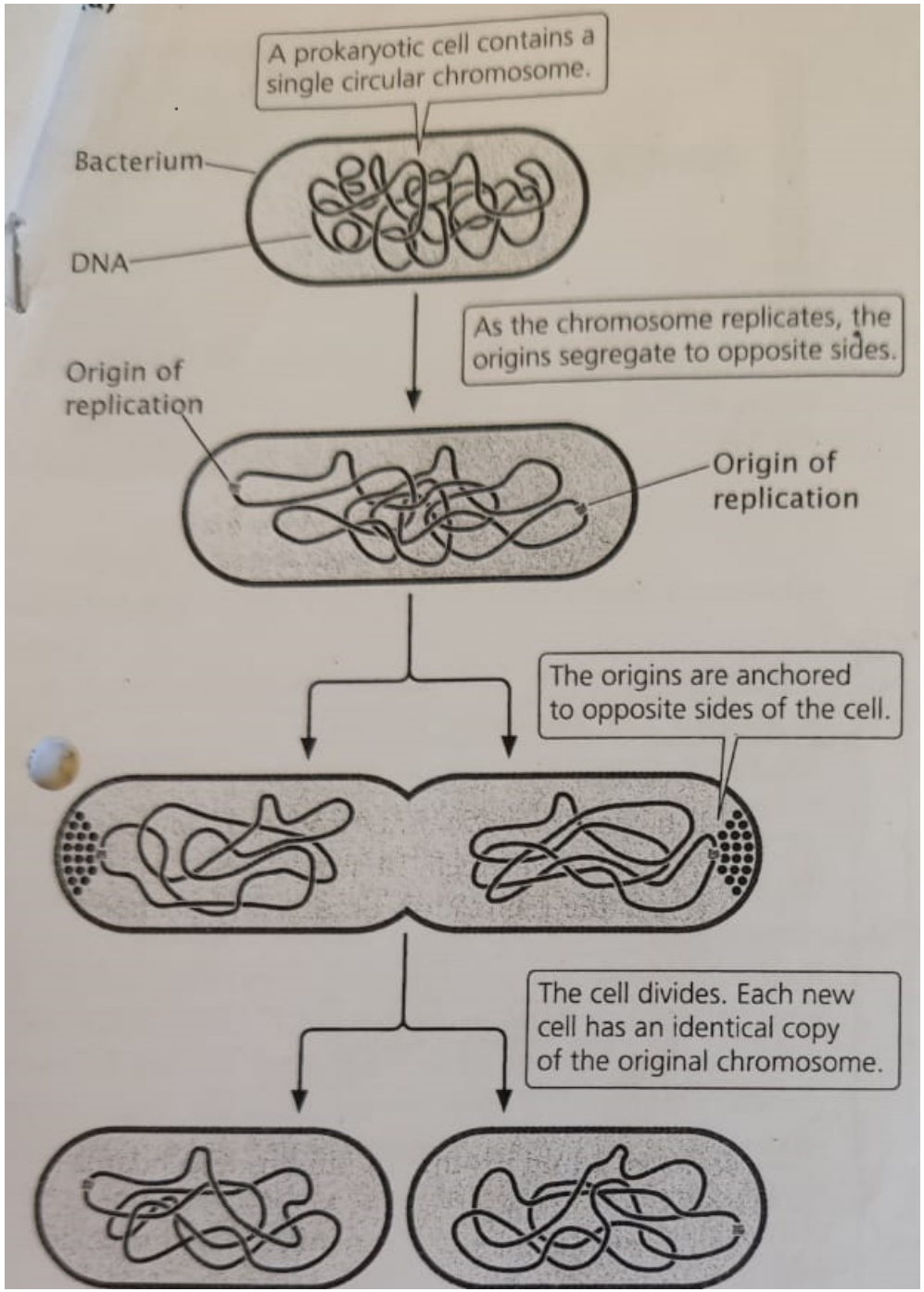
GENETICS-BT204

•Almost all of the cells in the body have DNA in them divided up into 46 lengths, called chromosomes.

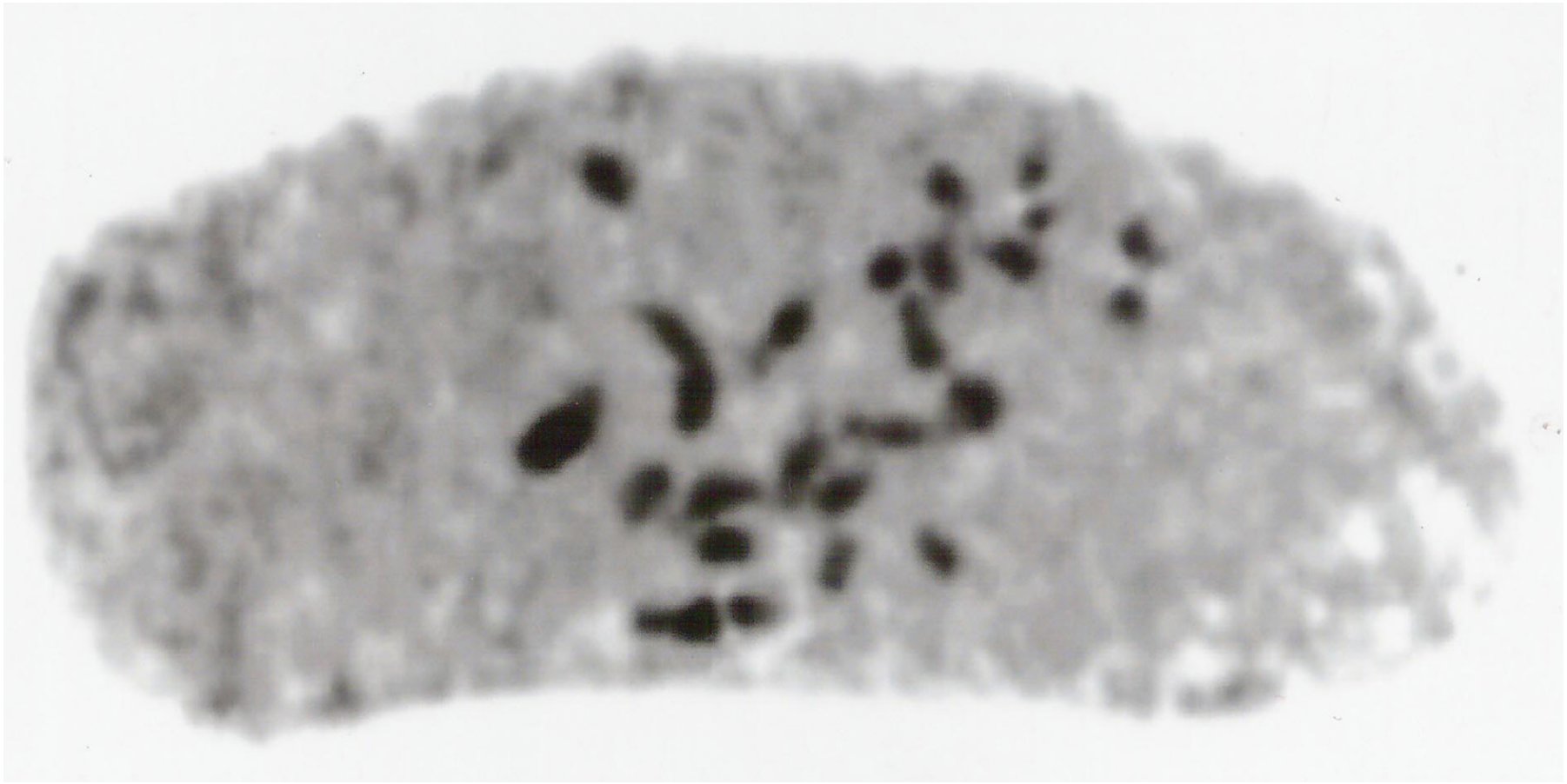
•The DNA out of a single cell if put it all together, end-to-end, it would make a very thin string two metres long. If take all the DNA from the body and join it together to make a thin rope, it would stretch from here to the moon and back 800 times!

Everyone has 22 pairs of chromosomes (making 44 altogether) called autosomes and are common to both males and females.

• One set of sex chromosomes. Sex chromosomes are also called as X and Y chromosome. Male have one X and one Y chromosome and female have two X chromosomes.

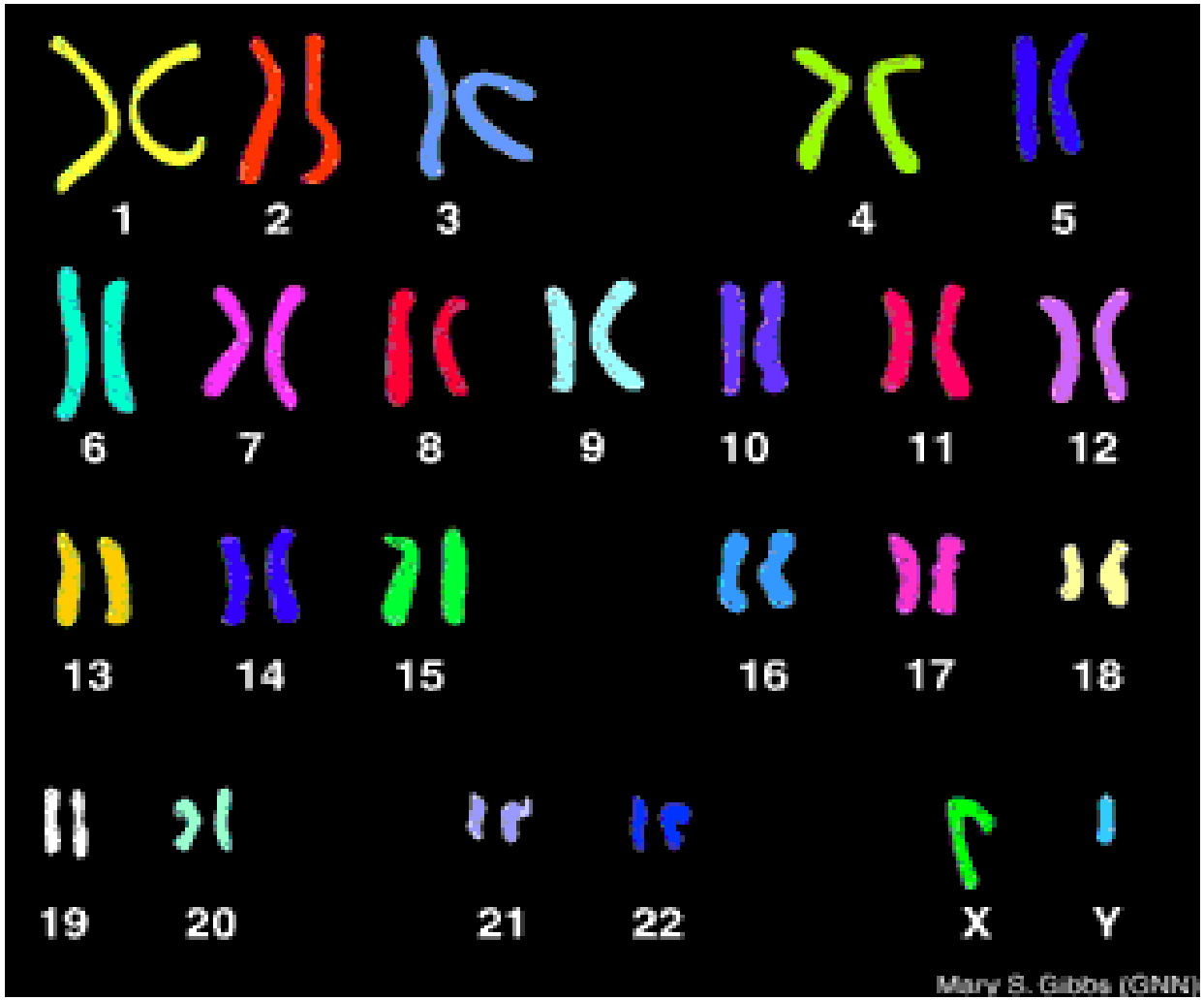


Prokaryotic cell div



A eukaryotic cell- showing chromosomes at Mitotic Metaphase stage in a cytological preparation

Karyotype


1
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12
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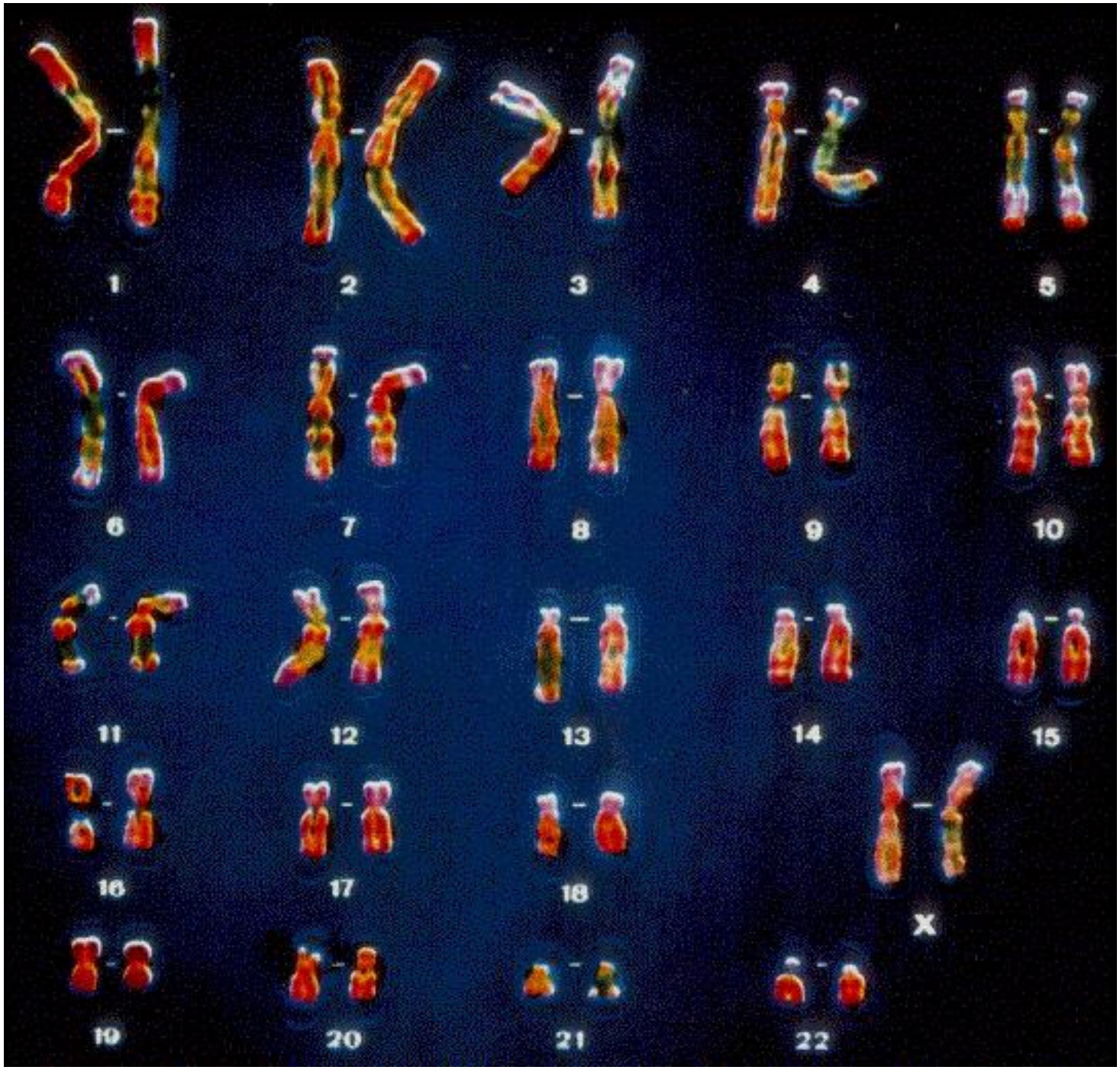
16
17
18
19
20
21
22
X
Y
Mary S. Gibbs (GNN)


1
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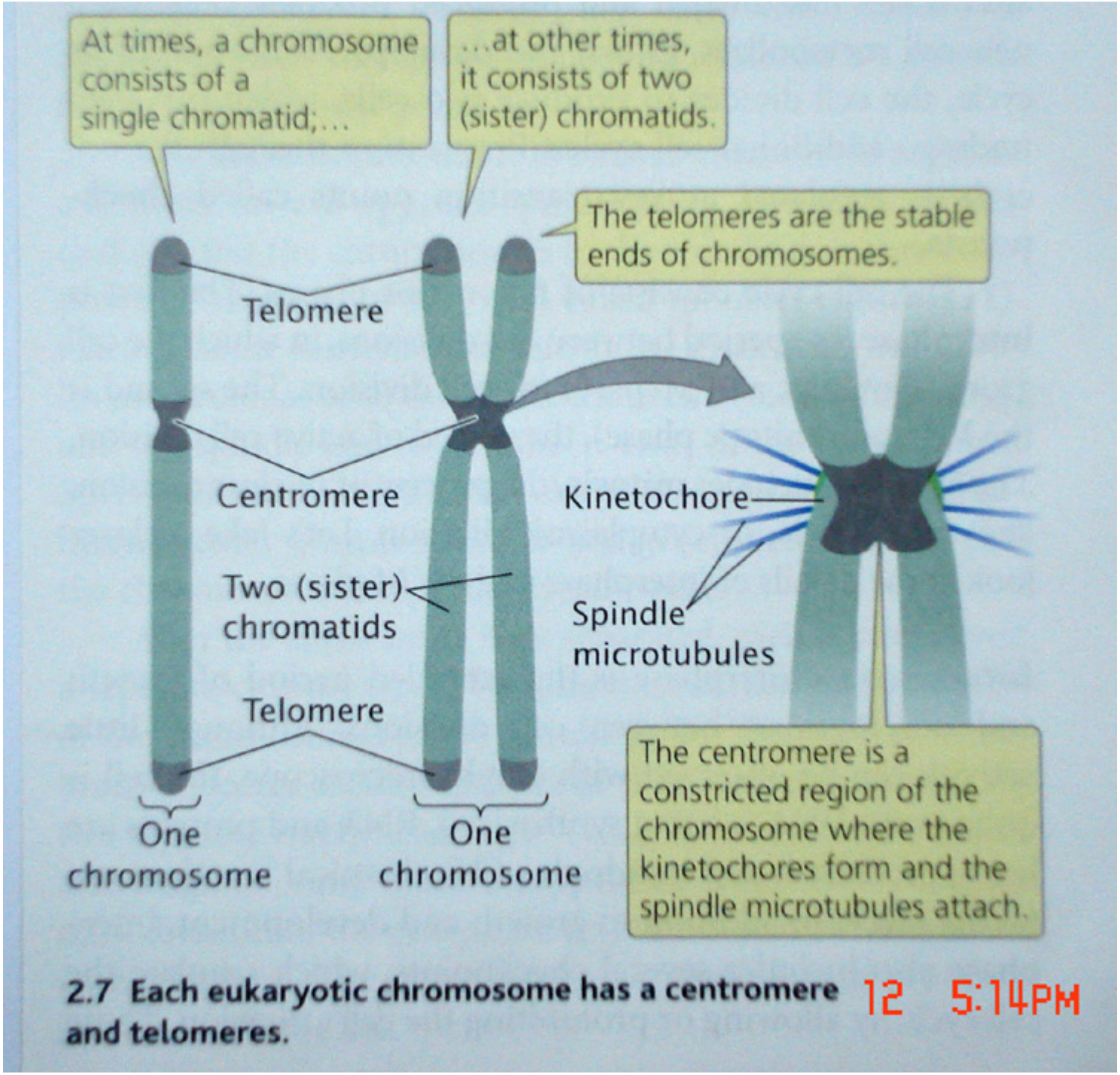
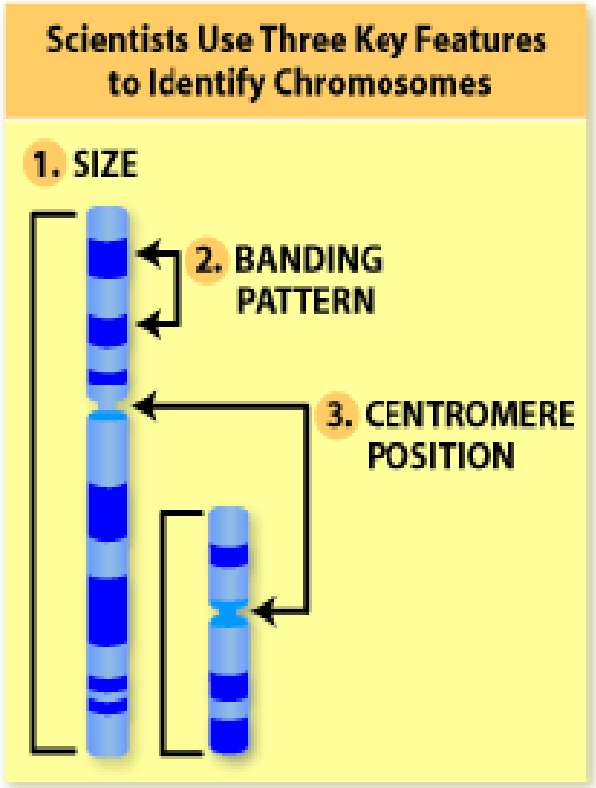
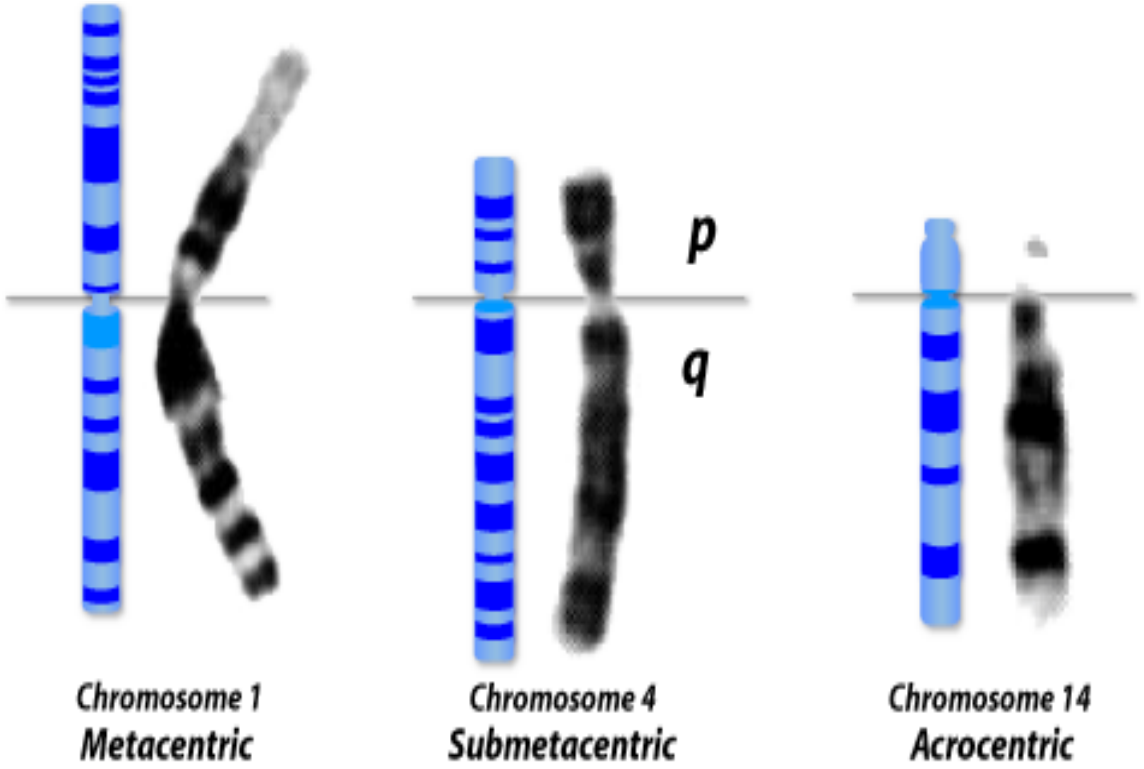


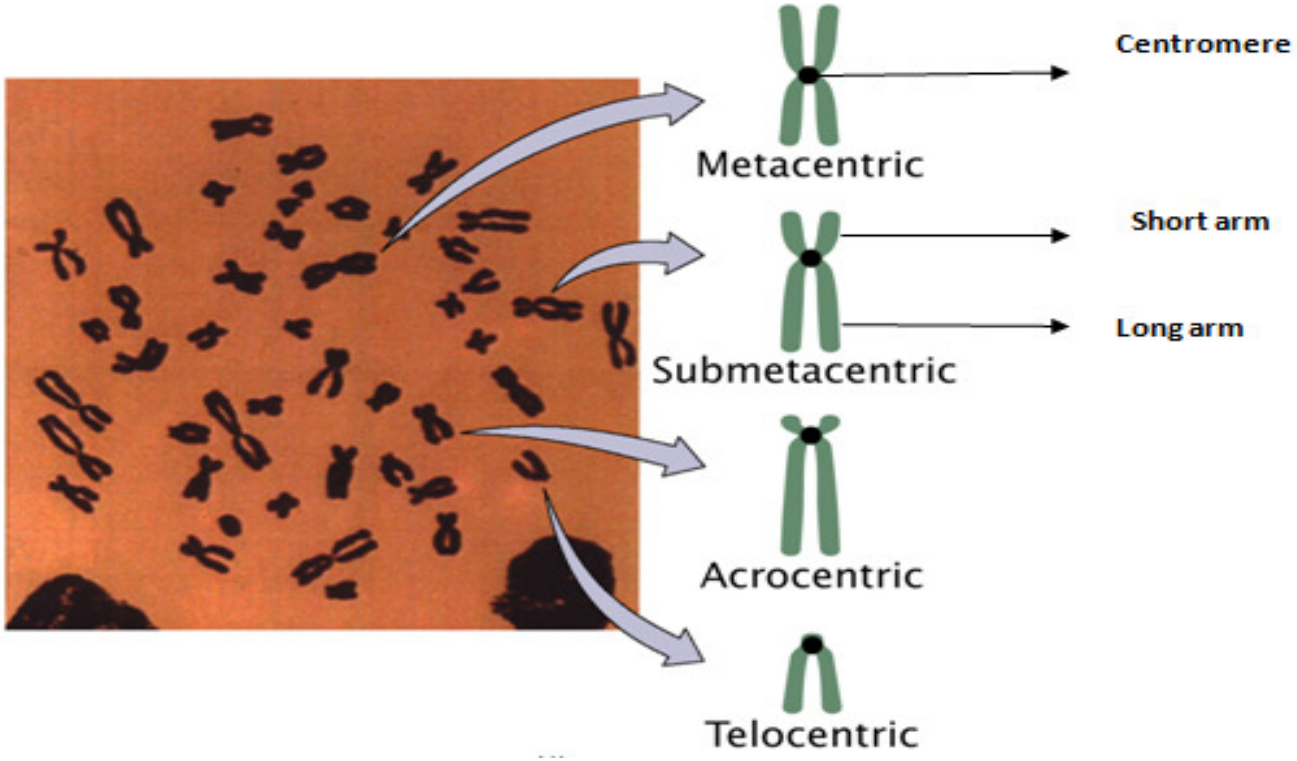
2.7 Each eukaryotic chromosome has a centromere and telomeres.

12 5:14PM

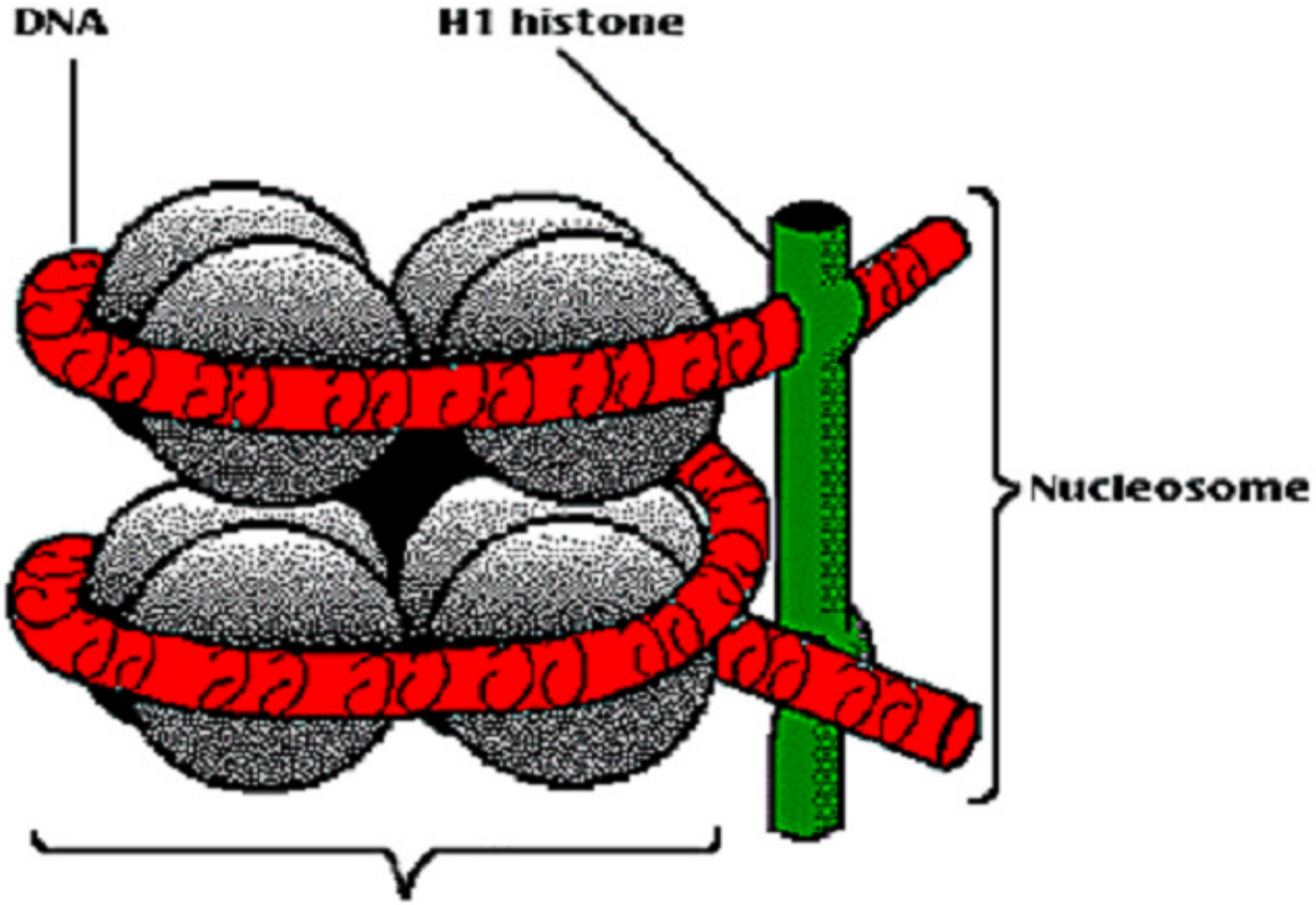

Scientists Use Three Key Features to Identify Chromosomes
1. SIZE
2. BANDING PATTERN
3. CENTROMERE POSITION


p
q
Chromosome 1
Metacentric
Chromosome 4
Submetacentric
Chromosome 14
Acrocentric

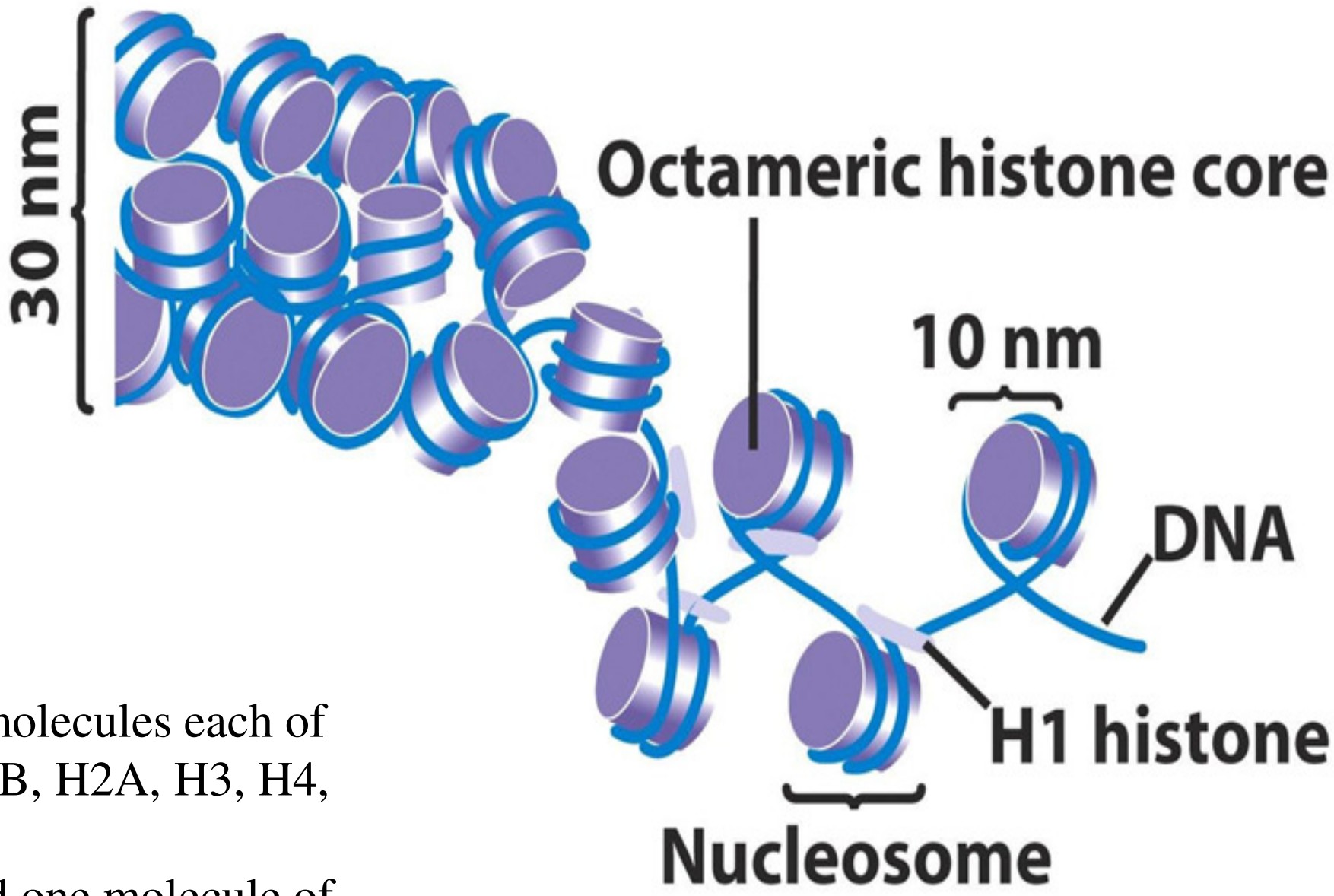
Types of chromosomes



Monocentric Chromosomes
Holocentric Chromosome
Dicentric Chromosome
Acentric Chromosome



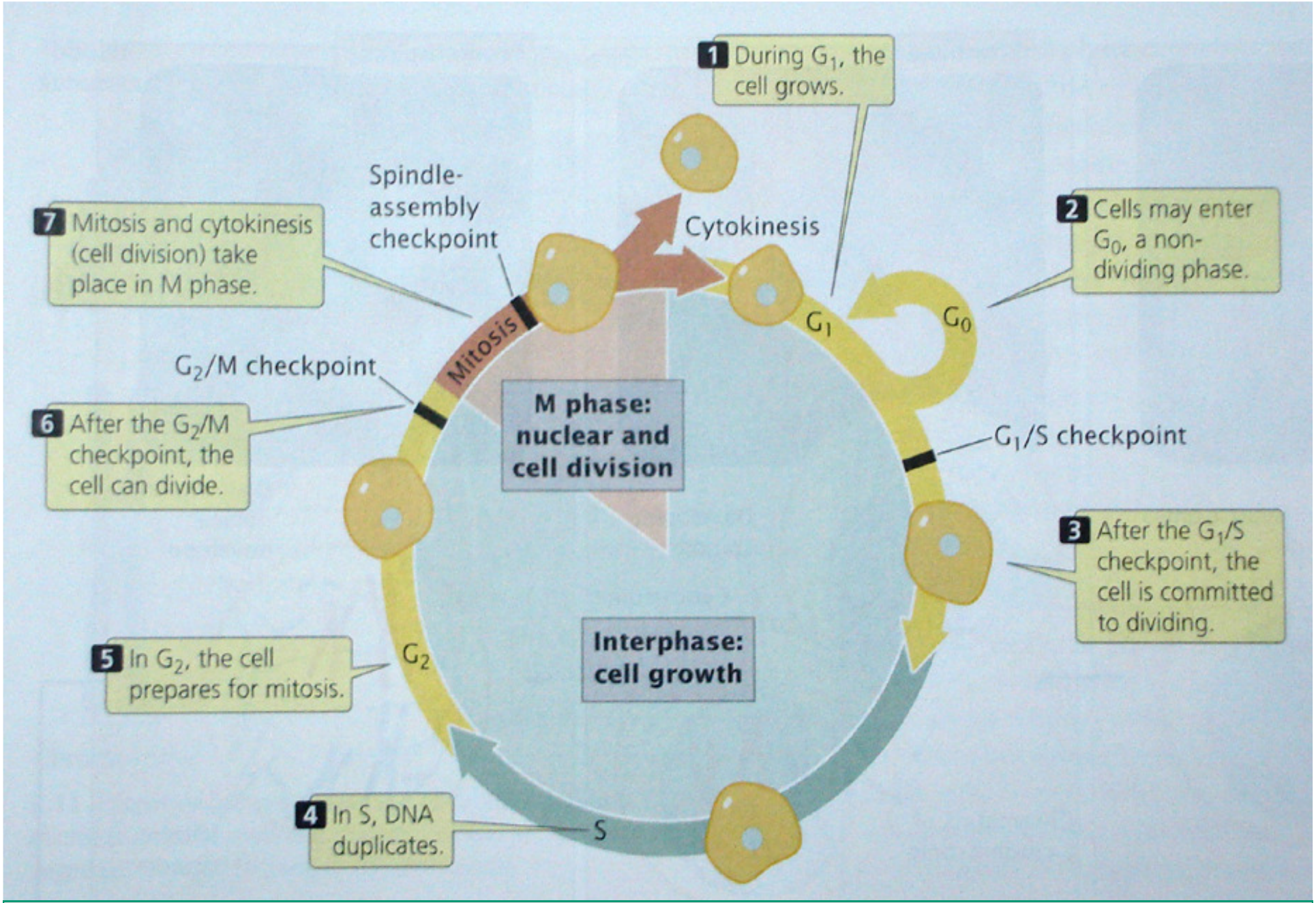
Nucleosome



2 molecules each of
H2B, H2A, H3, H4,

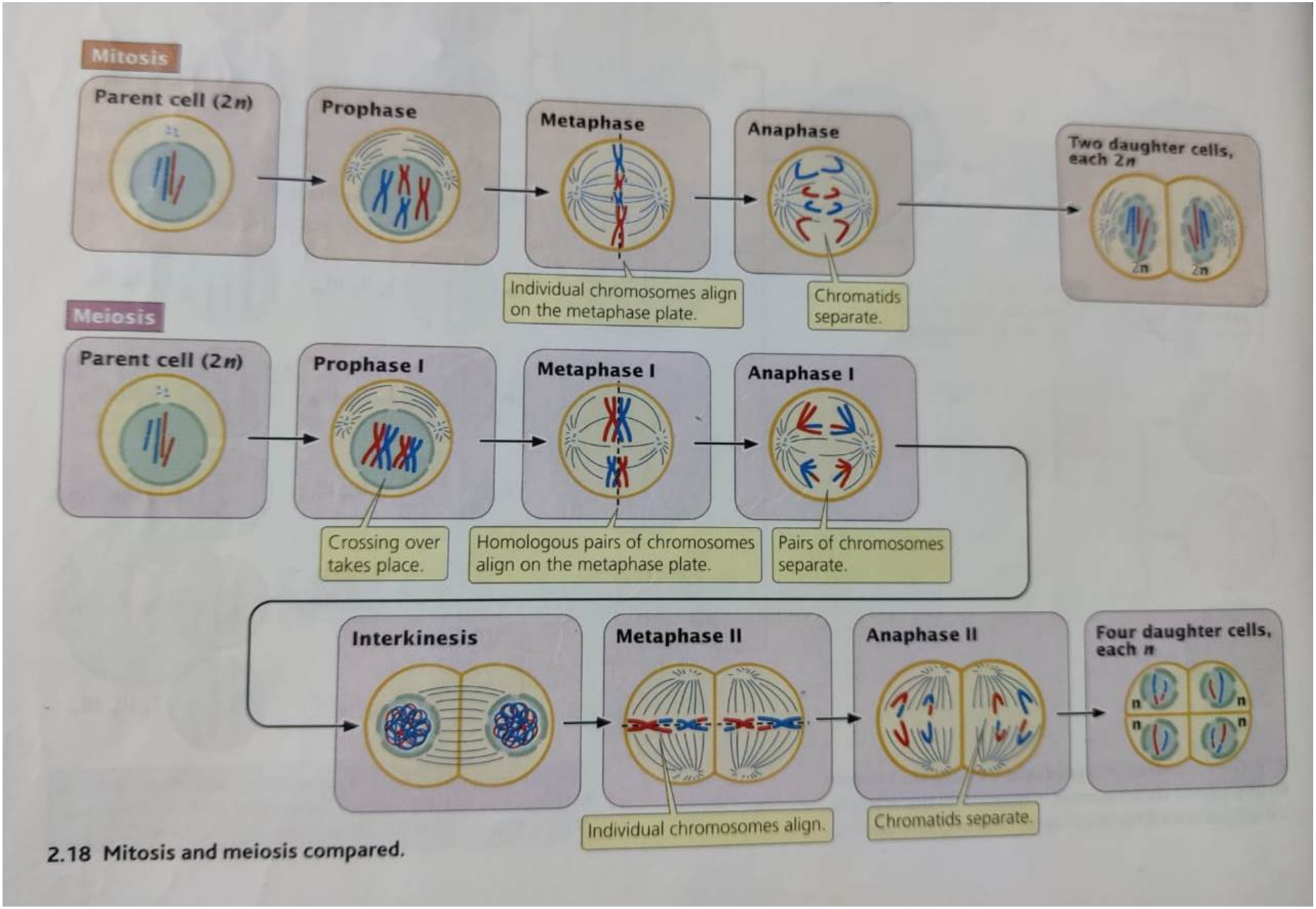
and one molecule of
HI


Nucleosome
DNA STRAND
GENE
SWITCH
IN OFF POSITION
DNA STRAND
GENE
SWITCH
TURNED ON

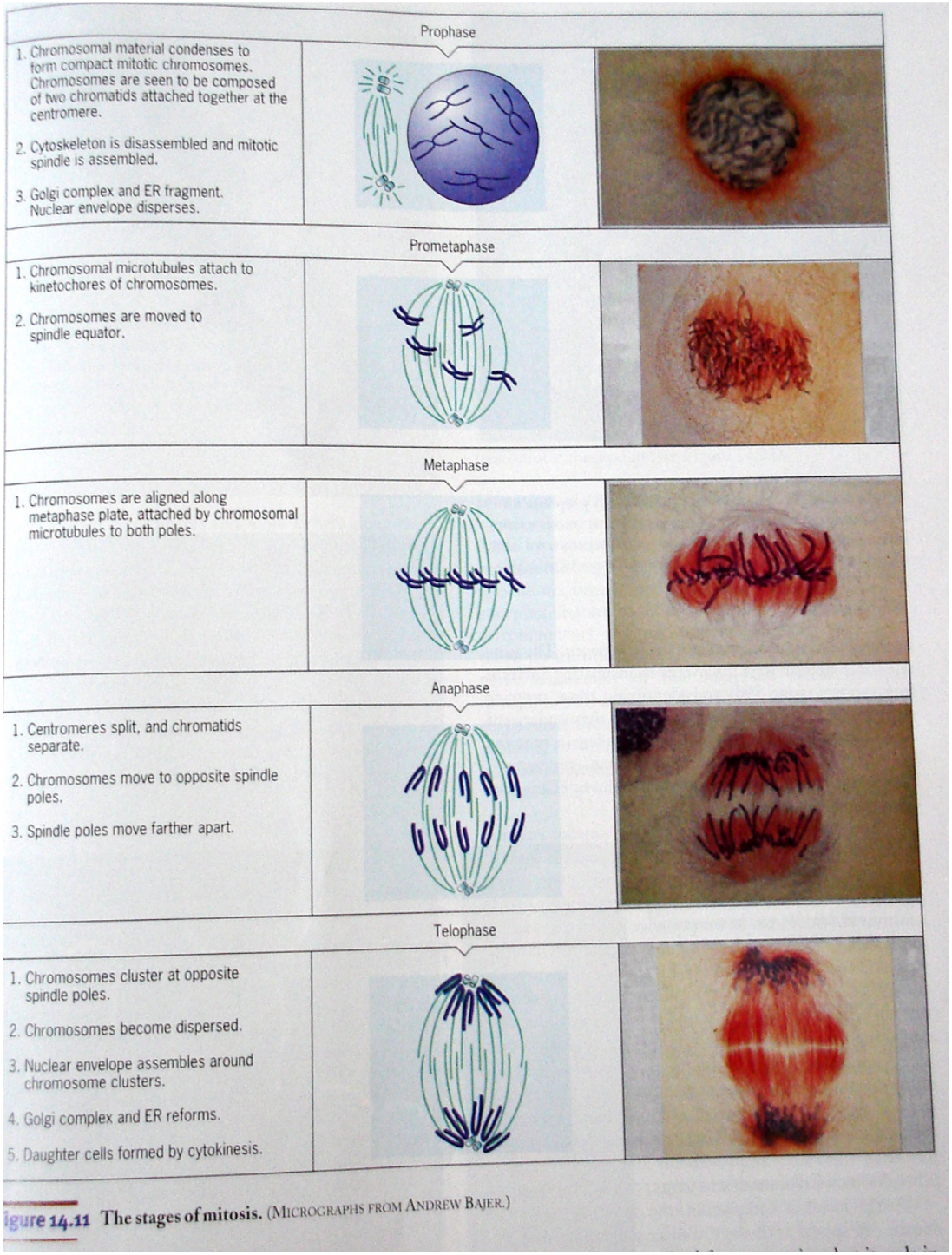

1 During G_1, the cell grows.
2 Cells may enter G_0, a non-dividing phase.
3 After the G_1/S checkpoint, the cell is committed to dividing.
4 In S, DNA duplicates.
5 In G_2, the cell prepares for mitosis.
6 After the G_2/M checkpoint, the cell can divide.
7 Mitosis and cytokinesis (cell division) take place in M phase.
Spindle-assembly checkpoint
Cytokinesis
G_1
G_0
G_1/S checkpoint
G_2
G_2/M checkpoint
Mitosis
S
M phase: nuclear and cell division
Interphase: cell growth

Cell Cycle

Mitosis Vs Meiosis

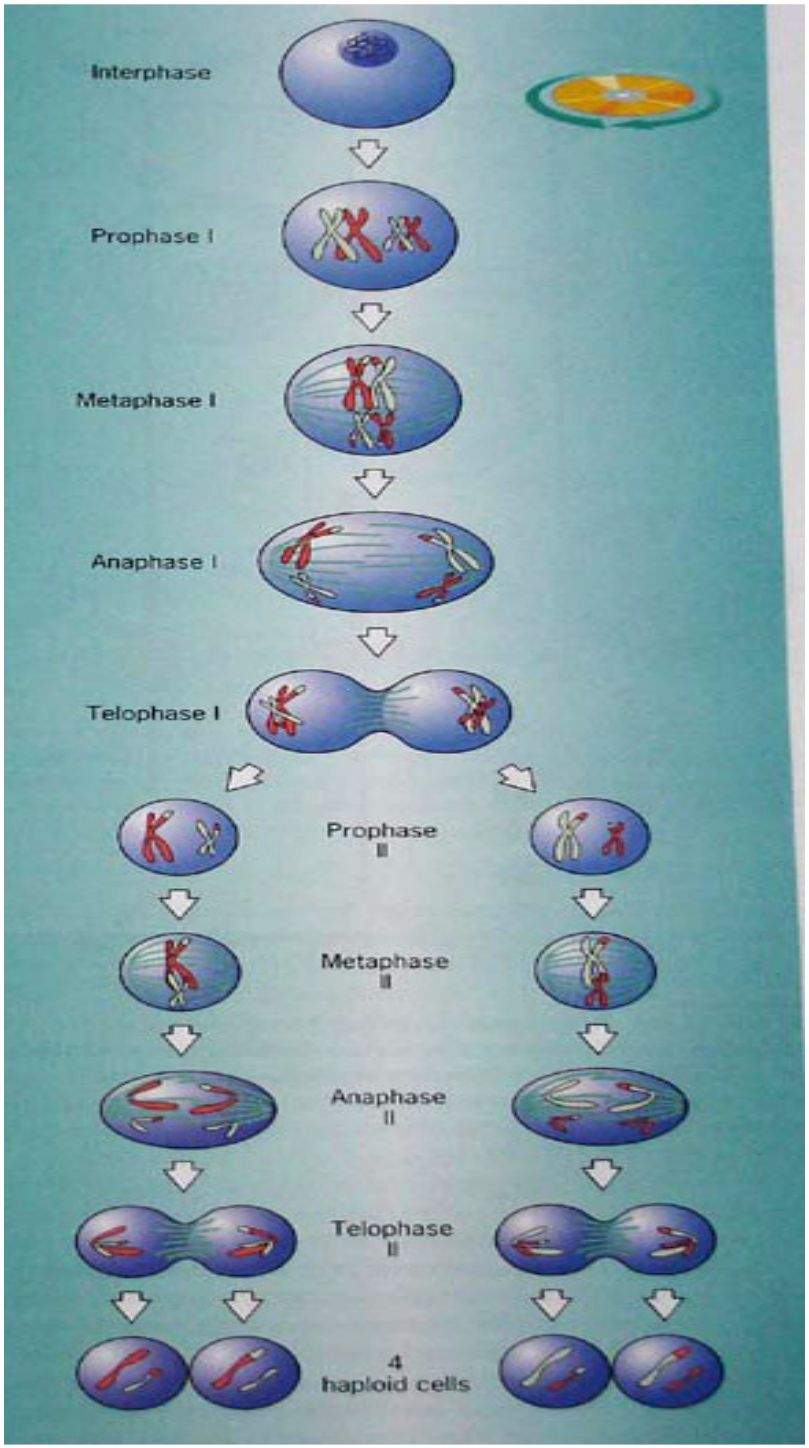


2.18 Mitosis and meiosis compared.



igure 14.11 **The stages of mitosis.** (MICROGRAPHS FROM ANDREW BAJER.)

Mitotic cell division



Meiotic cell division

Polytene chromosomes

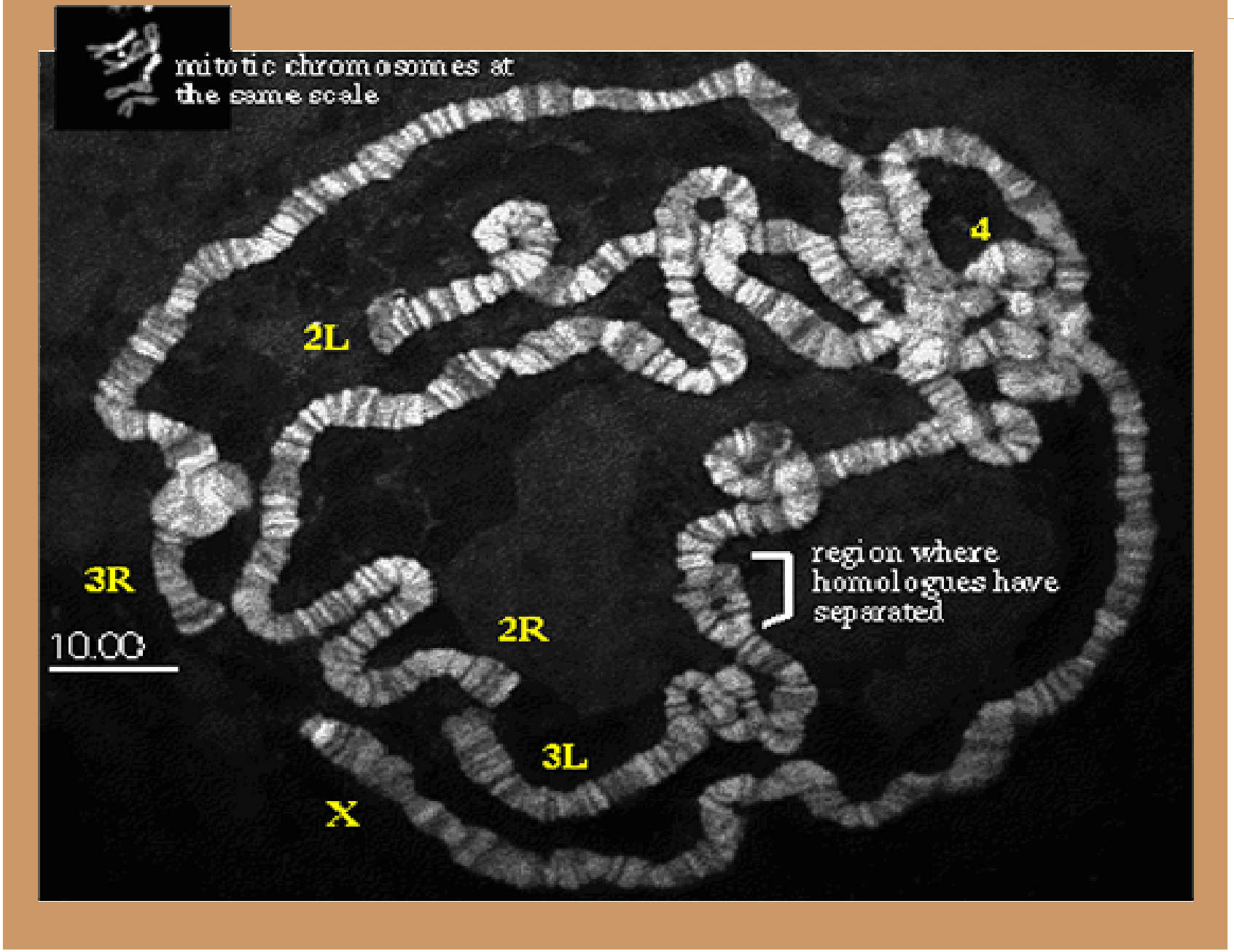
•Some insects, such as *Drosophila melanogaster* have highly replicated polytene chromosomes in some tissues such as the salivary glands.

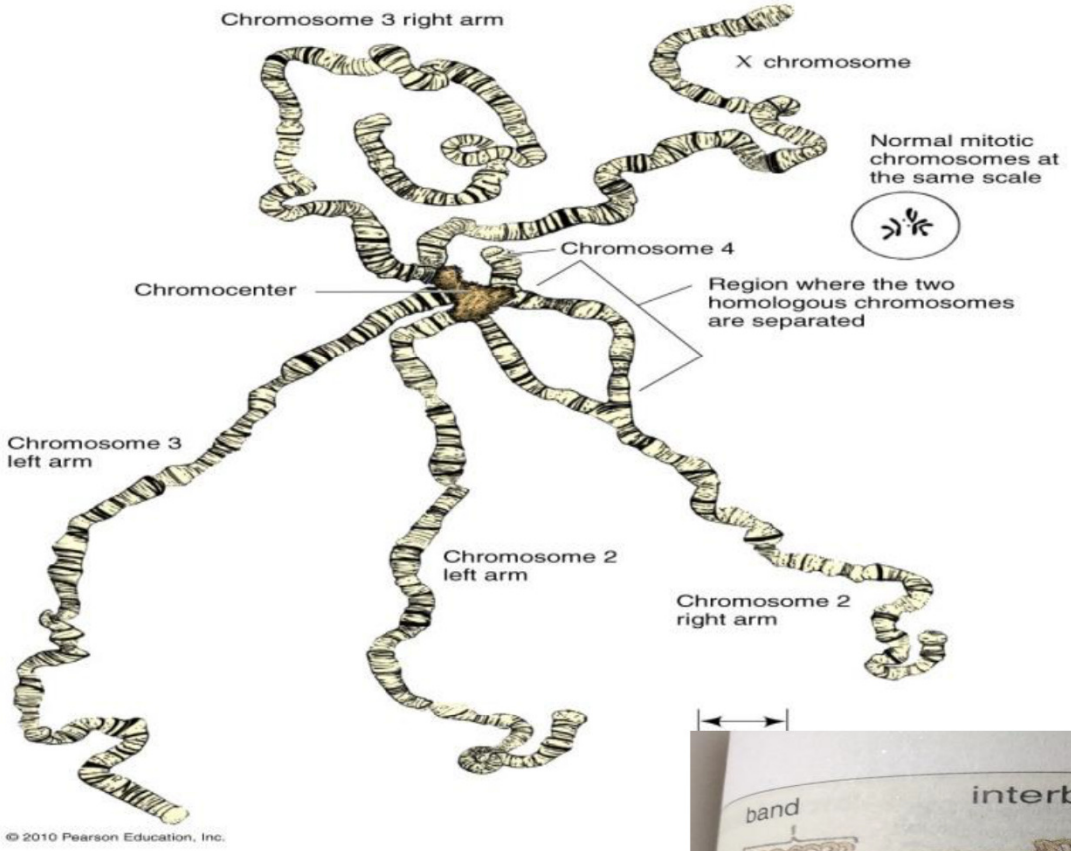
• **Polytene chromosomes** are a giant chromosome containing non-separated multiple copies of replicated DNA.

•Chromocentre is the point where polytene chromosomes appear to be attached.

•Along the length of the polytene chromosomes several features such as bands, puffs and Balbiani rings are present.

Polytene Chromosome





Polytene chromosomes

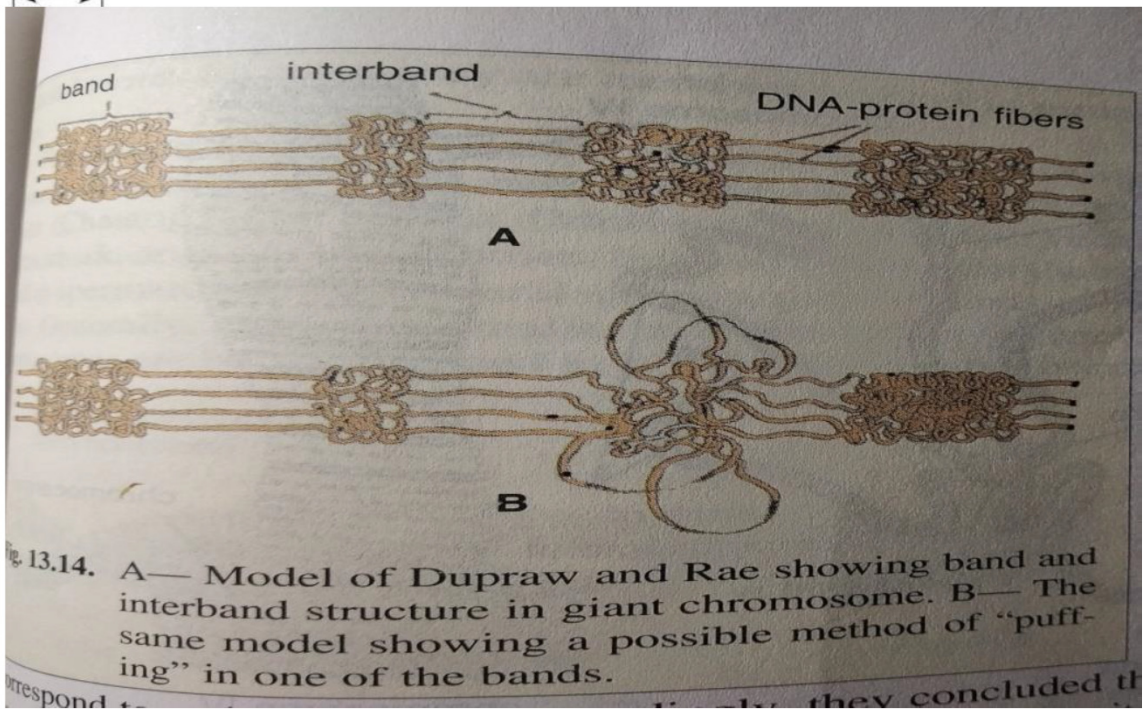
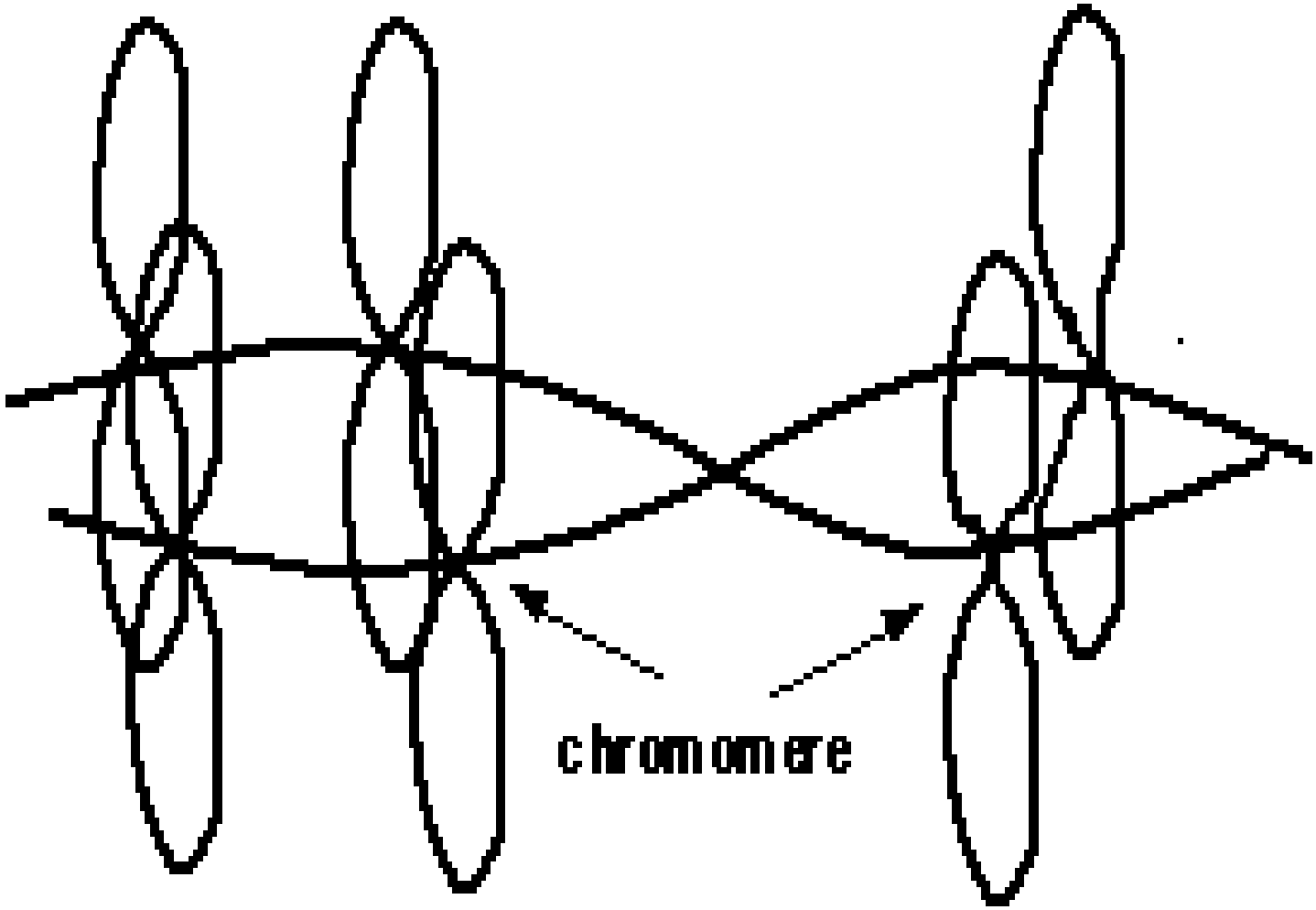


Fig. 13.14. A— Model of Dupraw and Rae showing band and interband structure in giant chromosome. B— The same model showing a possible method of "puffing" in one of the bands.



Lampbrush Chromosome

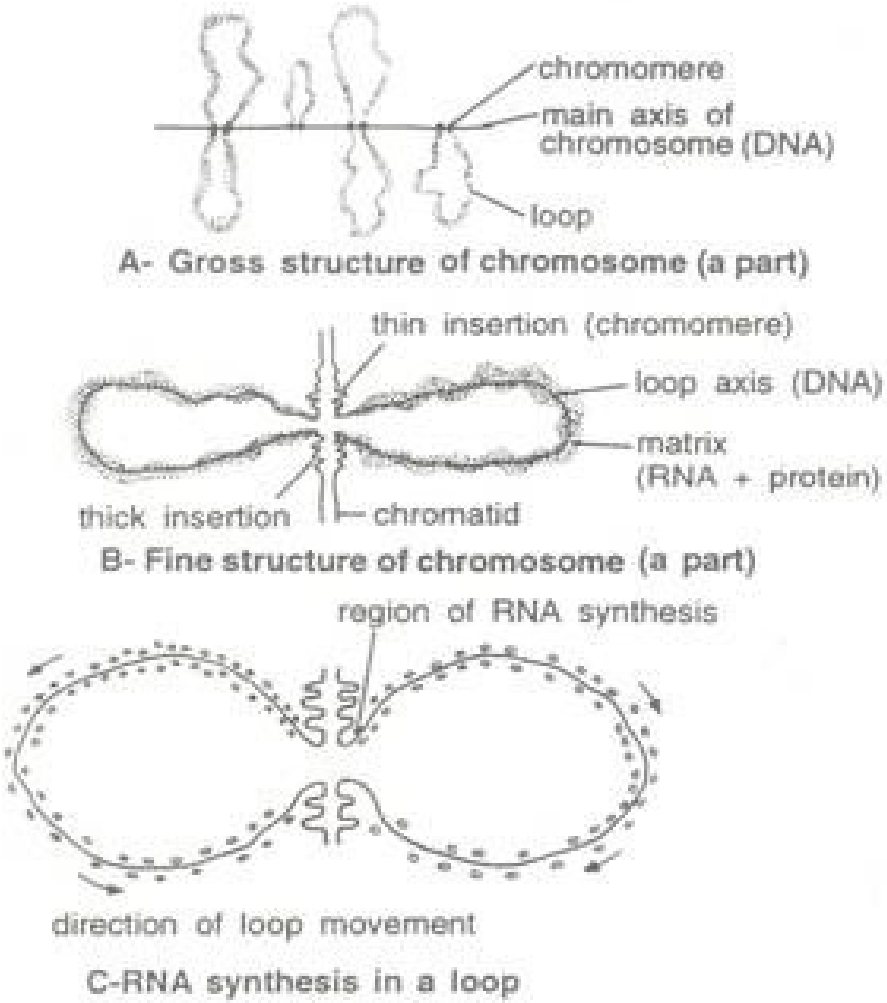
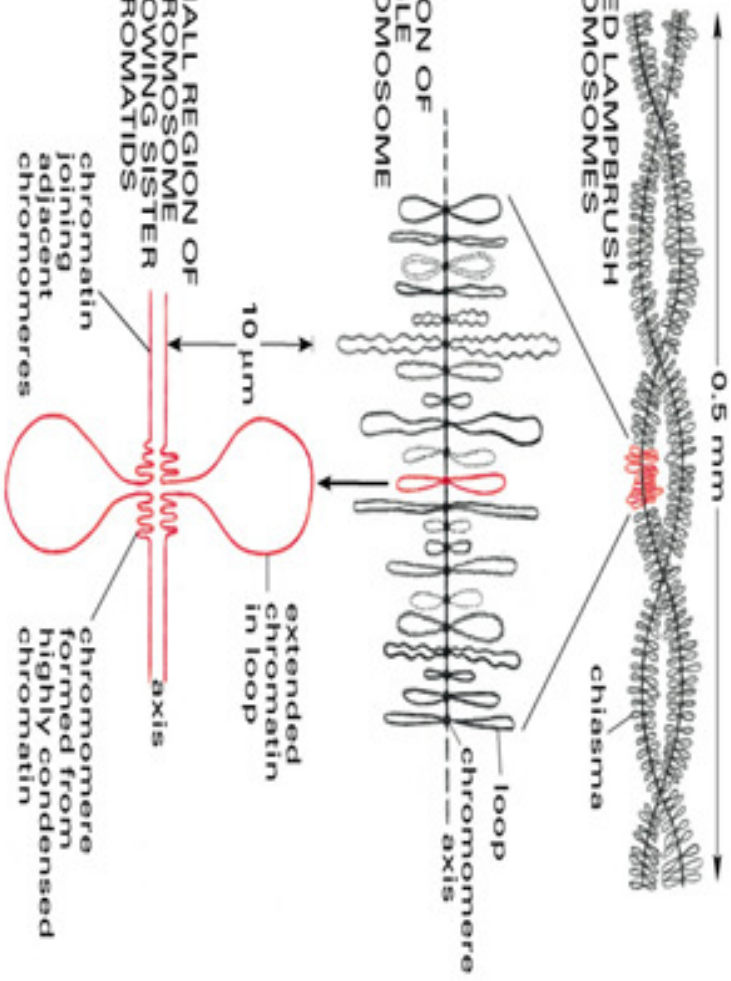


Fig. 11. Lampbrush chromosome.



• **Lampbrush chromosomes** occur in a limited phase of meiosis during oogenesis in amphibian oocytes.
•This chromosome is a **bivalent** (2 pairs of sister chromatids held together by chiasmata).
•The chromosome strands (20 nm diameter fibers consisting of two double strands of DNA) are dotted with about 5000 **chromomeres** (dark staining irregular structures also seen in interphase chromosomes).
•Twin loops (length 400-800 nm) emerge from chromomeres. An identical pattern of twinned loops occurs on both pairs of sister chromatids.
•Loops show a gradual increase of electron density from the chromomere around the loop and back to the chromomere.
•The average length of loops corresponds to the average length of RNA transcripts in these oocytes, but is much longer than the average length of RNA transcribed in somatic cells.