Lecture Plan

Exams -

Chromatin &
Cell Division -

Intro Mendelian Genetics -

Chi Squared tests -

Exams -

Mean and Median both at about 65 pts.

Check for math errors or mis-grading

See me during lab to discuss grades

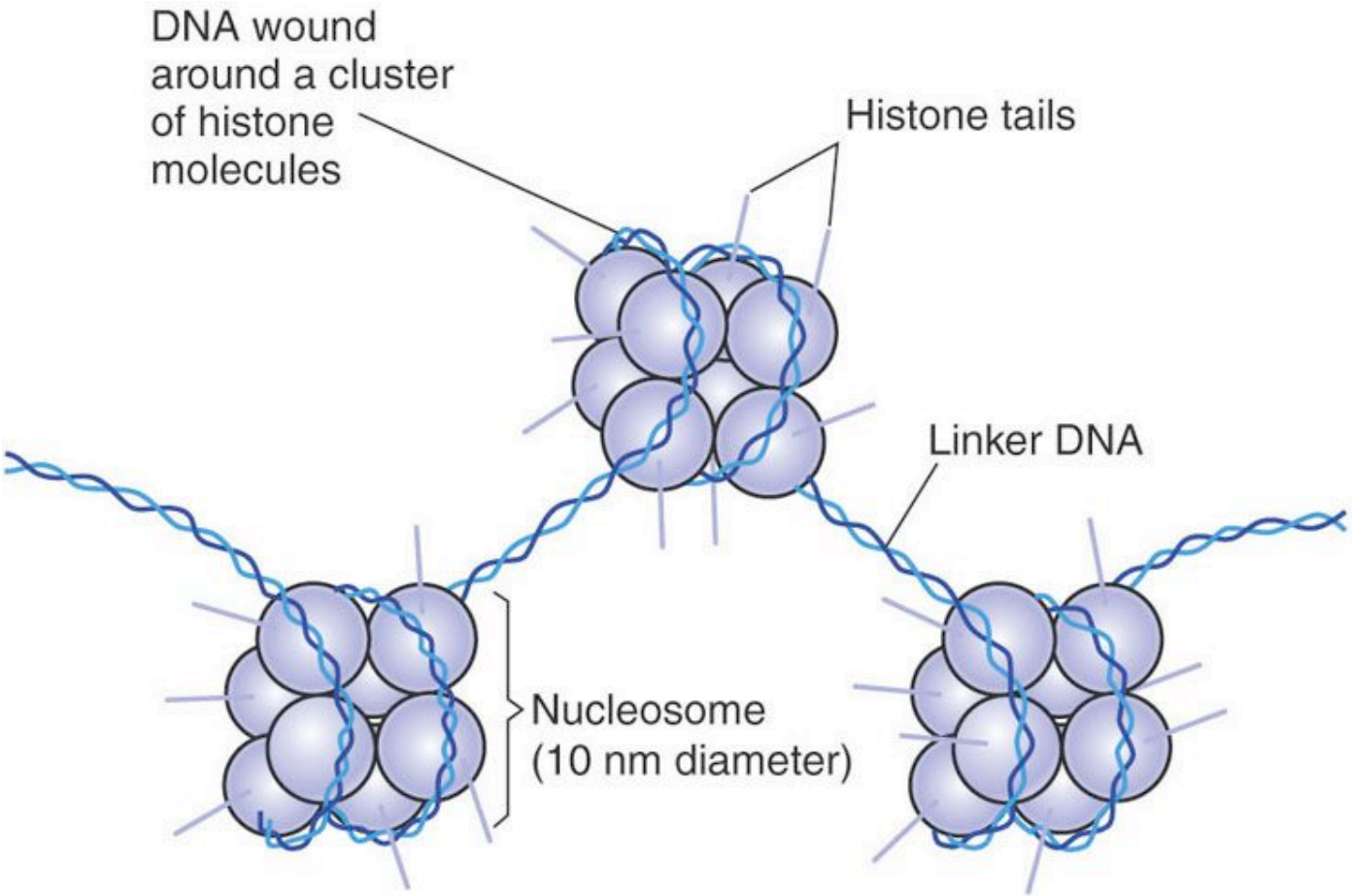
Problem: Every cell in your body contains about 3 feet of DNA - cells (and nuclei) are very tiny.

DNA must be carefully packaged so that it can be Replicated and so that sections can serve as a template for Protein Synthesis

A sense of Scale -

1 meter ~ 3 feet
1 micro meter (μm) = 1 millionth of a meter.
a nucleus is about 10 μm across

Nano meter (nm) = 1 billionth of a meter



(a) A model for the structure of a nucleosome. Each nucleosome bead contains a set of eight histone molecules, forming a protein core around which the double-stranded DNA winds. The DNA surrounding the histones consists of 146 nucleotide pairs; another segment of DNA, about 60 nucleotide pairs long, links nucleosome beads.

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Fig. 10-2a, p. 213

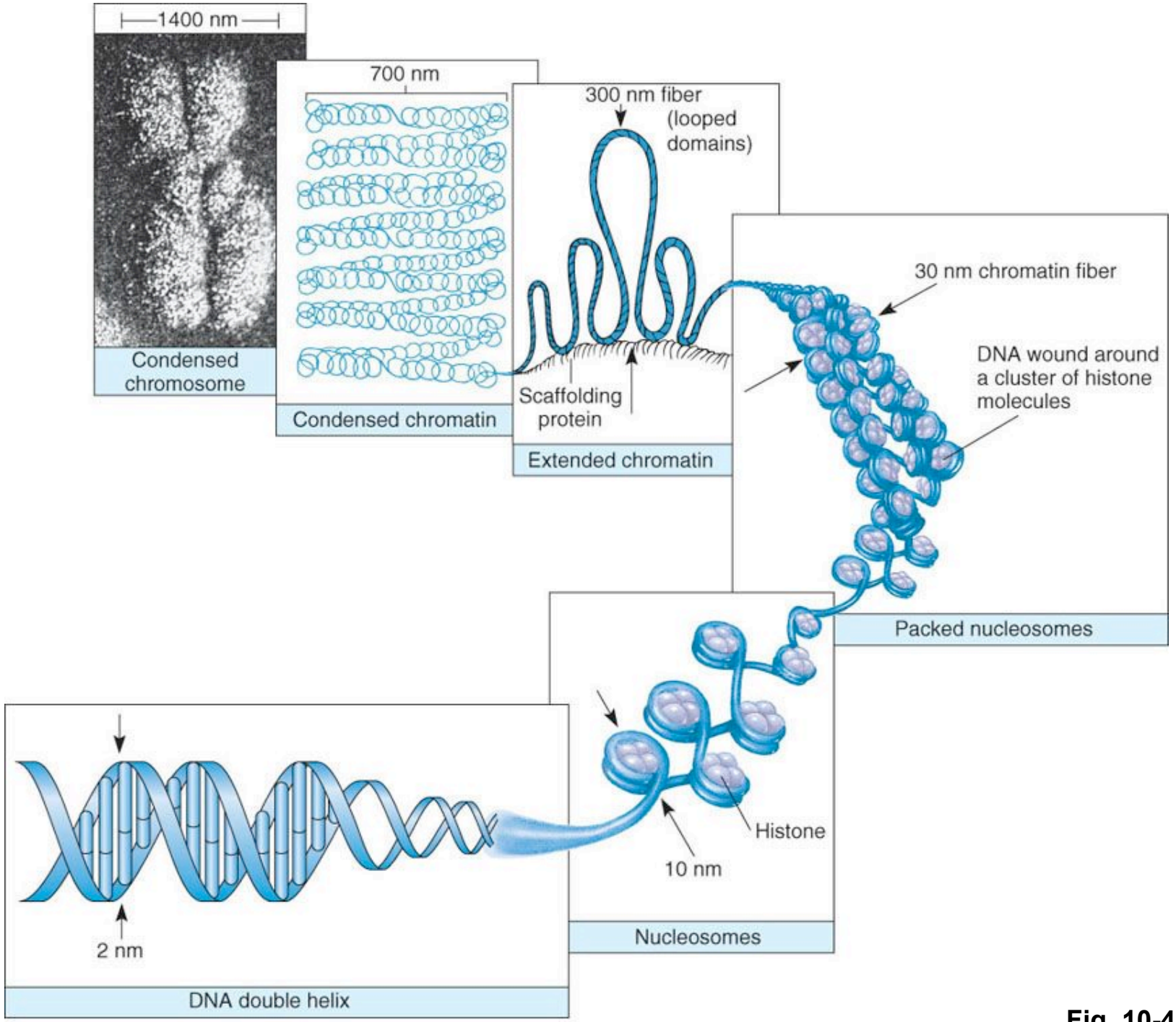

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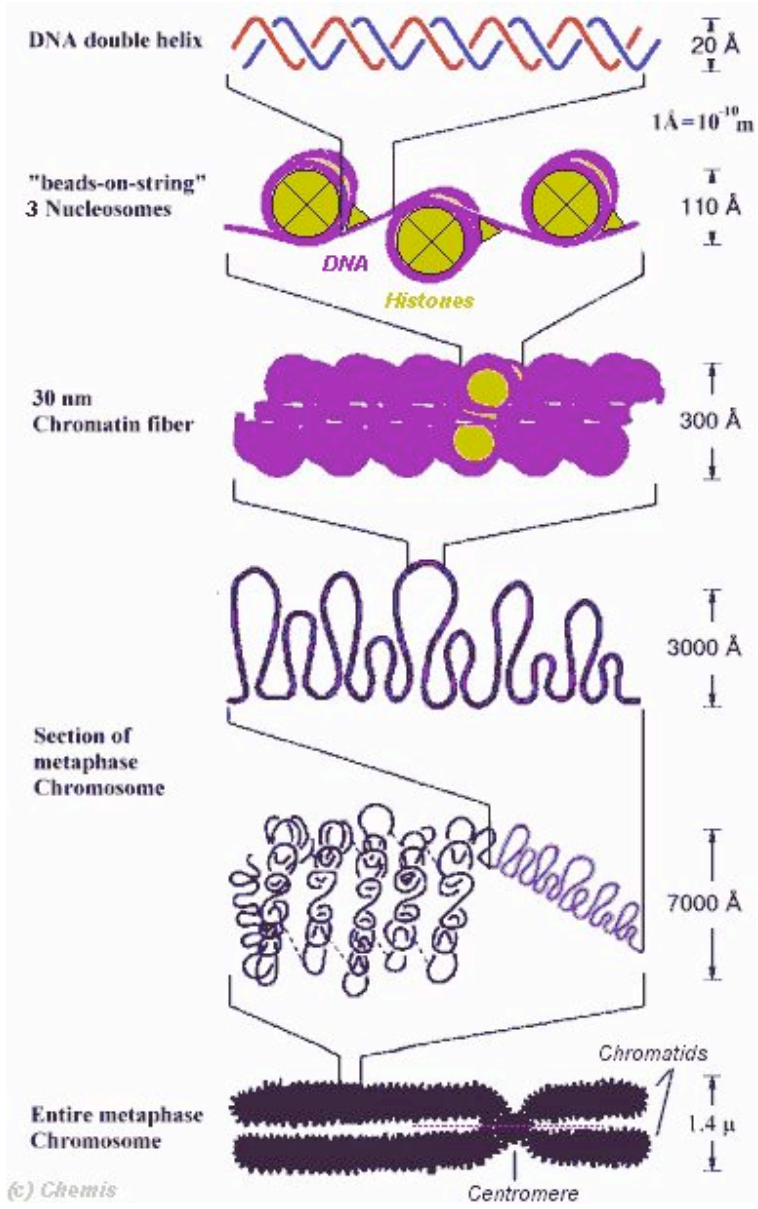
Fig. 10-4, p. 214



http://www.biostudio.com/demo_freeman_dna_coiling.htm

Chromosomes are a Myth…

…OK, not really, but the condensed chromosomes we see in textbooks only occur during certain phases of the cell cycle. Usually they are more relaxed, the DNA is spread out within the nucleus

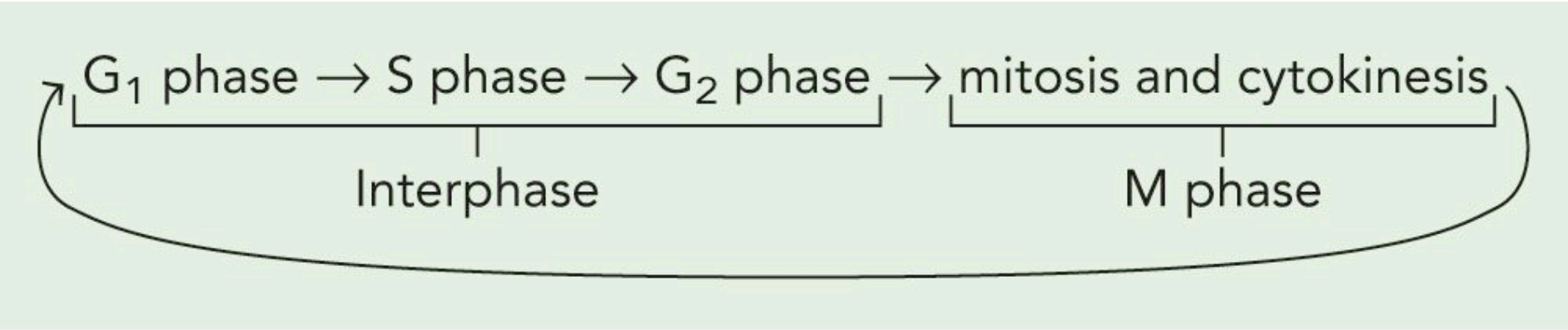
Problem: Individual cells can only get so big - for multicellular organisms to grow, they must make more cells.

Problem: Genetic material must be copied and divided evenly between the daughter cells

Solution: Mitosis

Mitosis and cell division (eukaryotes)

The cell cycle



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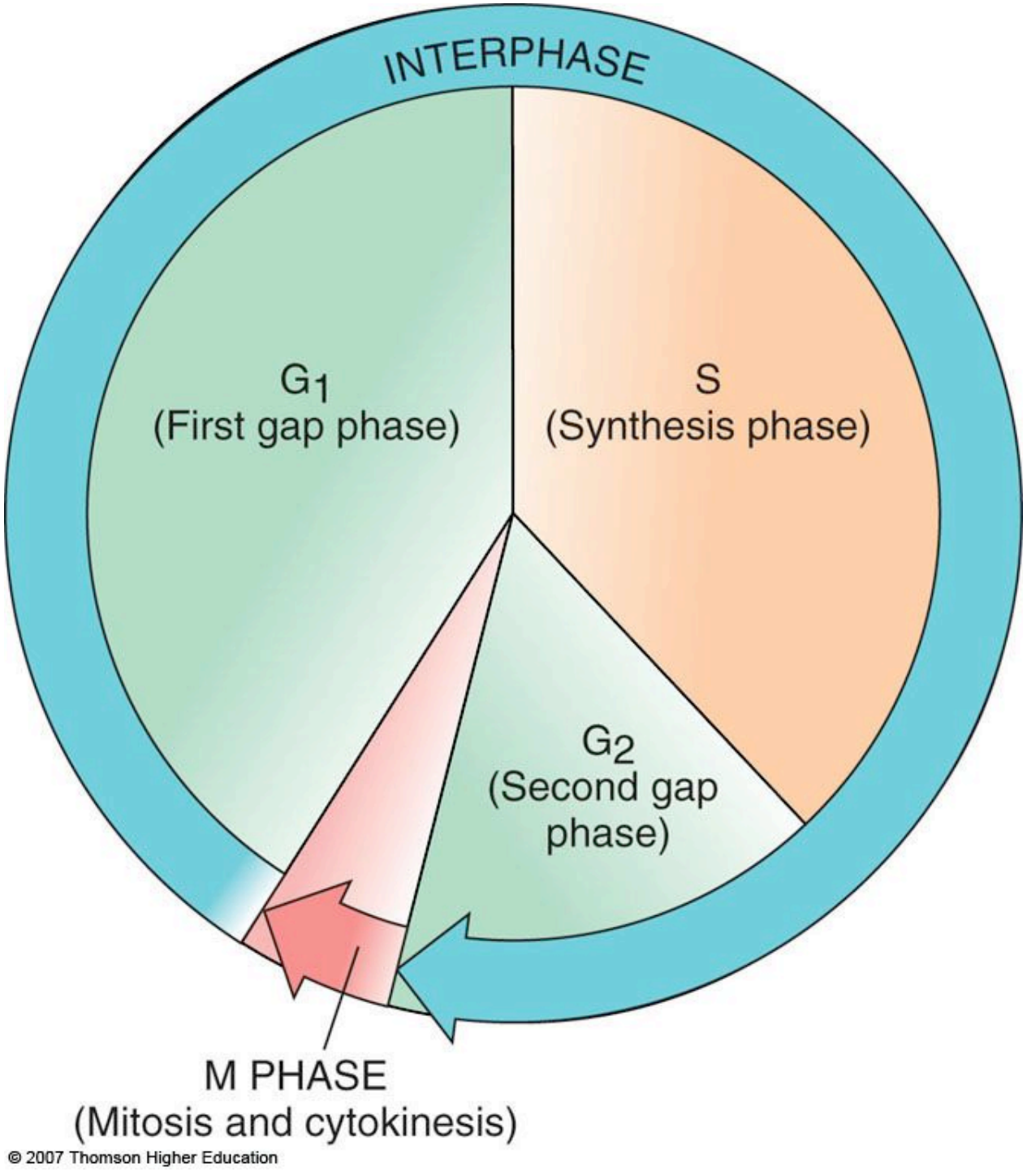

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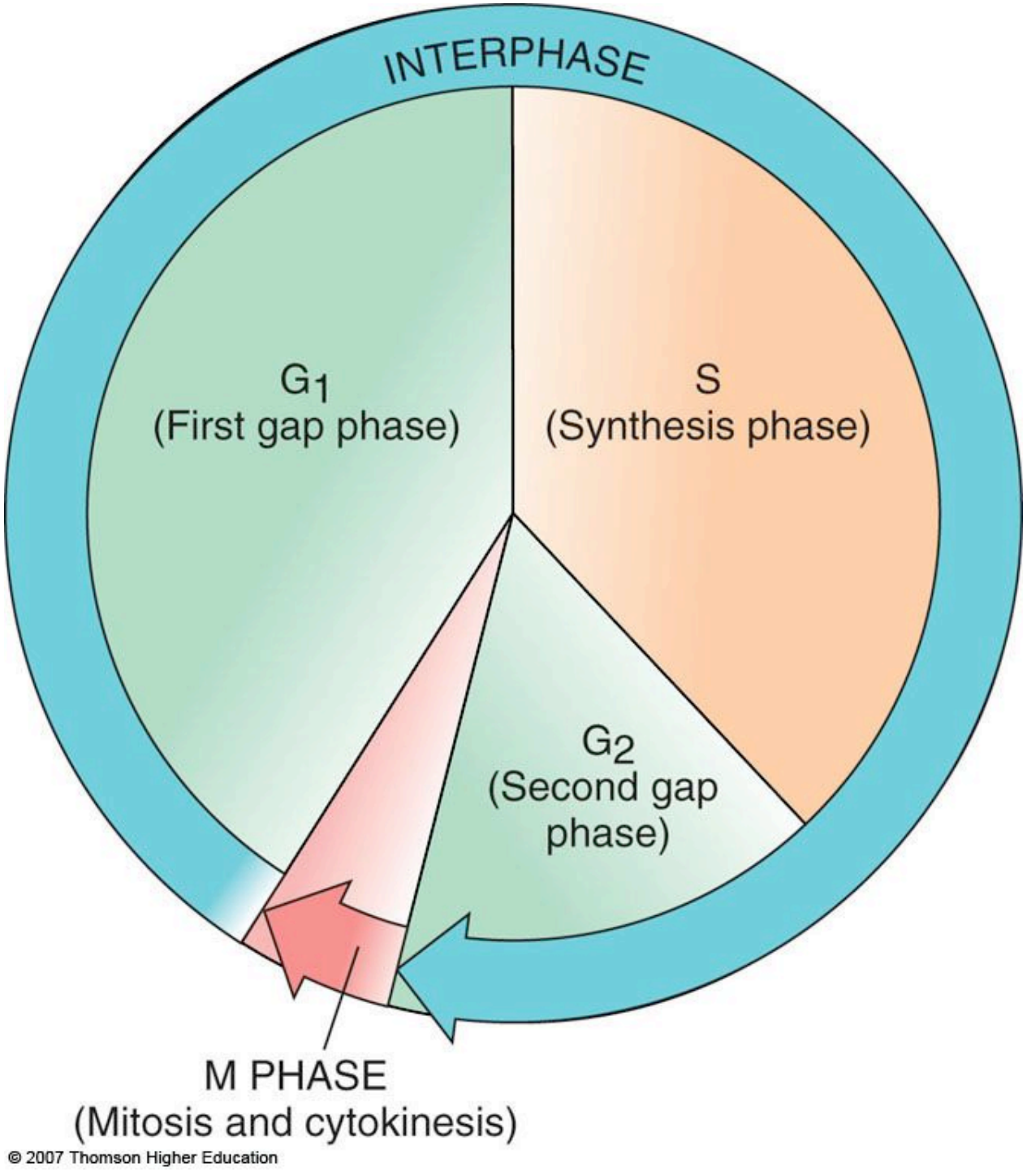
Interphase = everything Except mitosis & cell division

Fig. 10-5, p. 215



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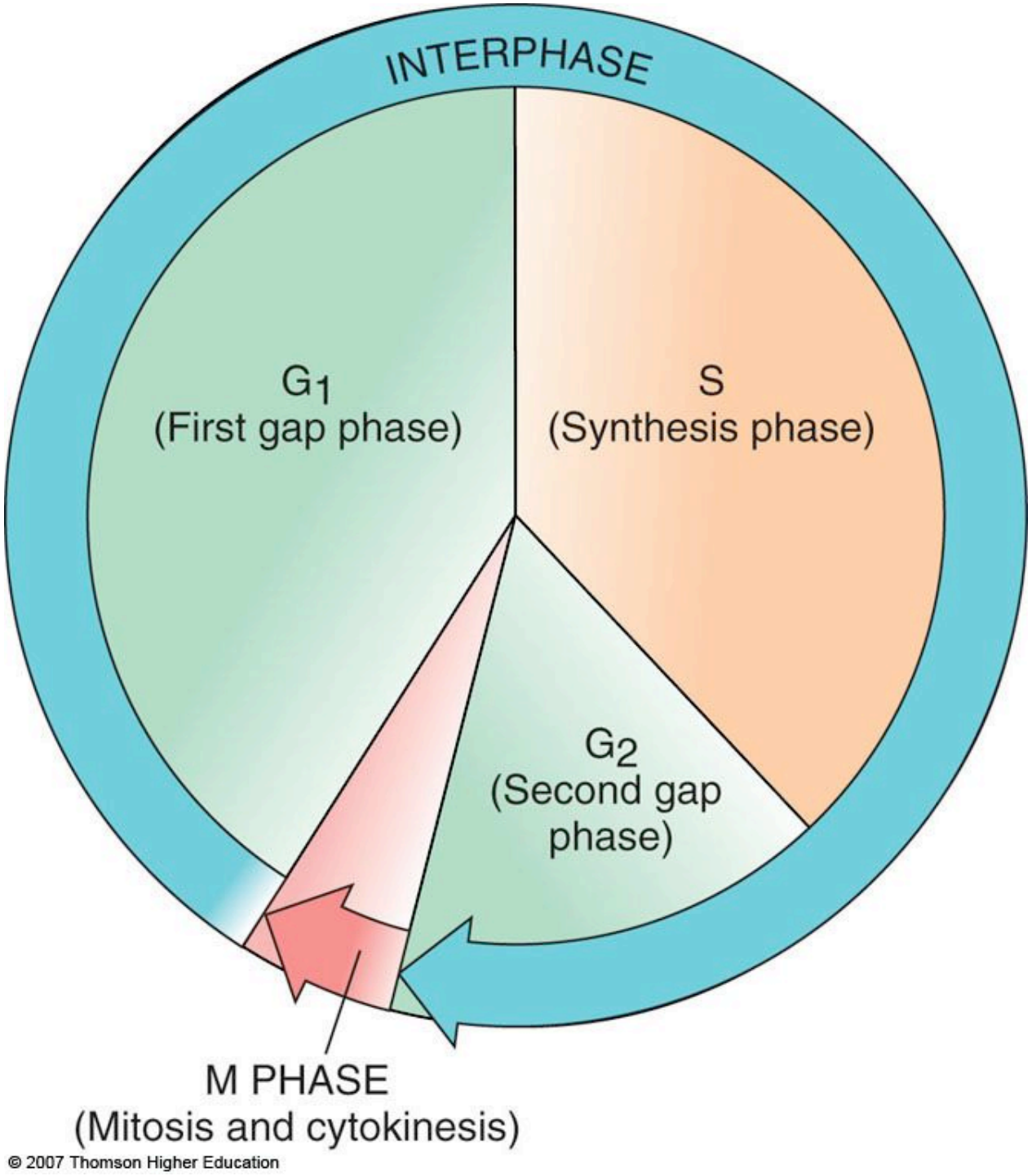
G1 Gap (or growth) phase

Lots of protein synthesis

Fig. 10-5, p. 215



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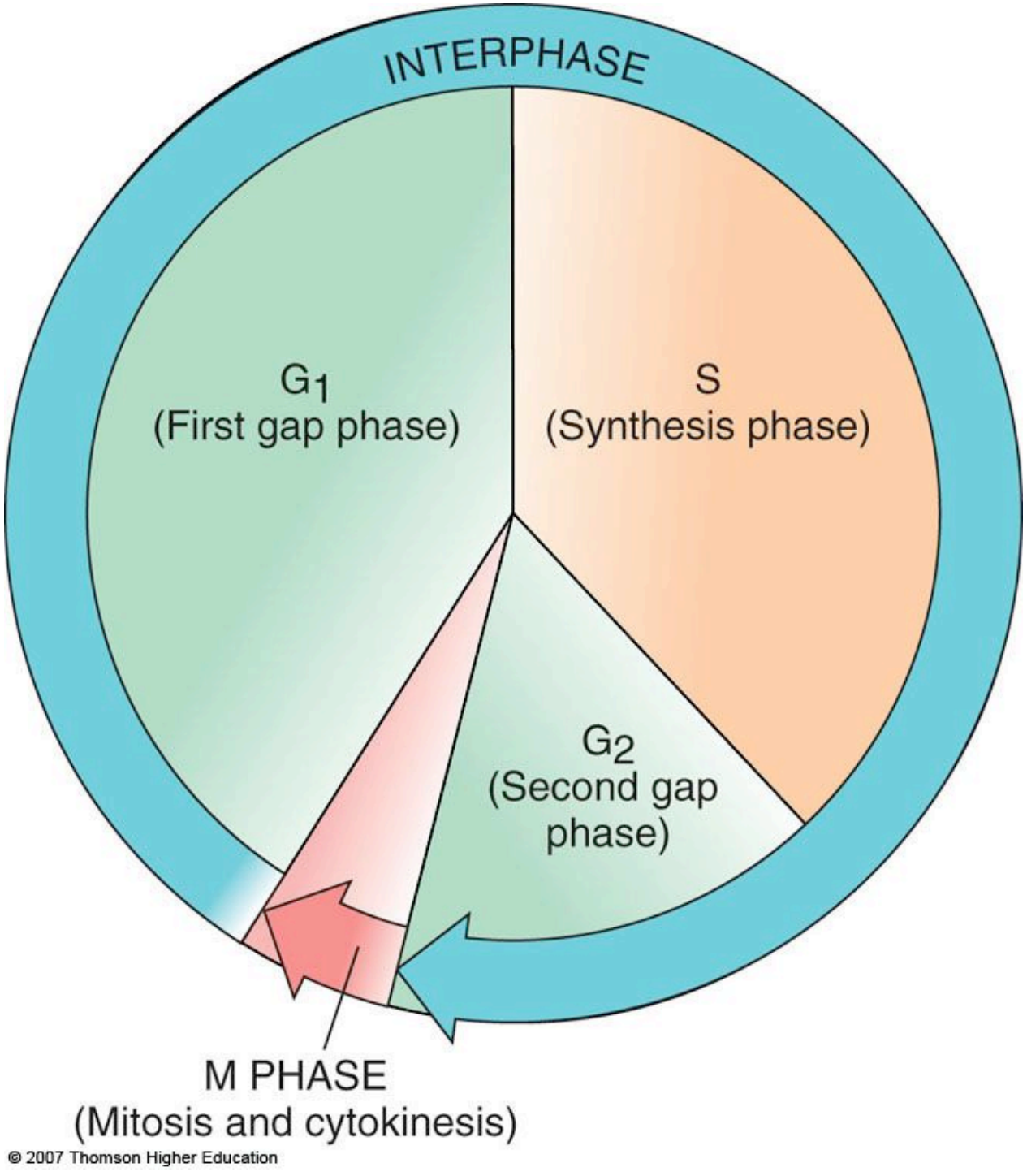
S phase

Chromosome

Replication

(twice the DNA)

Fig. 10-5, p. 215



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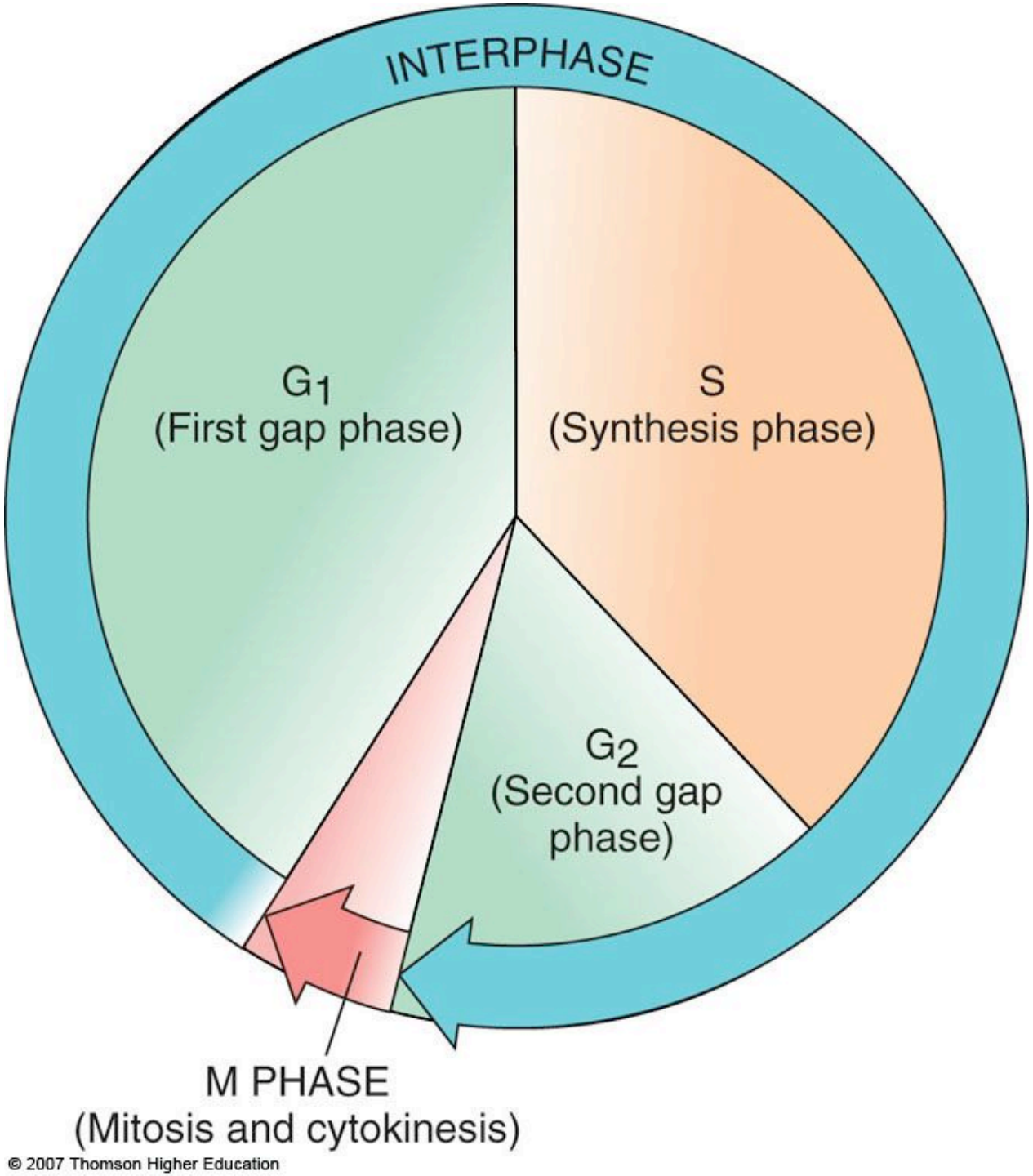
G2 phase

Lots of protein synthesis

(microtubules)

Fig. 10-5, p. 215



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M phase

Mitosis (chromosomes condense and are sorted evenly into daughter cells)

Fig. 10-5, p. 215

DNA

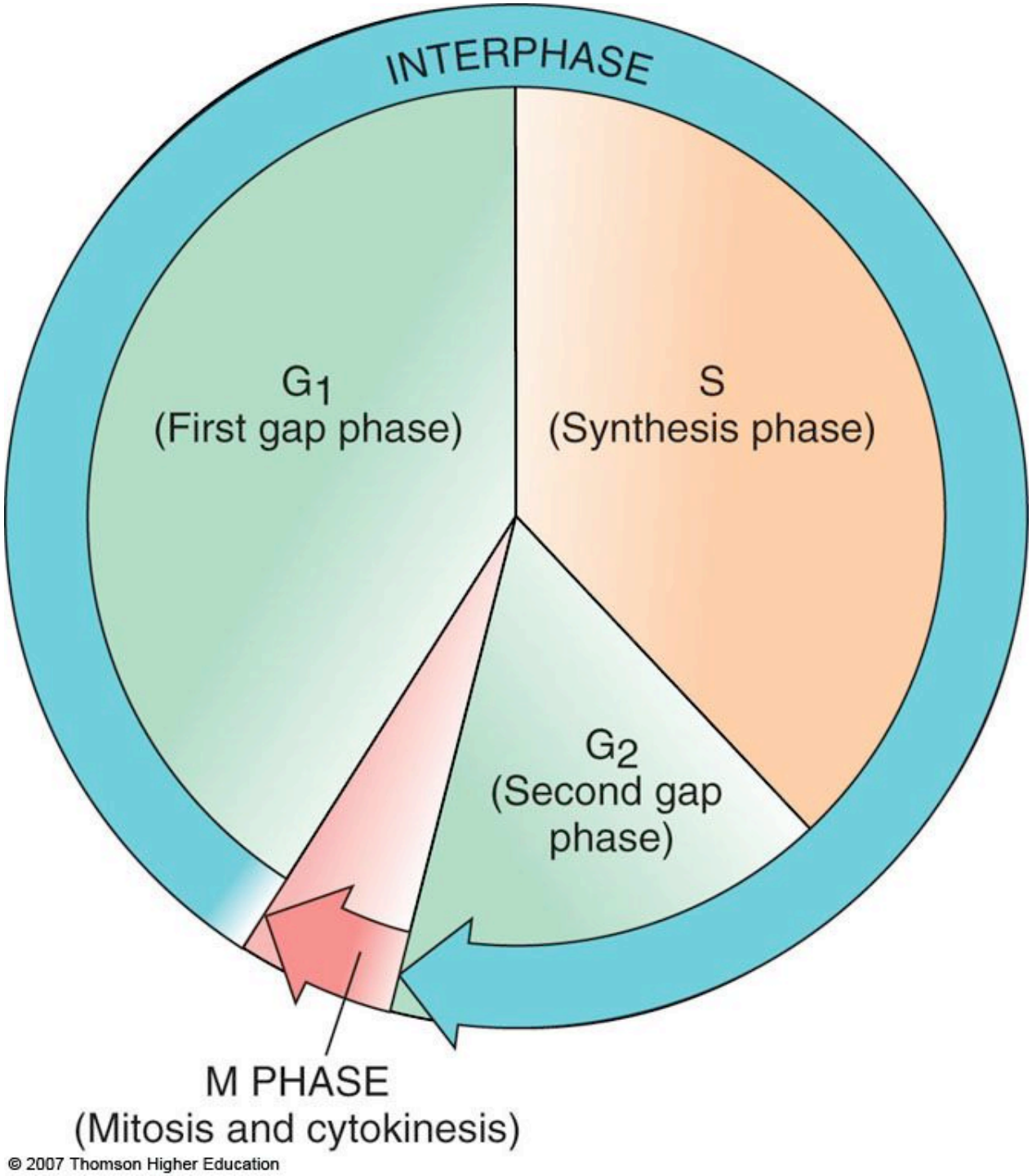

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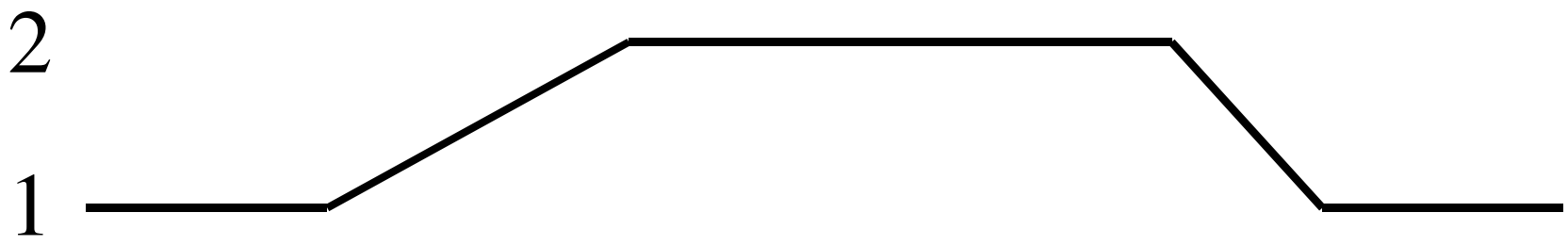
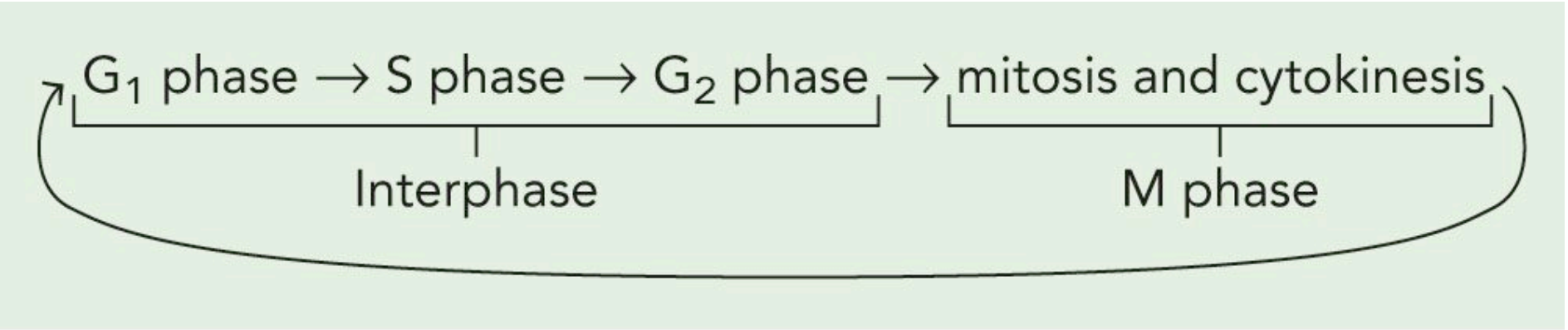
Fig. 10-5, p. 215

D NA Content per cell





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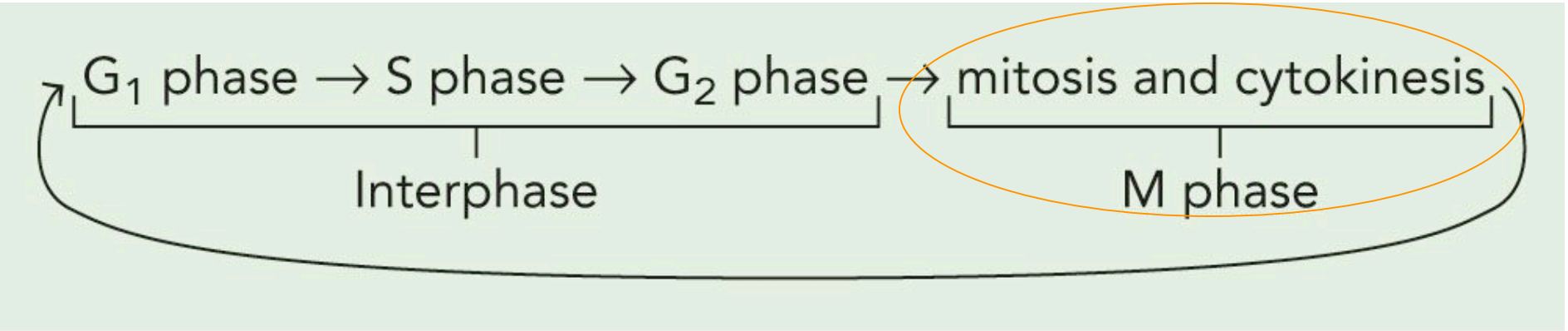
D NA Content per cell



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Steps of mitosis

Interphase ends -> Prophase -> Prometaphase

-> Metaphase -> Anaphase -> Telophase

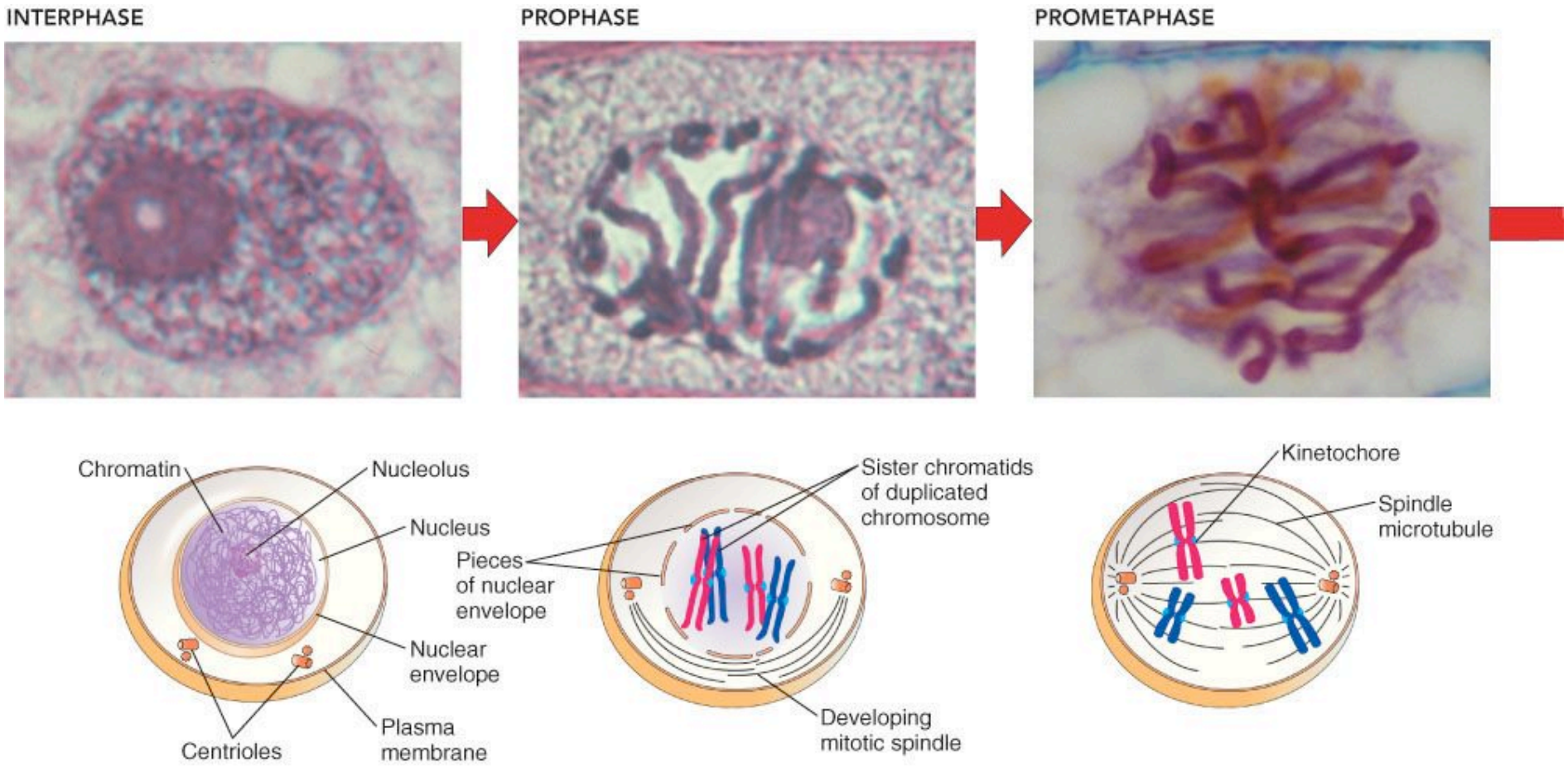

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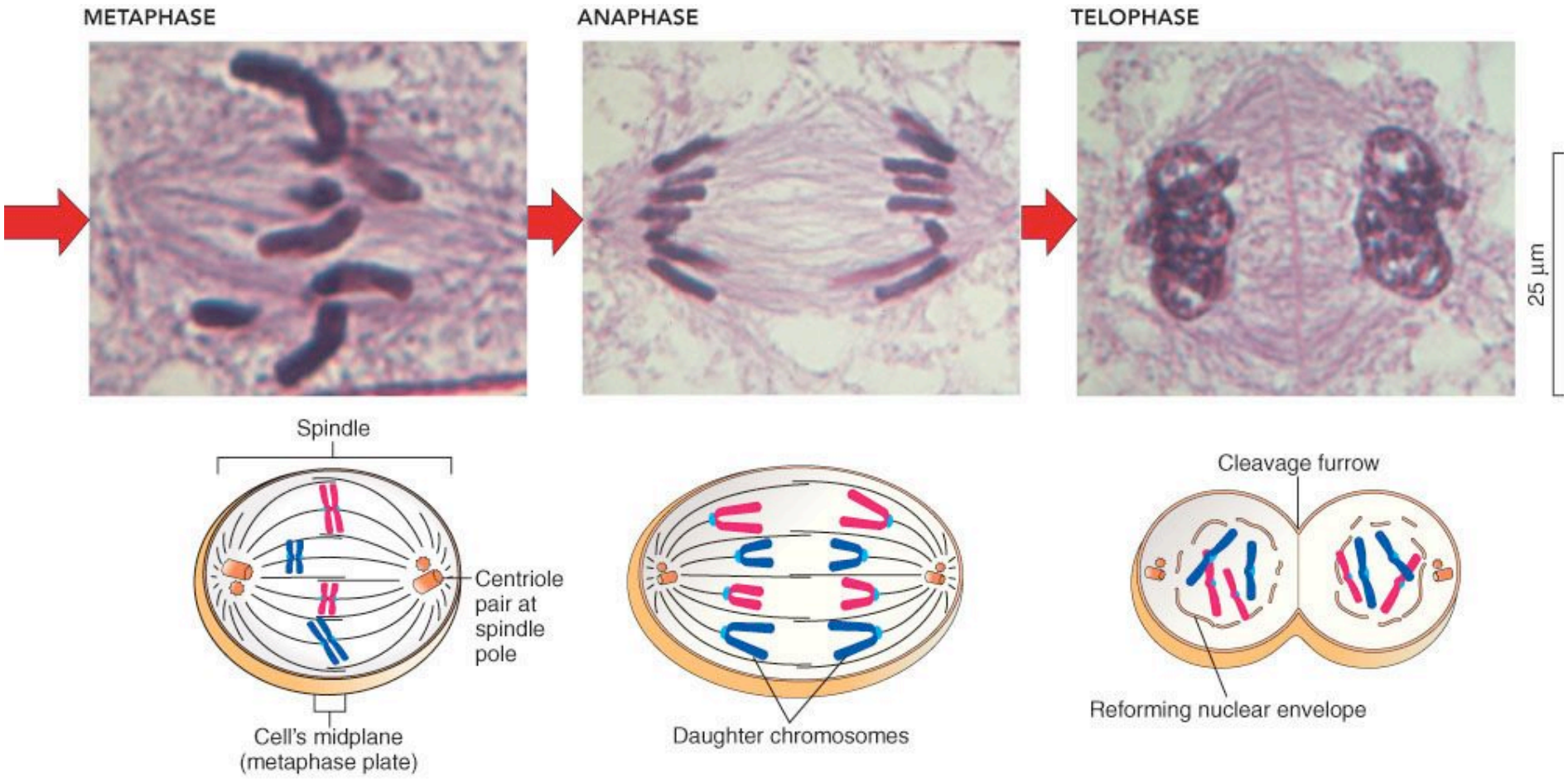
Fig. 10-6a, p. 216



Chromosomes line up along cell's midplane. Spindle microtubules attach each chromosome to both poles.

Sister chromatids separate at their centromeres. One group of chromosomes moves toward each pole of cell. Spindle poles move farther apart.

Chromosomes are grouped at poles. Chromosomes decondense, and nuclear envelopes begin to form. Cytokinesis produces two daughter cells.

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Fig. 10-6b, p. 217

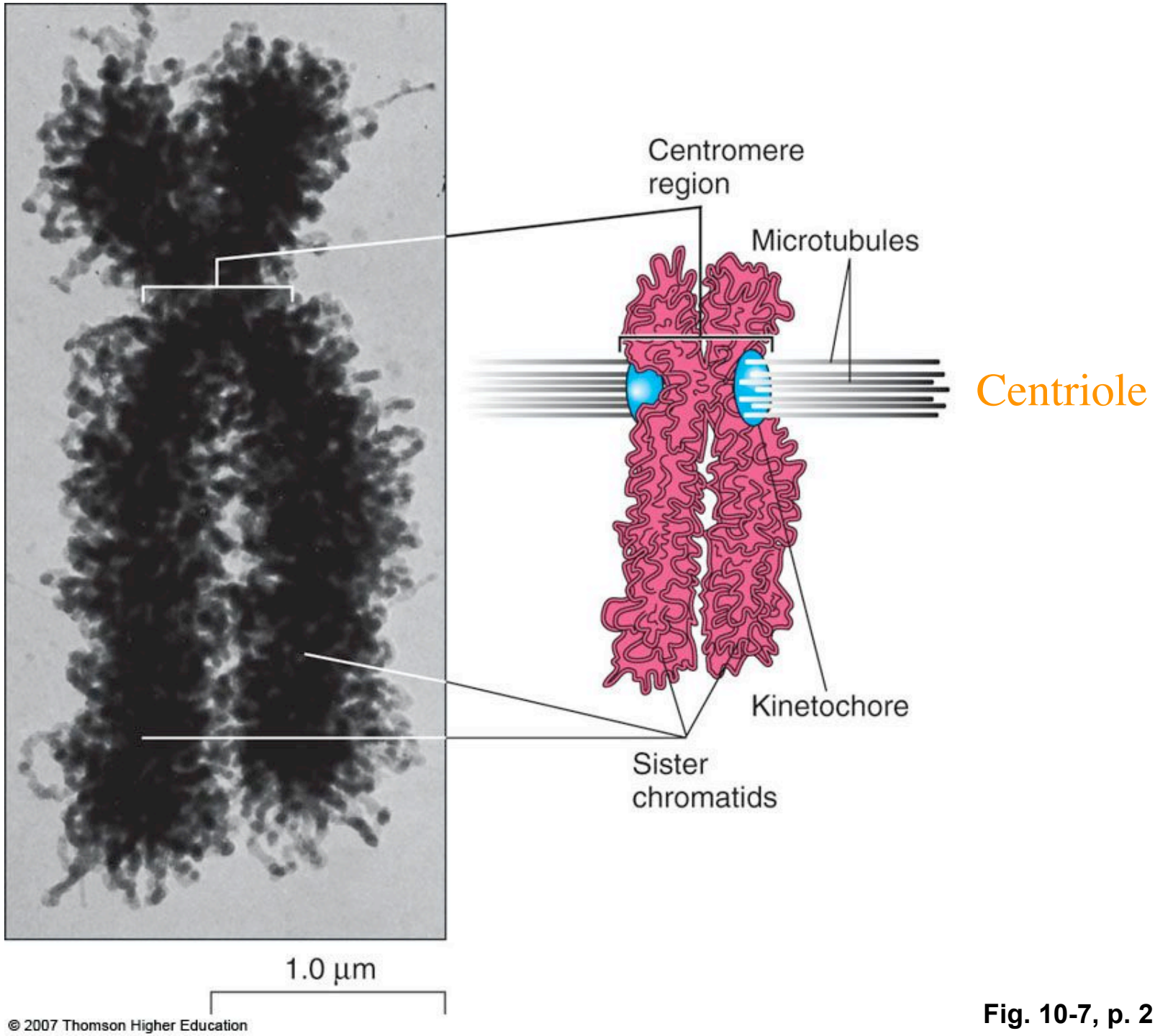

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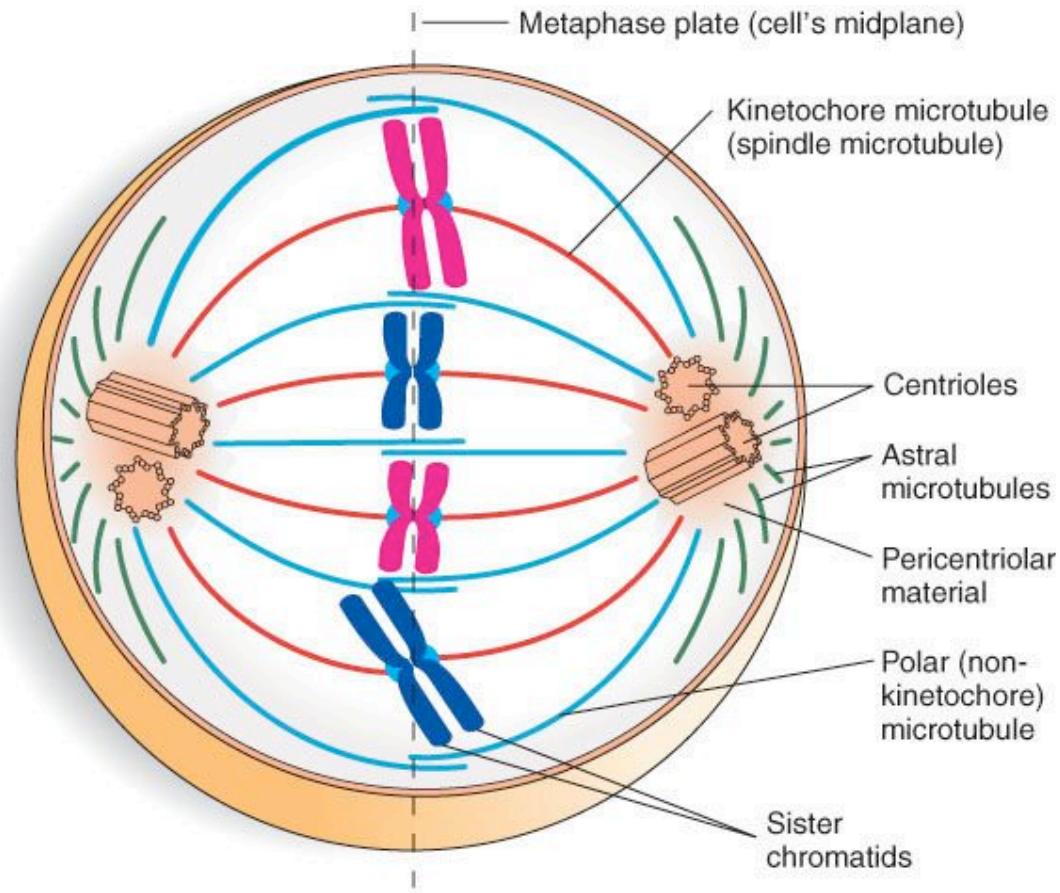
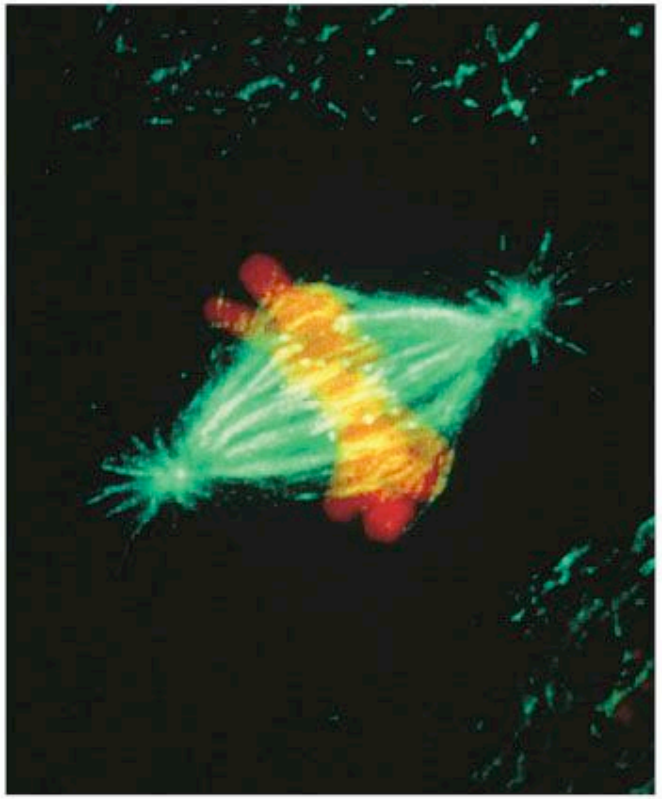
Fig. 10-7, p. 218





(a) One end of each microtubule of this animal cell is associated with one of the poles. Astral microtubules (*green*) radiate in all directions, forming the aster. Kinetochore microtubules (*red*) connect the kinetochores to the poles, and polar (non-kinetochore) microtubules (*blue*) overlap at the midplane.

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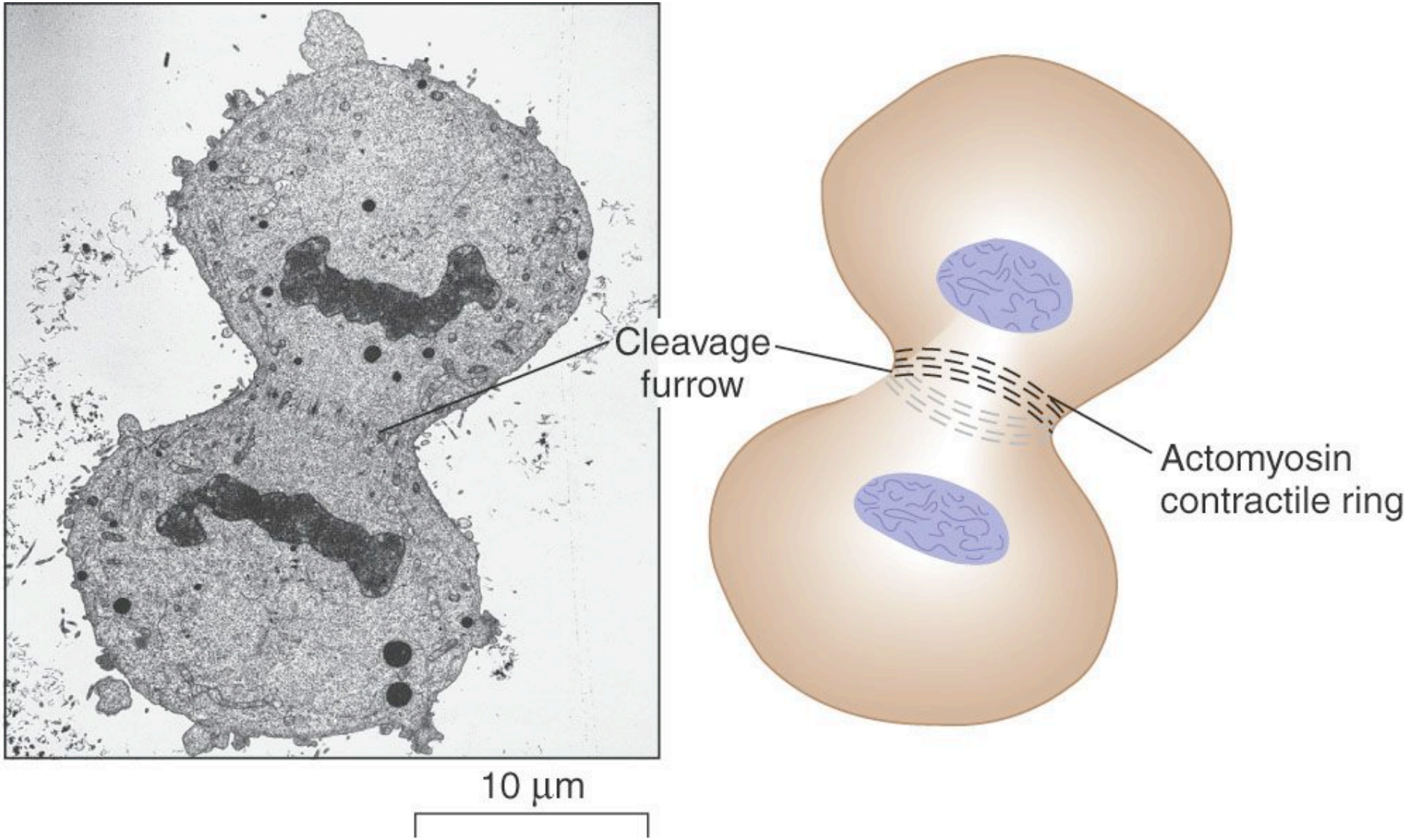
(b) This fluorescence LM of an animal cell at metaphase shows a well-defined spindle and asters (chromosomes, *orange*; microtubules, *green*).



(a) TEM of the equatorial region of a cultured animal cell undergoing cytokinesis. Note the cleavage furrow. Dividing fungal cells also have a contractile ring that causes cytokinesis.

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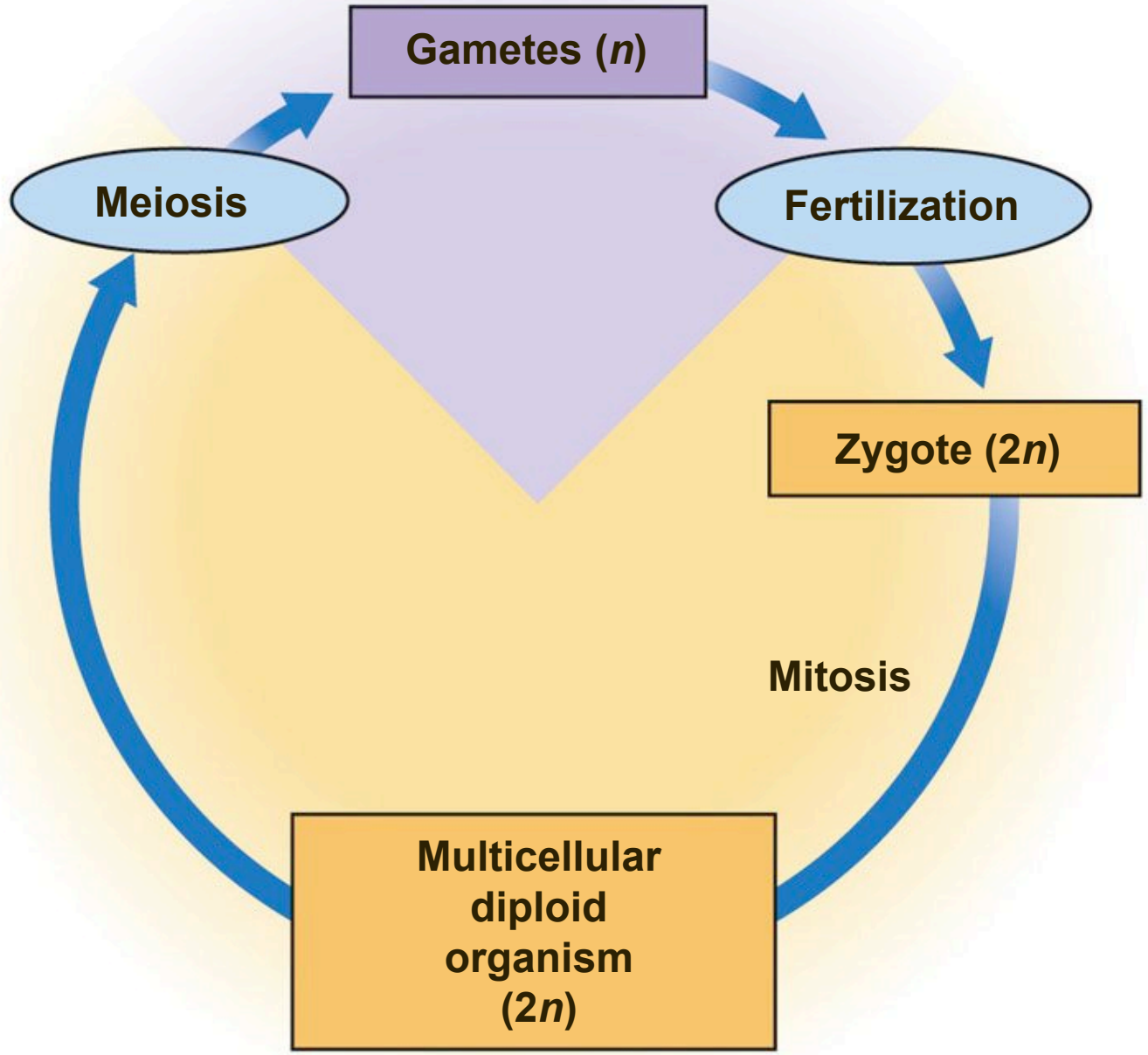
Web Resources -

Problem: when organisms mate, the amount of DNA in gametes must be reduced by half, otherwise the amount of DNA in somatic cells would double every generation..

Solution: Meiosis - reduces the number of chromosome copies in gametes - to be covered next week -



Animals

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Fig. 10-17a, p. 230

Mendelian Genetics -

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Fig. 11-CO, p. 234

Law of Segregation

Allele pairs separate or segregate during gamete formation, and unite at fertilization

Law of Independent Assortment

During gamete formation the segregation of the alleles of one allelic pair is independent of the segregation of the alleles of another allelic pair

Fig. 11-CO, p. 234

Mendelian Genetics -

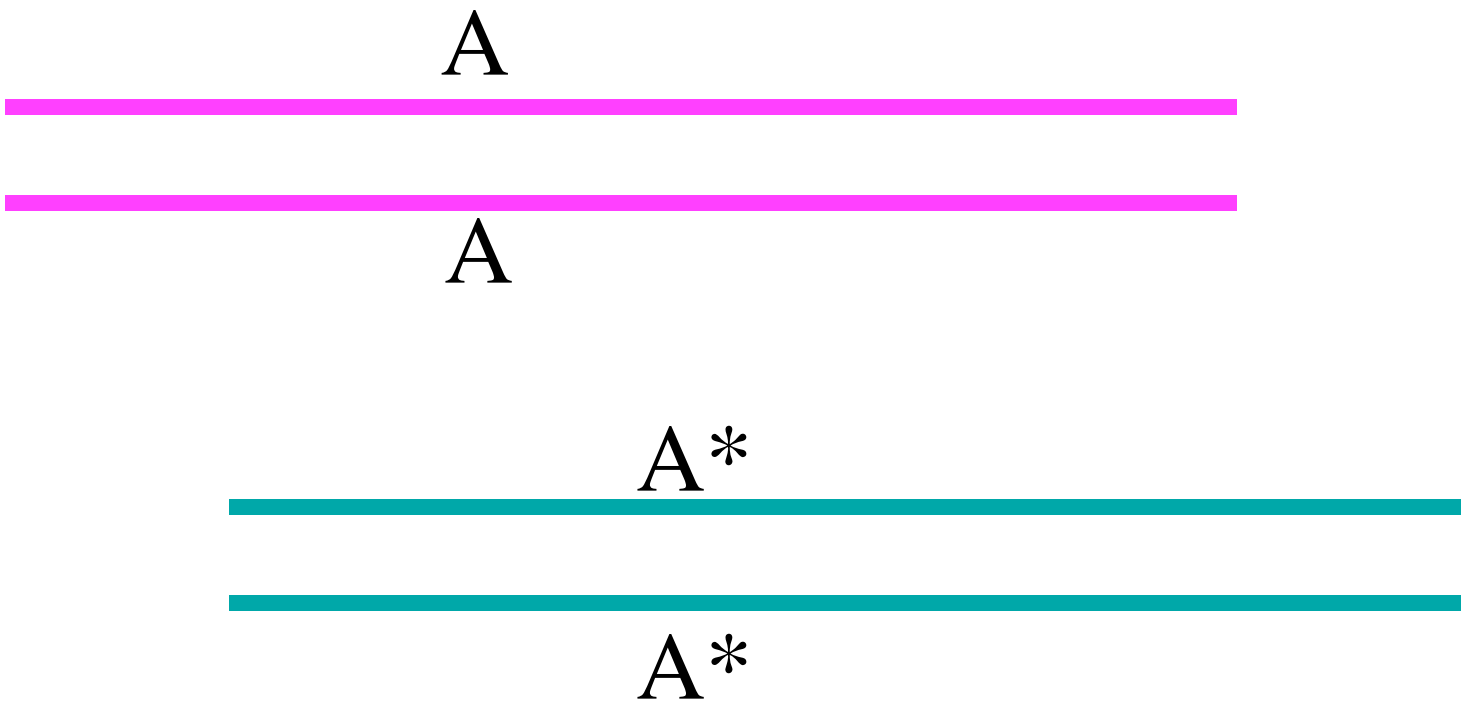
Locus - The position of a gene on a chromosome

Gene - the segment of a chromosome that

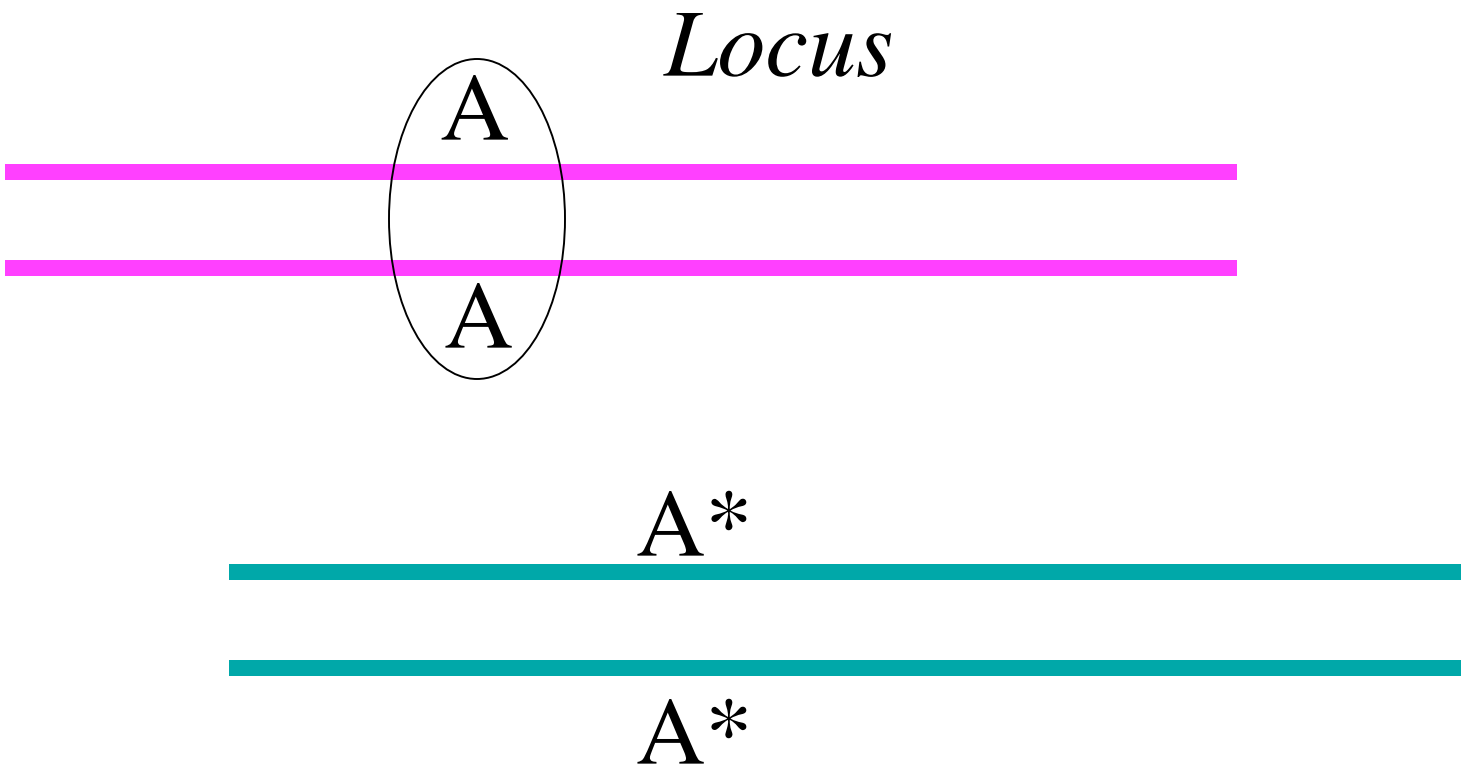
determines a specific character (eye color)

Allele - the state of a gene at a locus, determines traits (brown eyes, blue eyes)

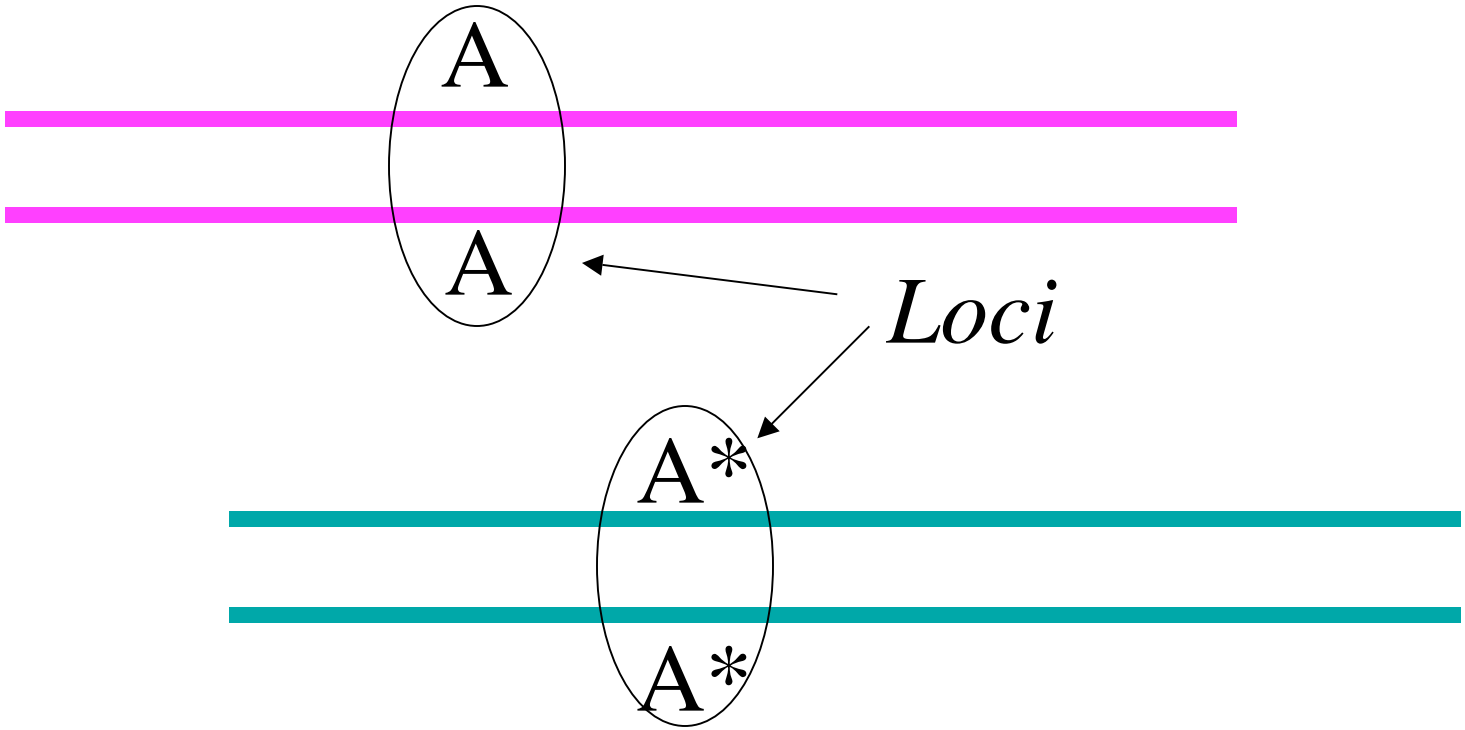
Mendelian Genetics -



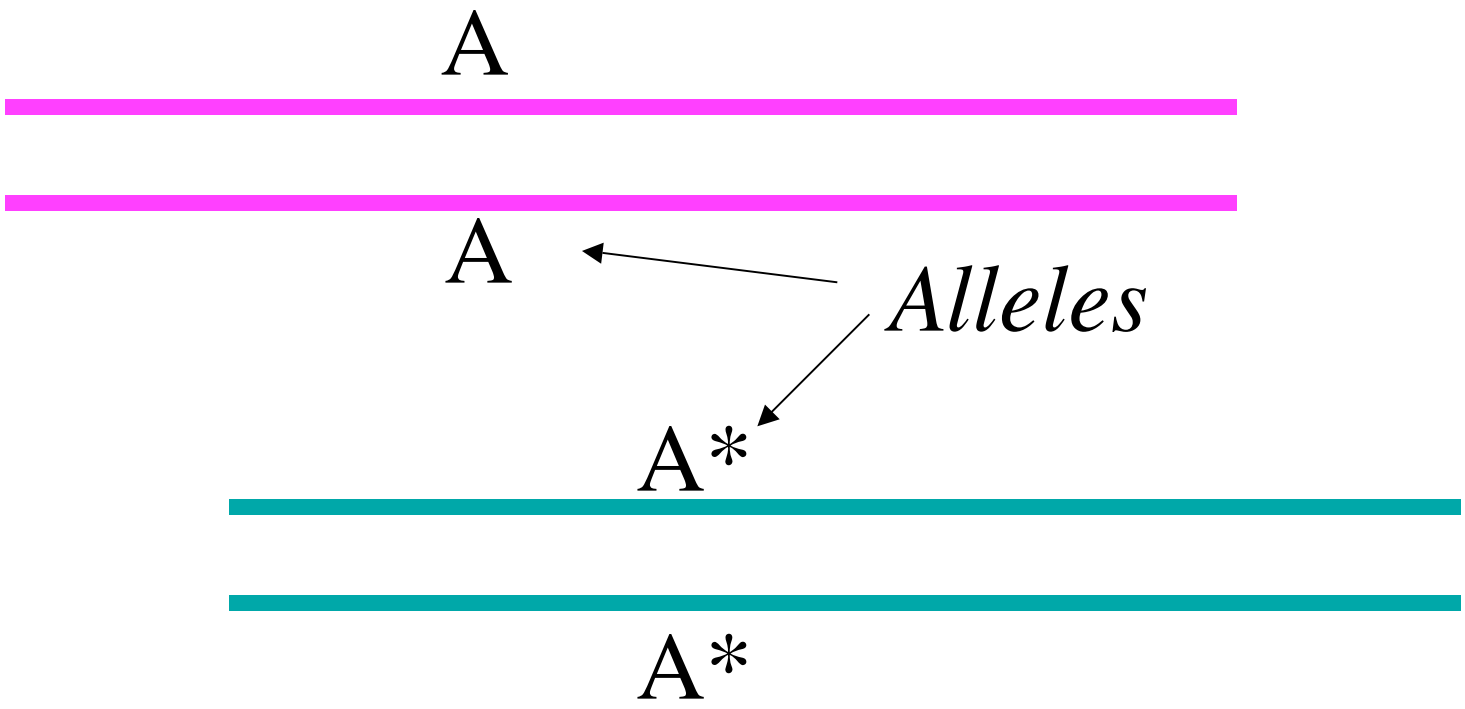
Mendelian Genetics -



Mendelian Genetics -



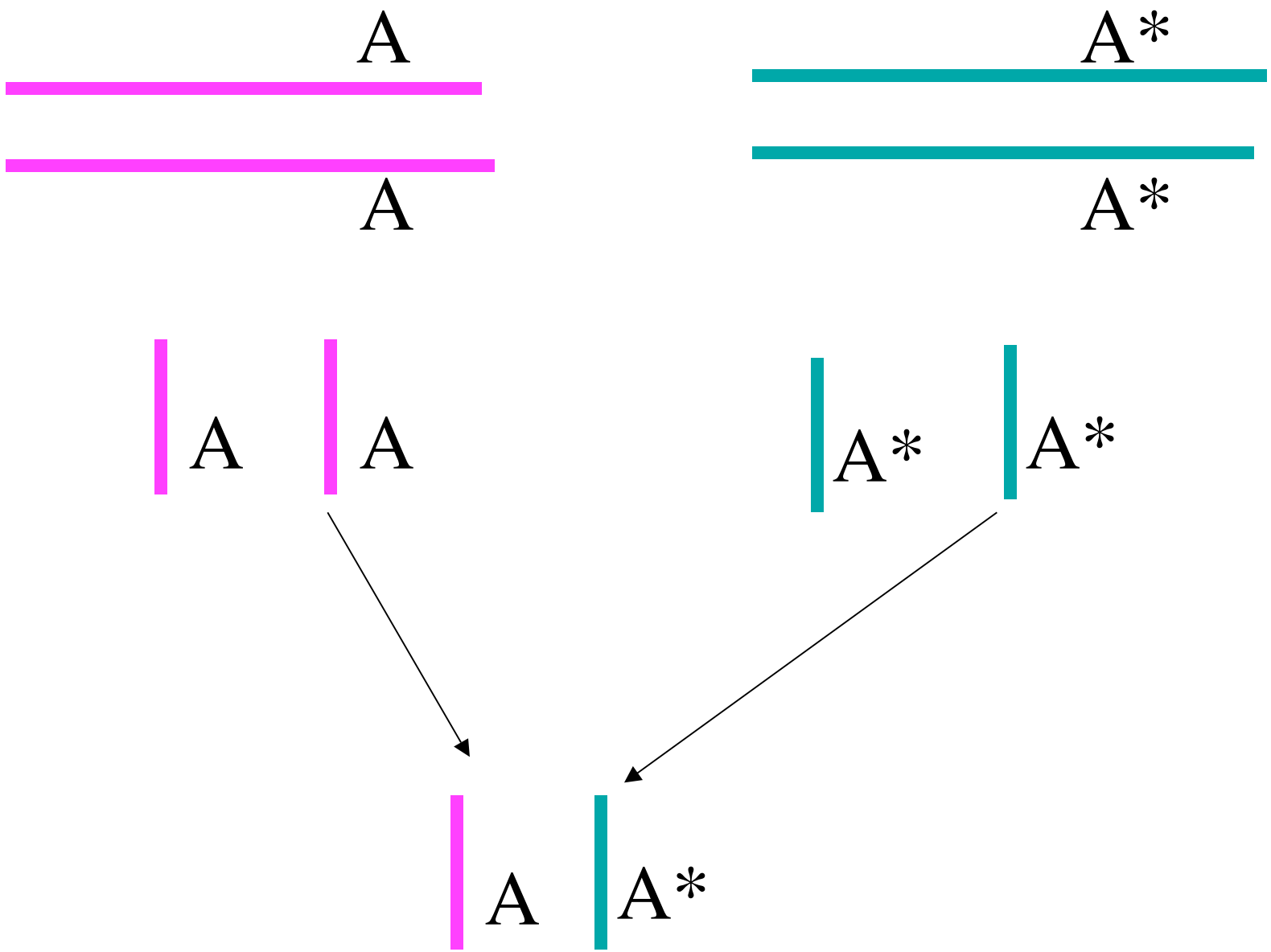
Mendelian Genetics -



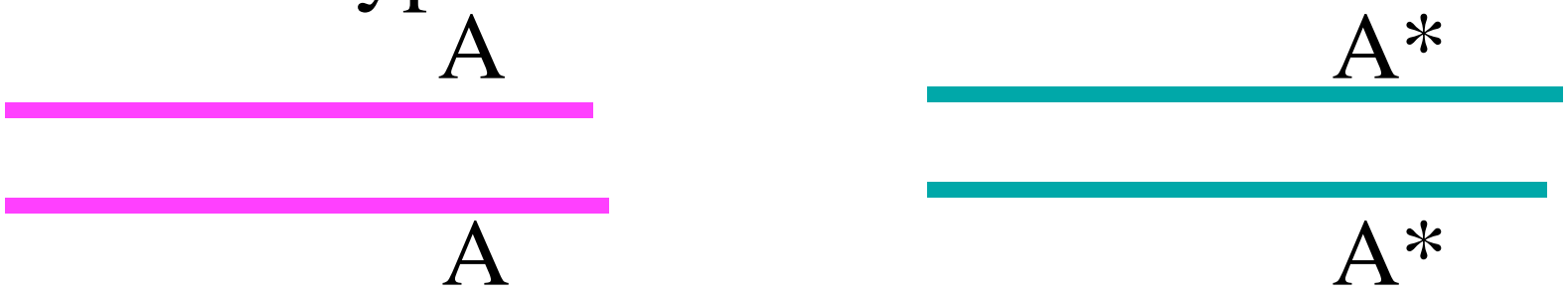
True Breeding Characters - characters that did not vary in self fertilizing plants - we know today that this simply means that both alleles are the same

We know that Mendel observed that when pea lines with true breeding characters were crossed, the descendants were all identical

(WHY?)


A
A
A*
A*
A
A
A*
A*
A
A*

Parental Genotypes



Possible Gametes

F1 Genotypes

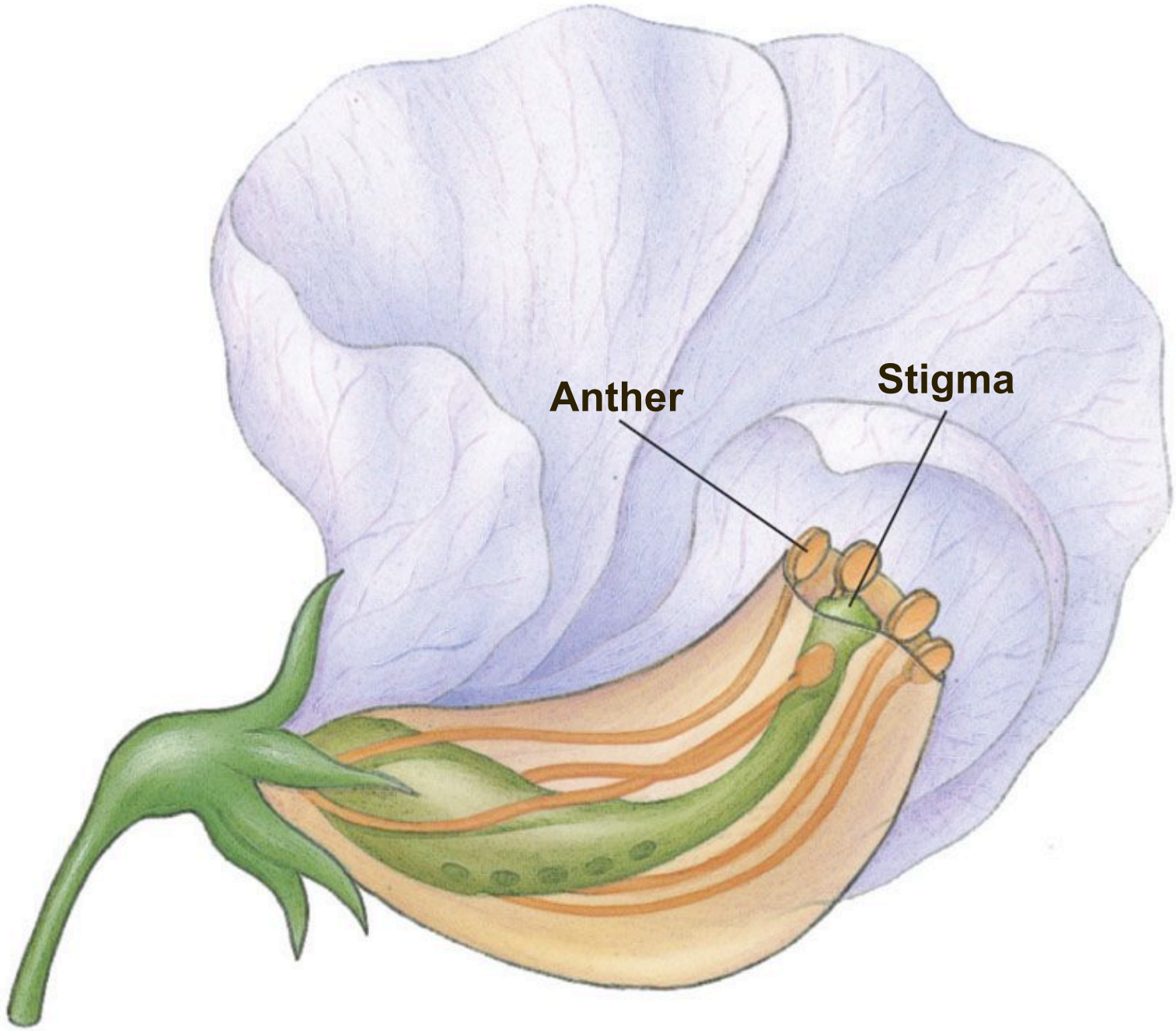


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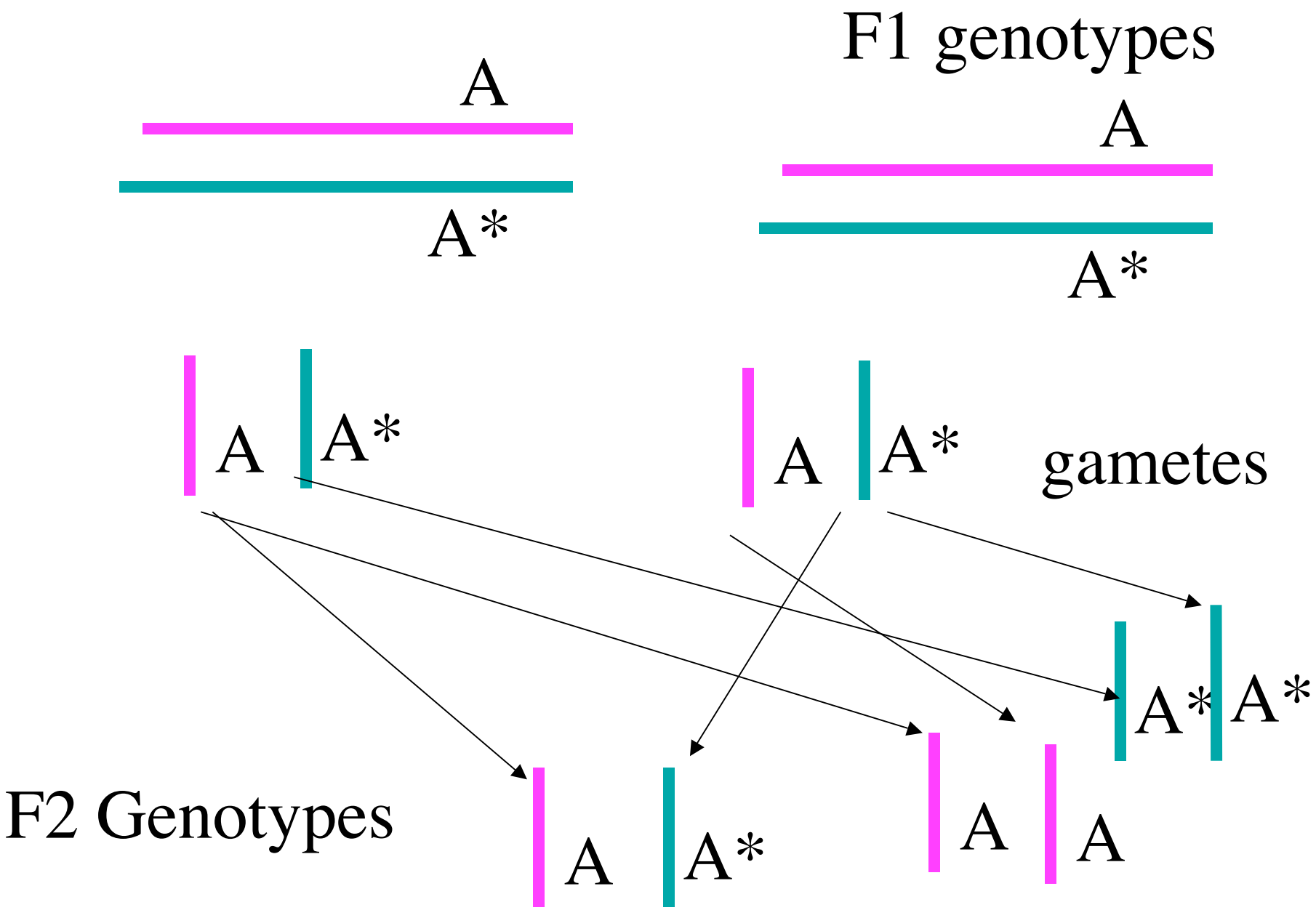
Fig. 11-1, p. 235


F1 genotypes
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A
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A*
gametes
A*
A*
F2 Genotypes
A
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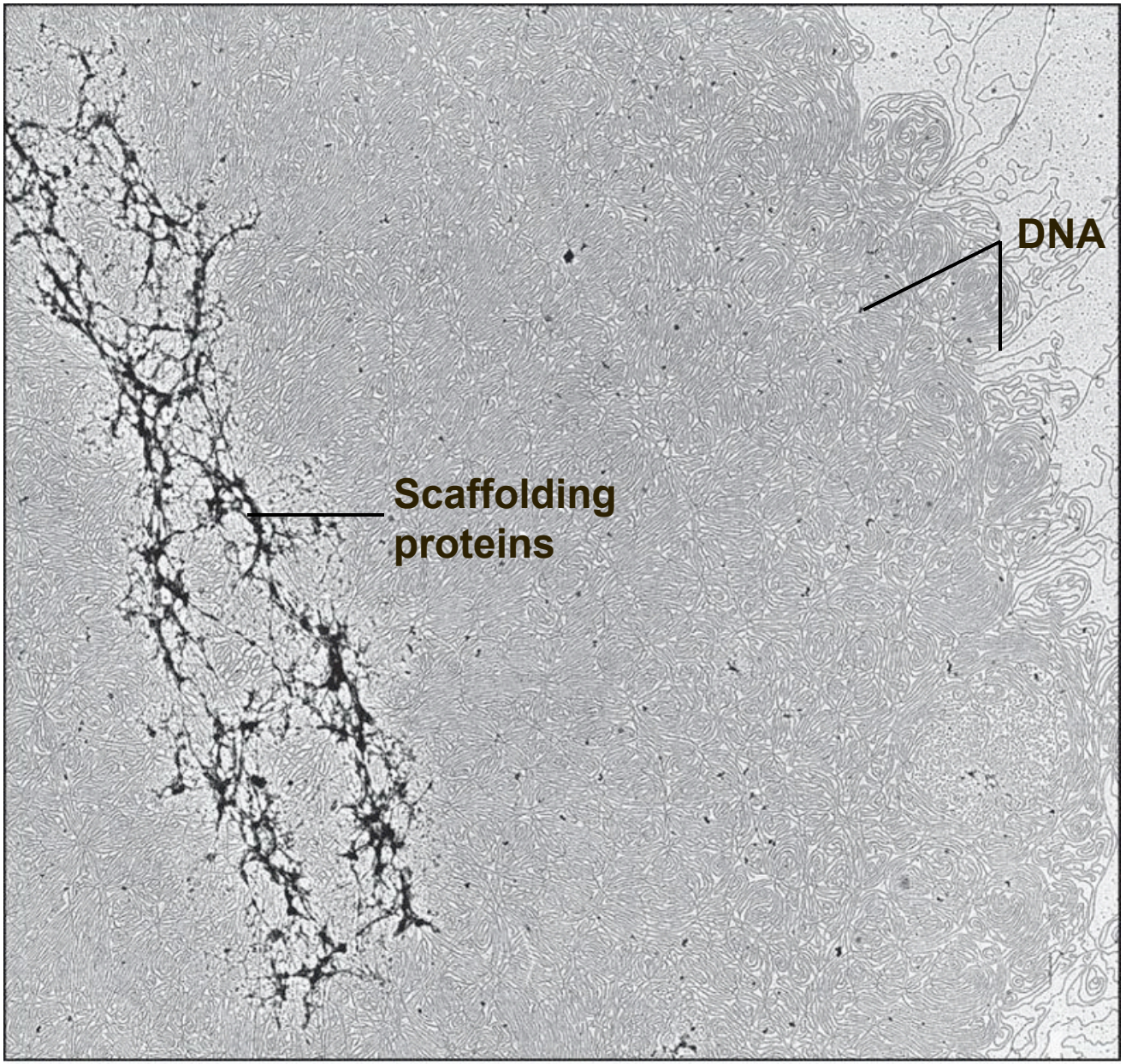
A



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2 _m

Fig. 10-3, p. 213