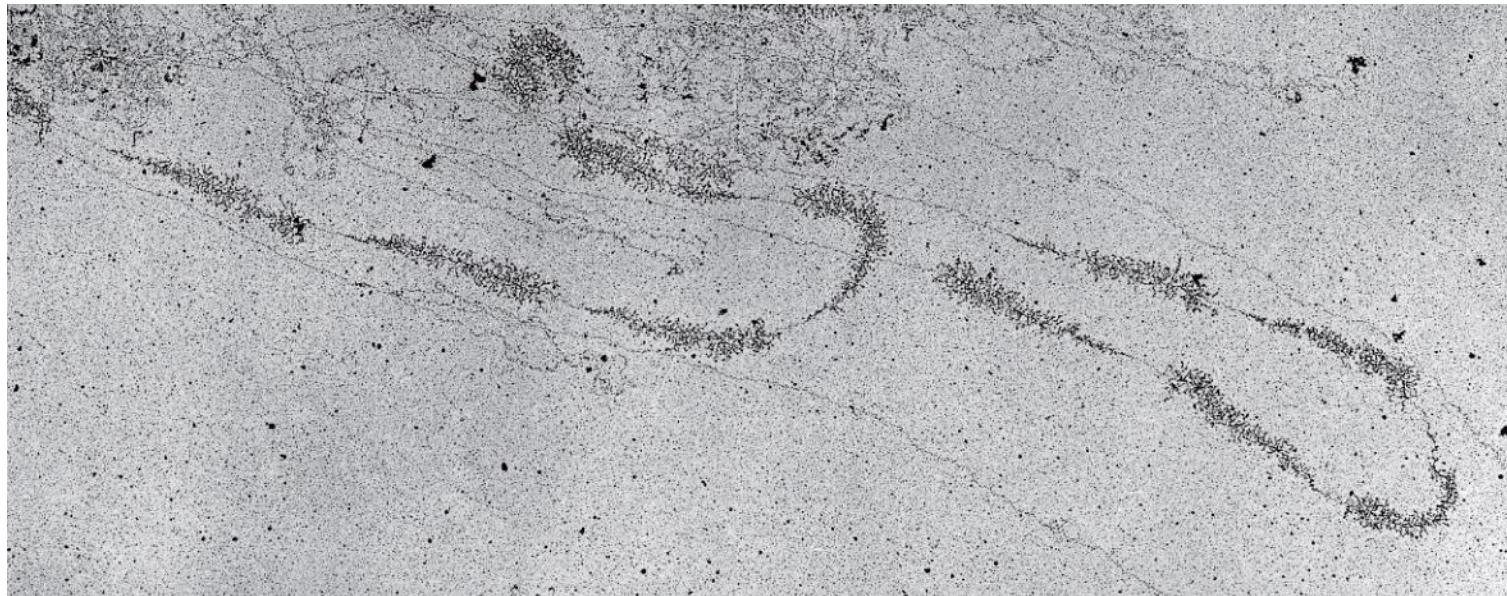
Muchos genes
Algunos genes
Pocos genes



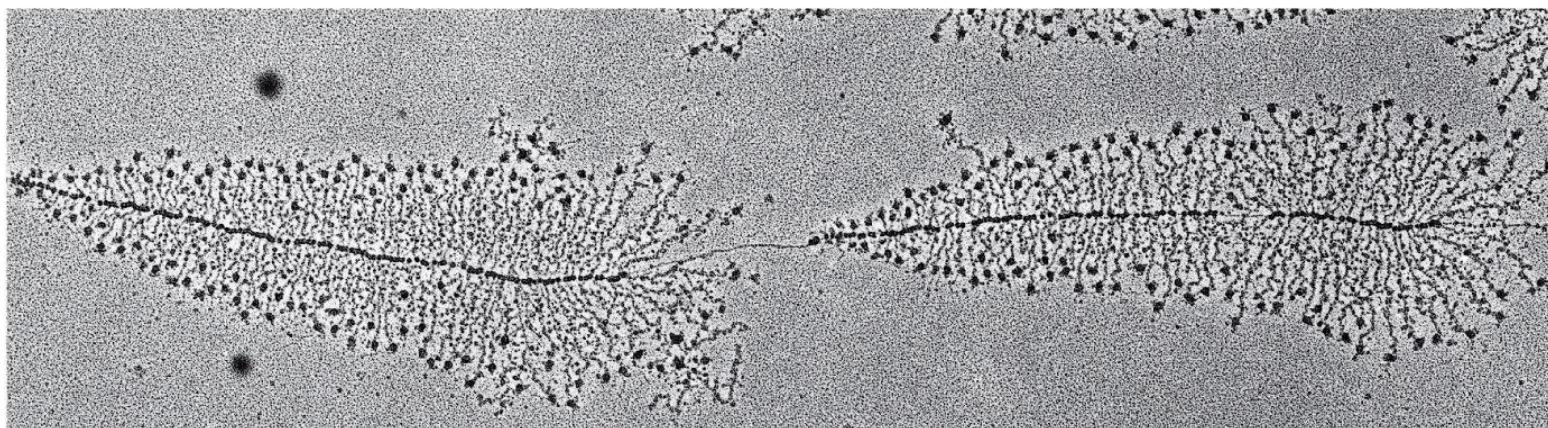
El nucleolo



Transcripción del ARNr

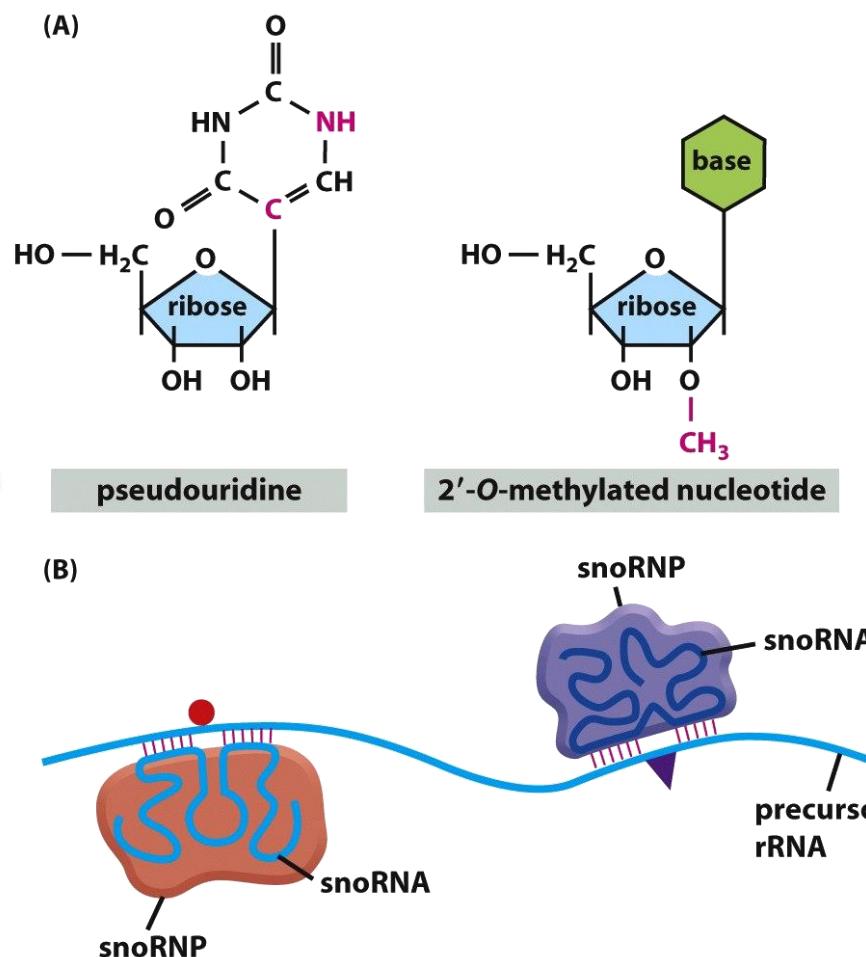
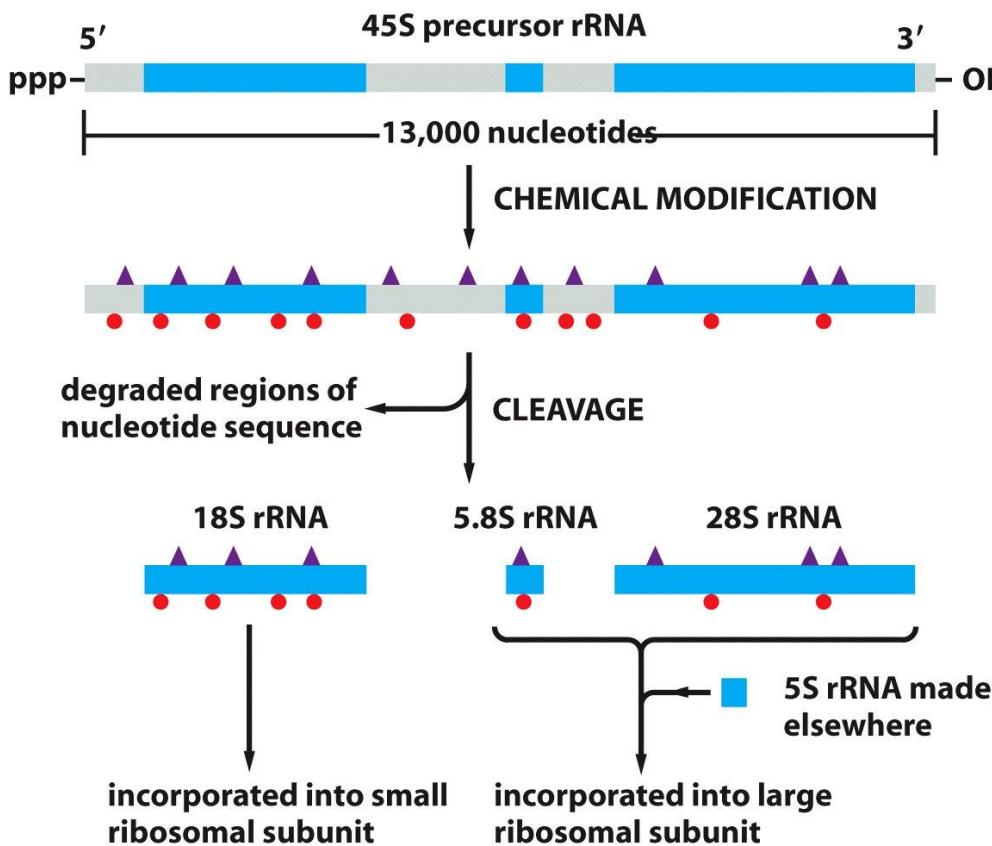


2 μm

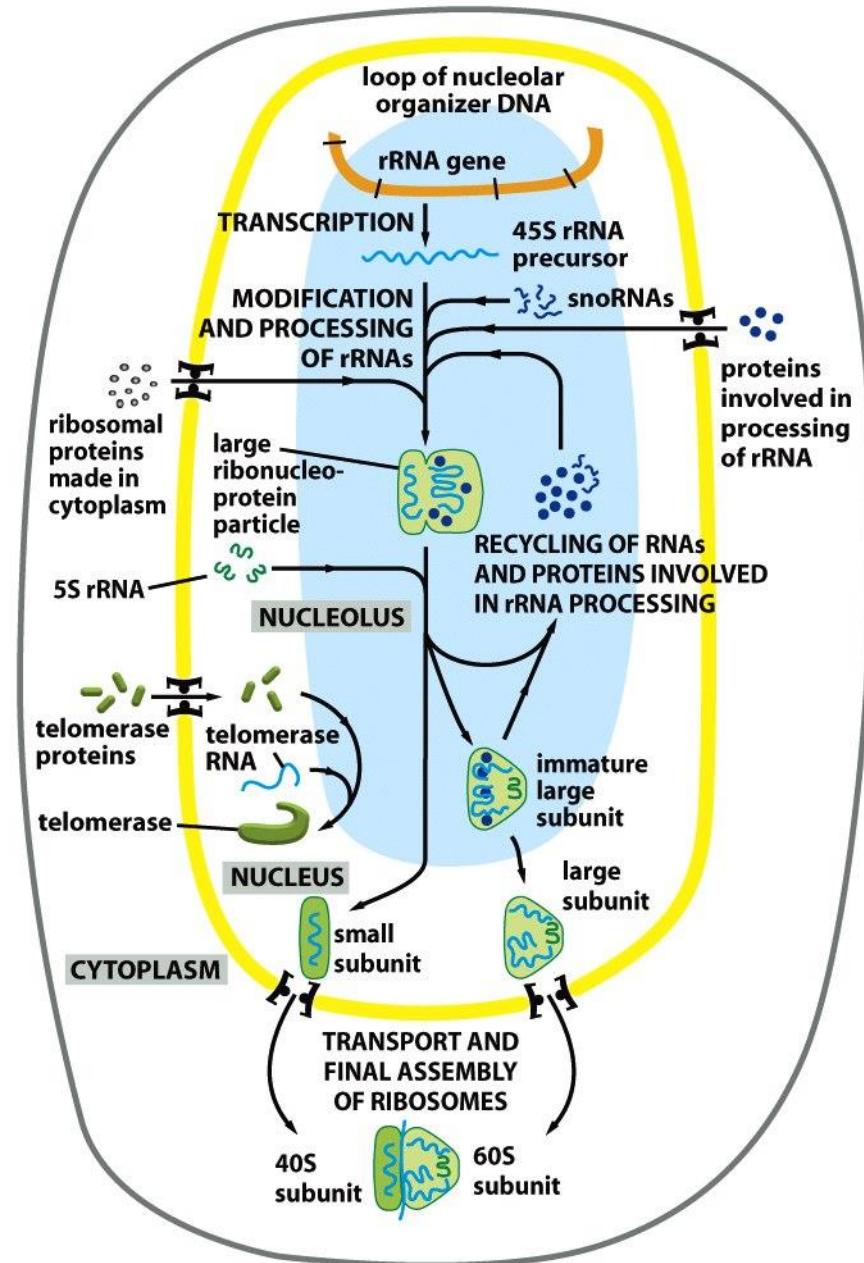
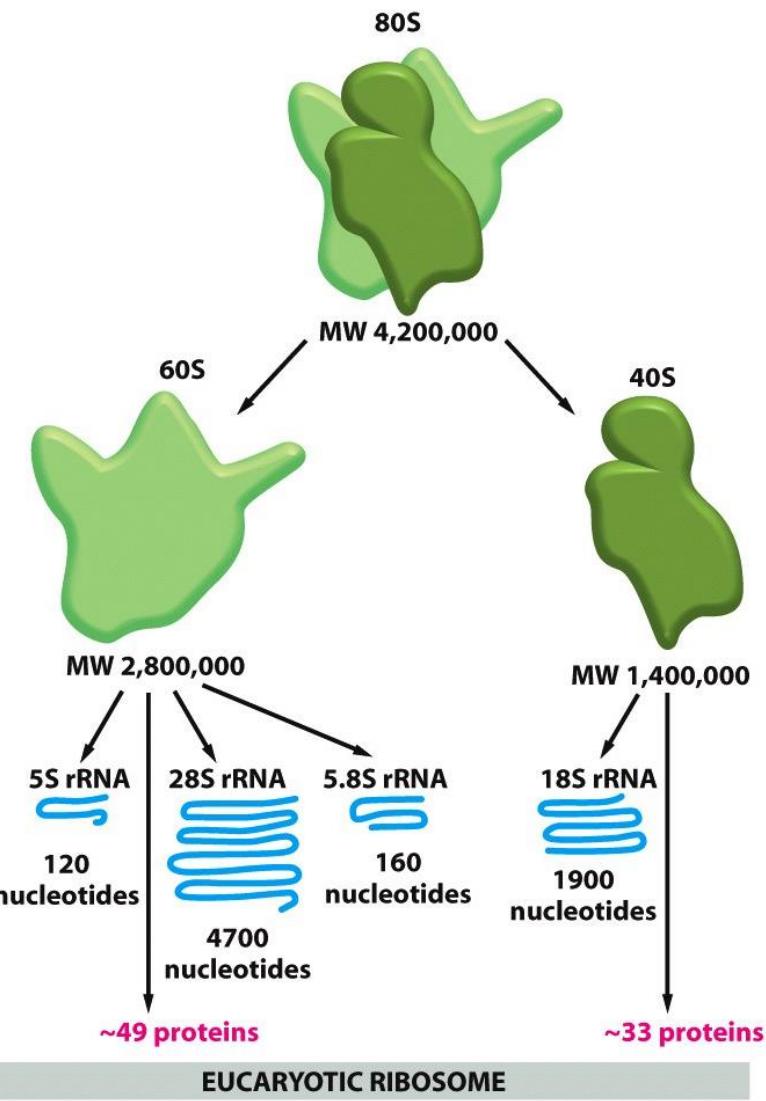


1 μm

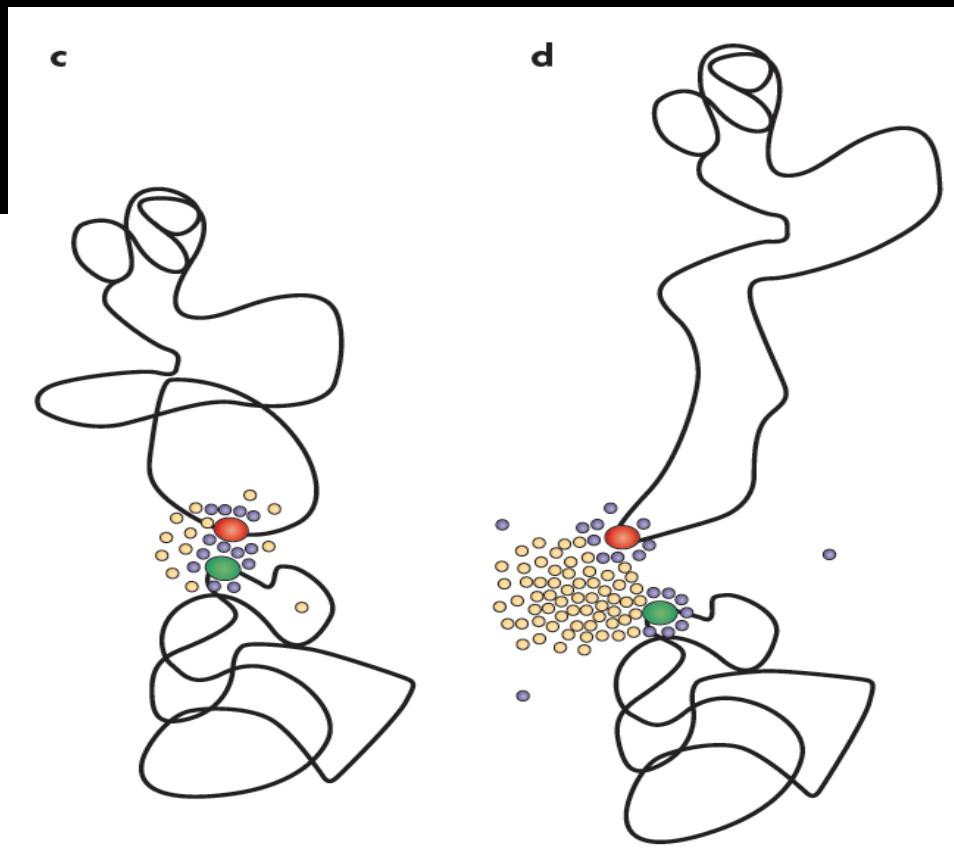
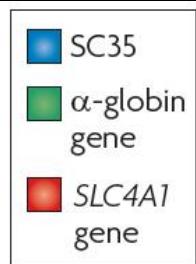
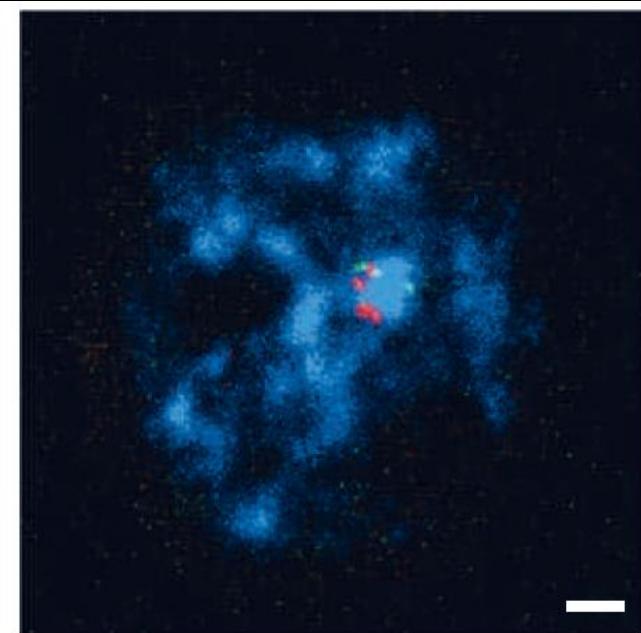
Procesamiento del ARNr

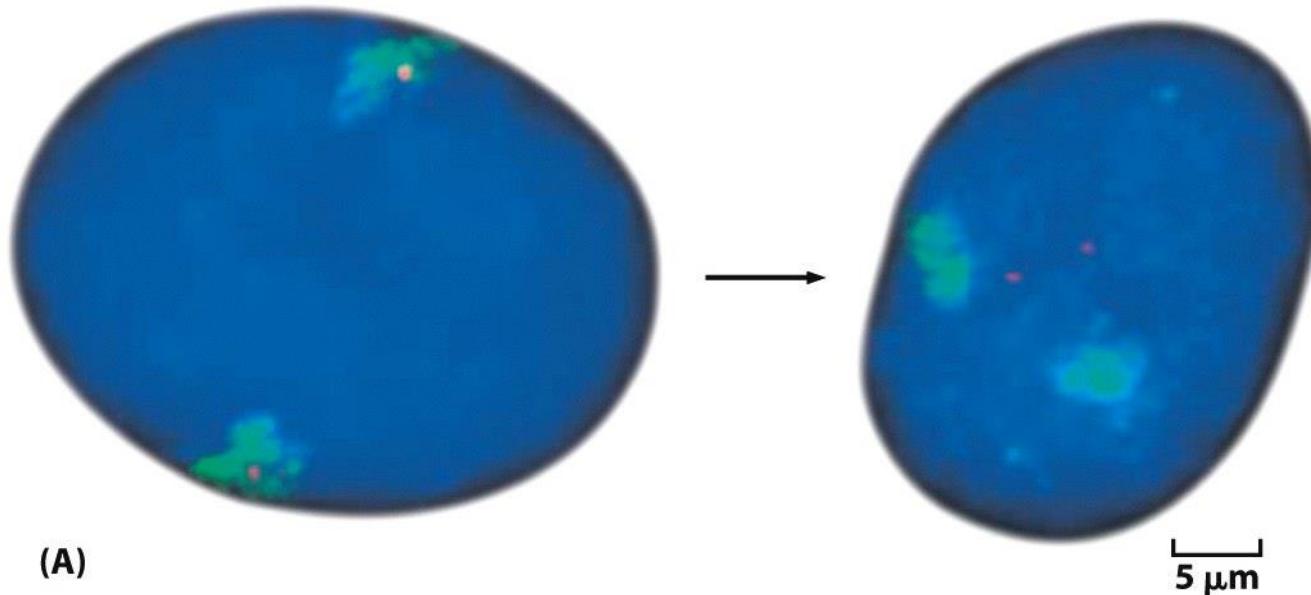


El nucleolo como fábrica de ribosomas



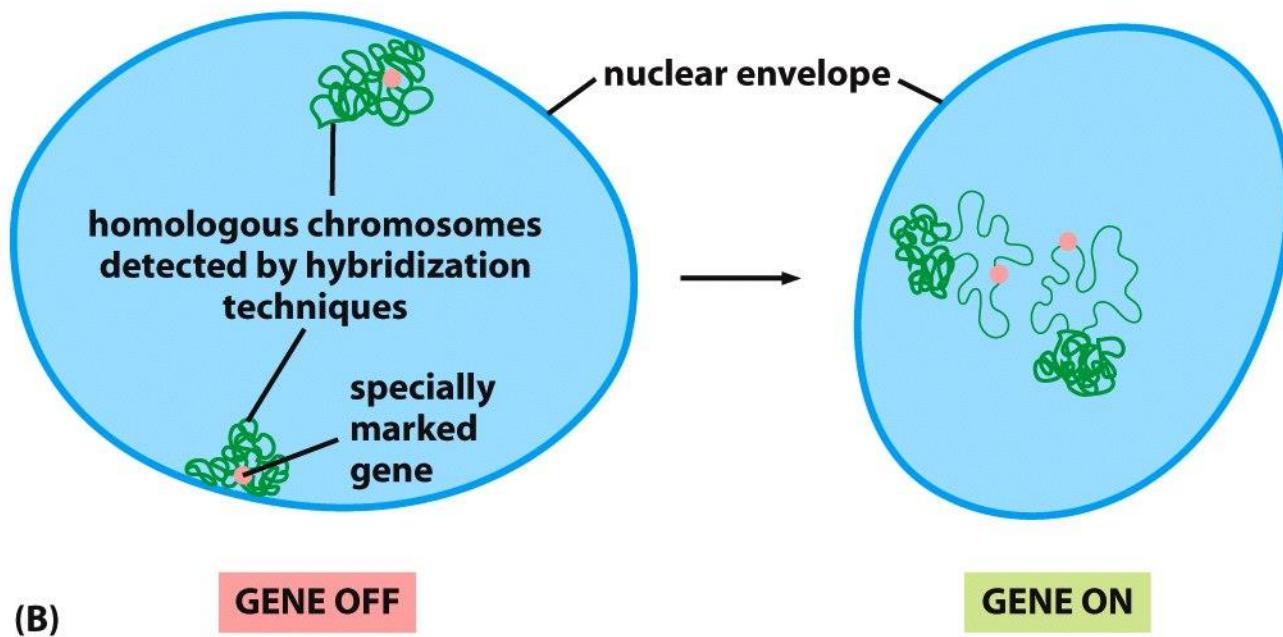
Fábricas de transcripción: los cruces y rotondas en los caminos de maquinaria activa nuclear





(A)

$5 \mu\text{m}$

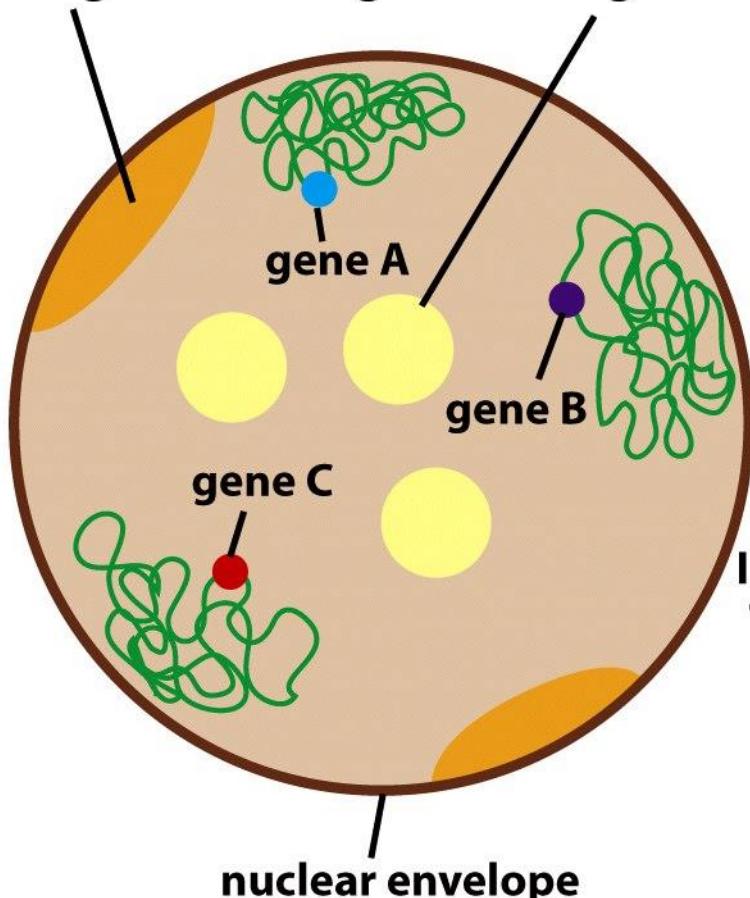


(B)

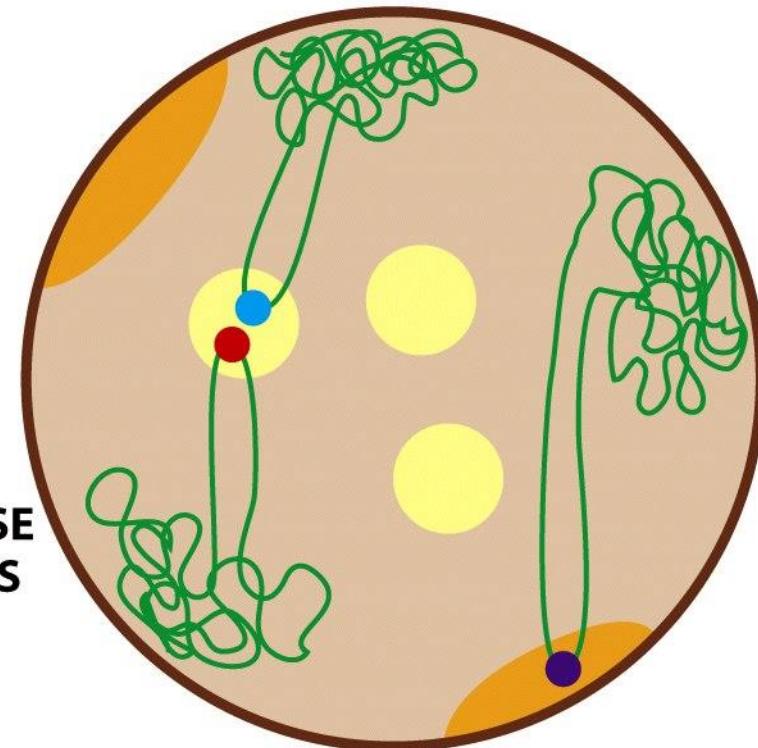
GENE OFF

GENE ON

**nuclear neighborhood
for gene silencing** **nuclear neighborhood
for gene expression**

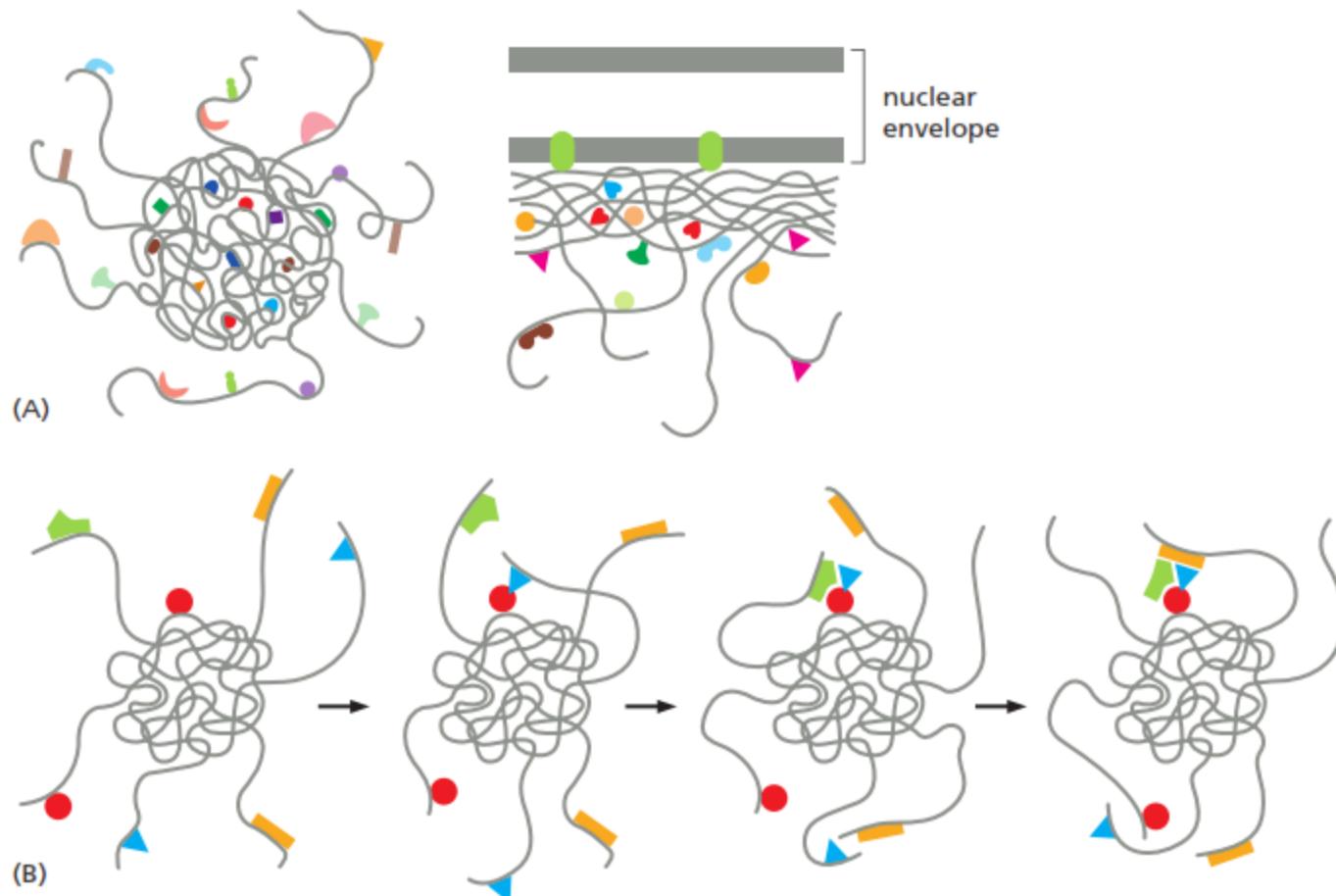


**CELL
CHANGES
IN RESPONSE
TO SIGNALS**

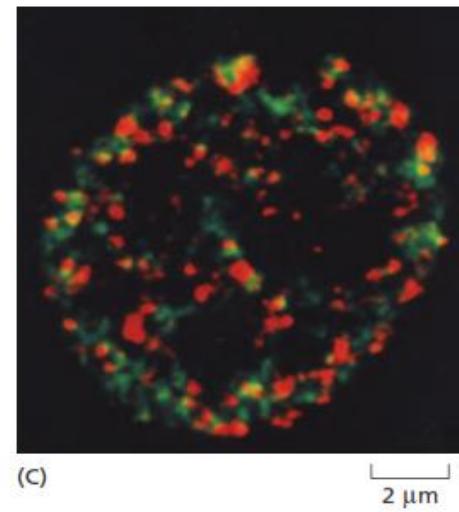
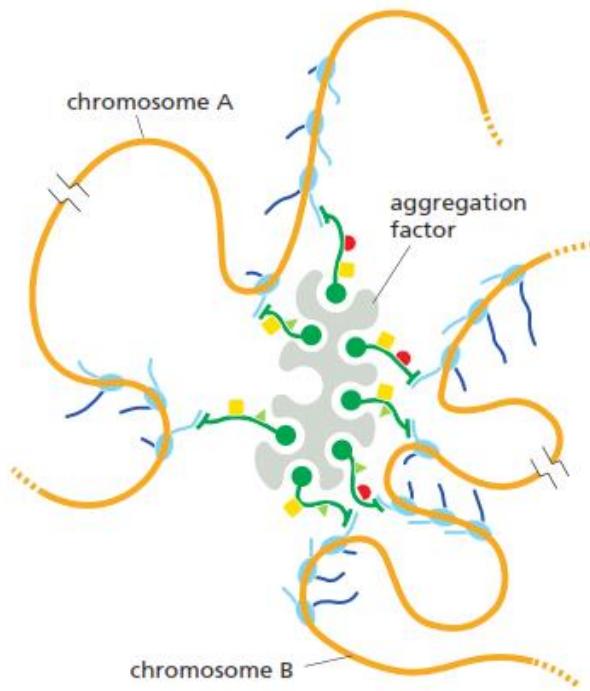
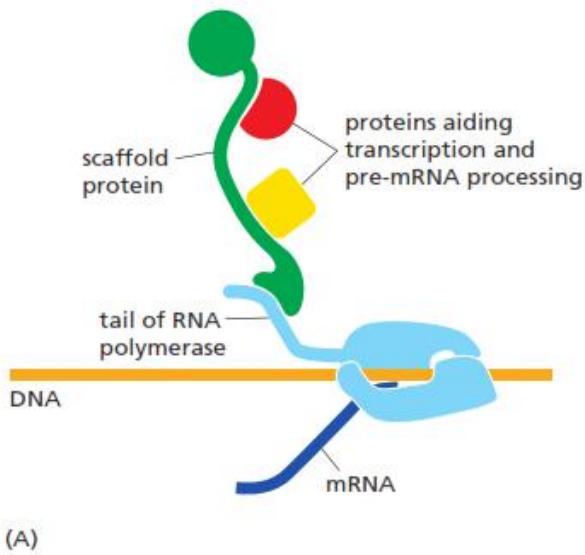


**movement to different nuclear
neighborhoods: genes A and C become
highly active and gene B becomes
silenced in heterochromatin**

Compartimentos efectivos sin membranas plasmáticas



Zonas de carga y preparación



La función, determina la estructura?

Cual es el rol de las fabricas funcionales (transcripción, duplicación en la organización de la cromatina?

