Cell Growth and Division

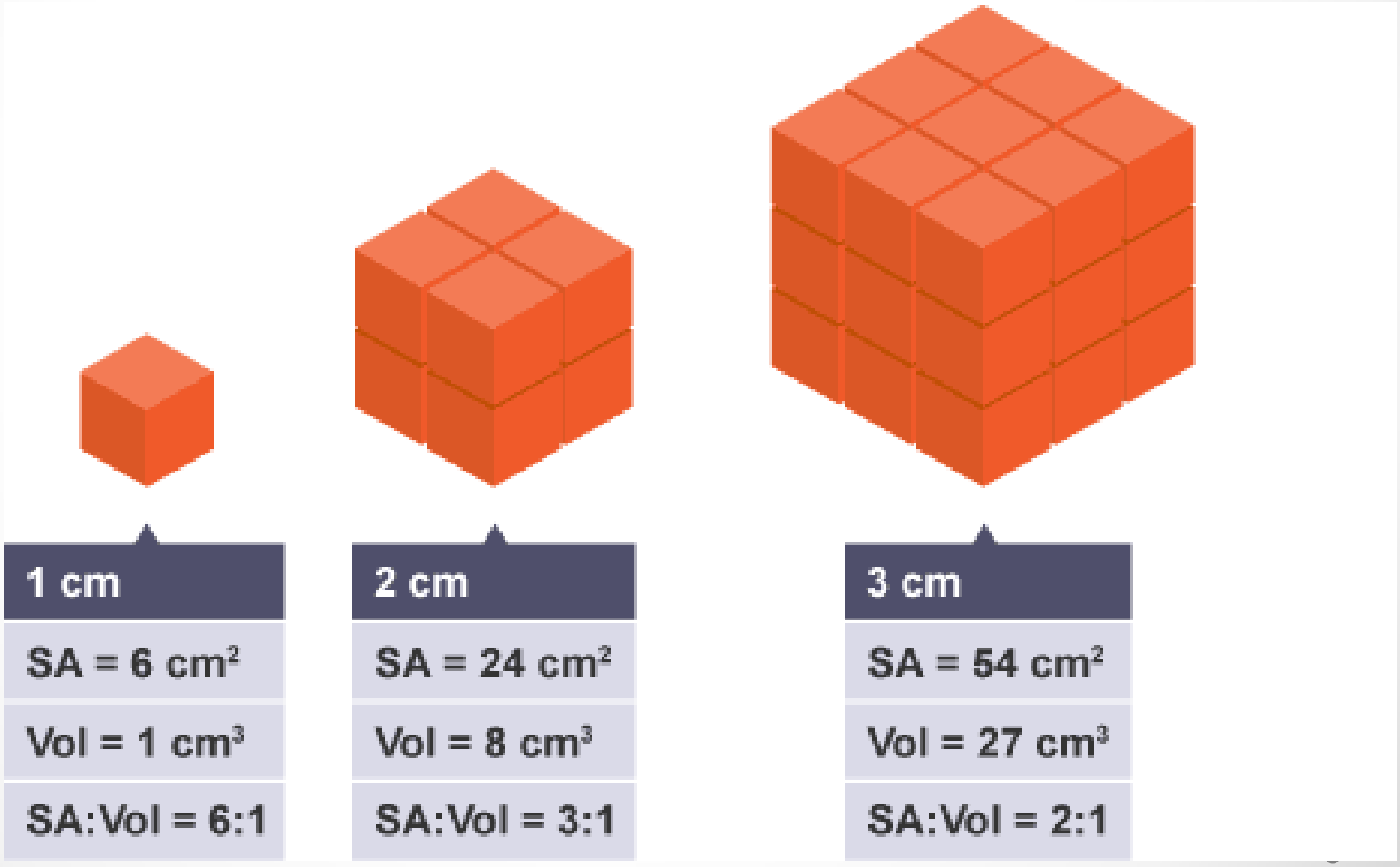
Ch 10

10-1 Cell Growth

- Adult animal cells are the same size as those of a young animal
- Cell size is limited by 2 things:
  - The demand on the DNA
  - Library analogy
- Ability of cells to move all necessary substances across the membrane
  - Ratio of surface area to volume
  - Larger cells produce more waste and need more nutrients; ability to move these things across the membrane is limited by the surface area
  - Volume (lxwxh)increases more than surface area(lxw)
  - Two lane street in town analogy

10-1 Cell Growth

- Why is surface area so important anyway?!



1 cm	2 cm	3 cm
SA = 6 cm^2	SA = 24 cm^2	SA = 54 cm^2
Vol = 1 cm^3	Vol = 8 cm^3	Vol = 27 cm^3
SA:Vol = 6:1	SA:Vol = 3:1	SA:Vol = 2:1

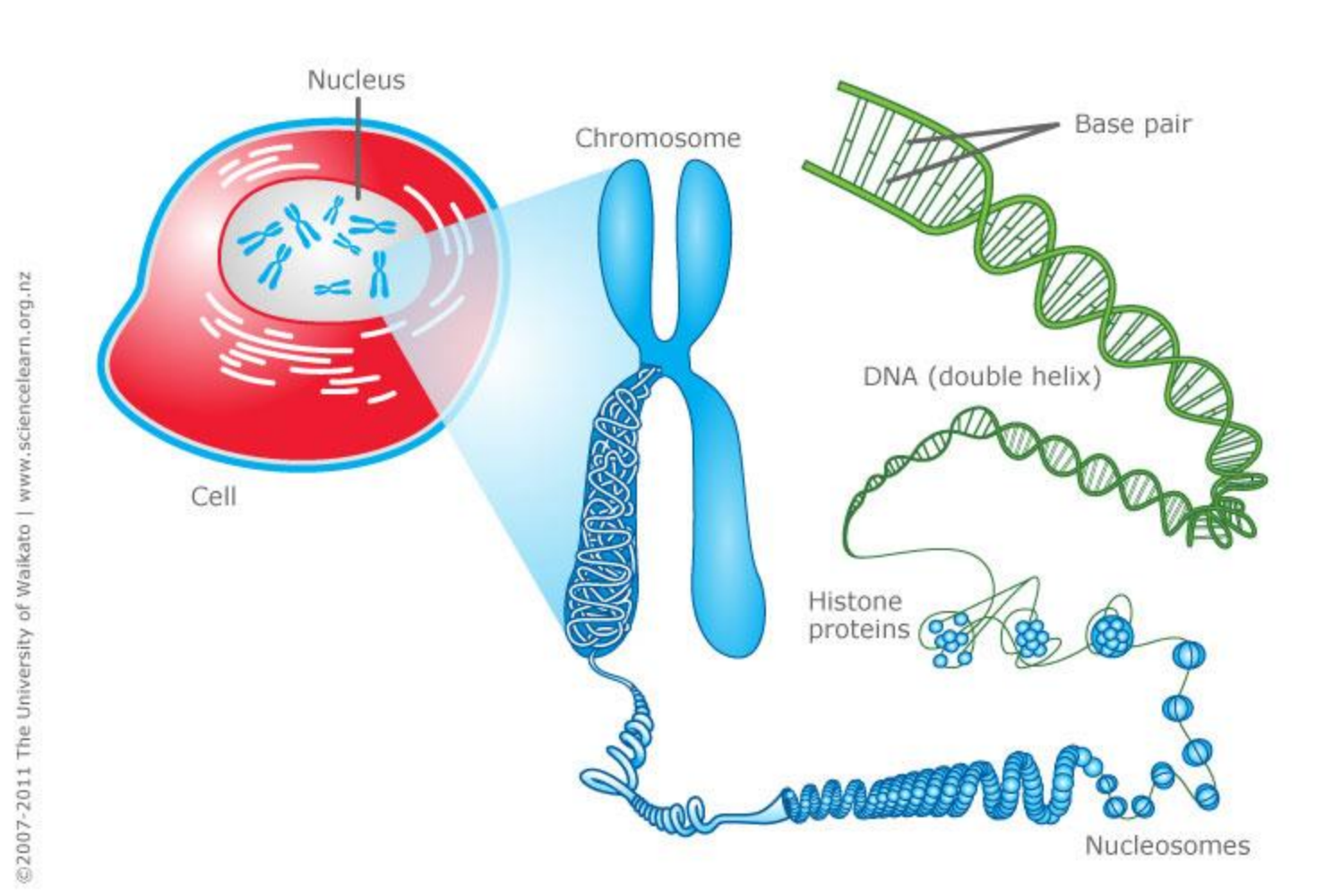
10-2 Cell Division

- What would happen if cells divided without any preparation?
- What needs to happen first? Why?

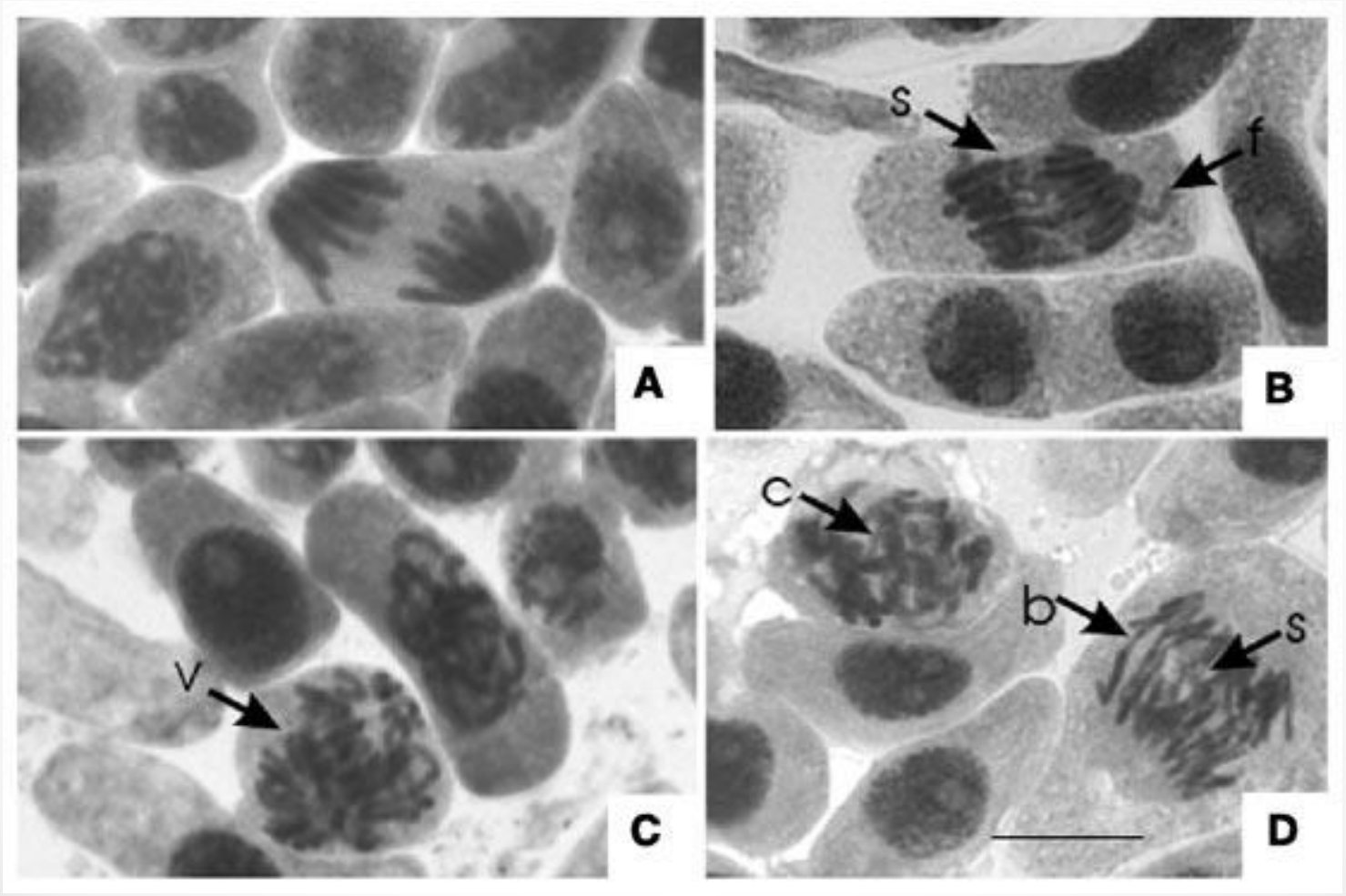
10-2 Cell Division

- Chromosomes-DNA and proteins
- Only visible during cell division because all other times the chromosomes are spread throughout the nucleus
- Chromosomes condense into compact structures than can be seen with a light microscope

10-2 Cell Division

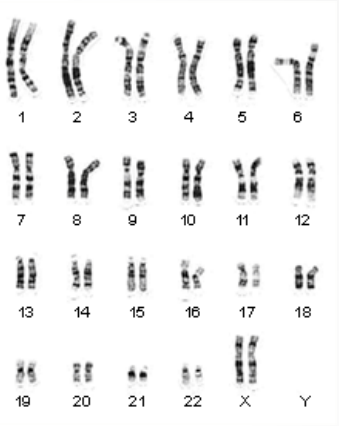


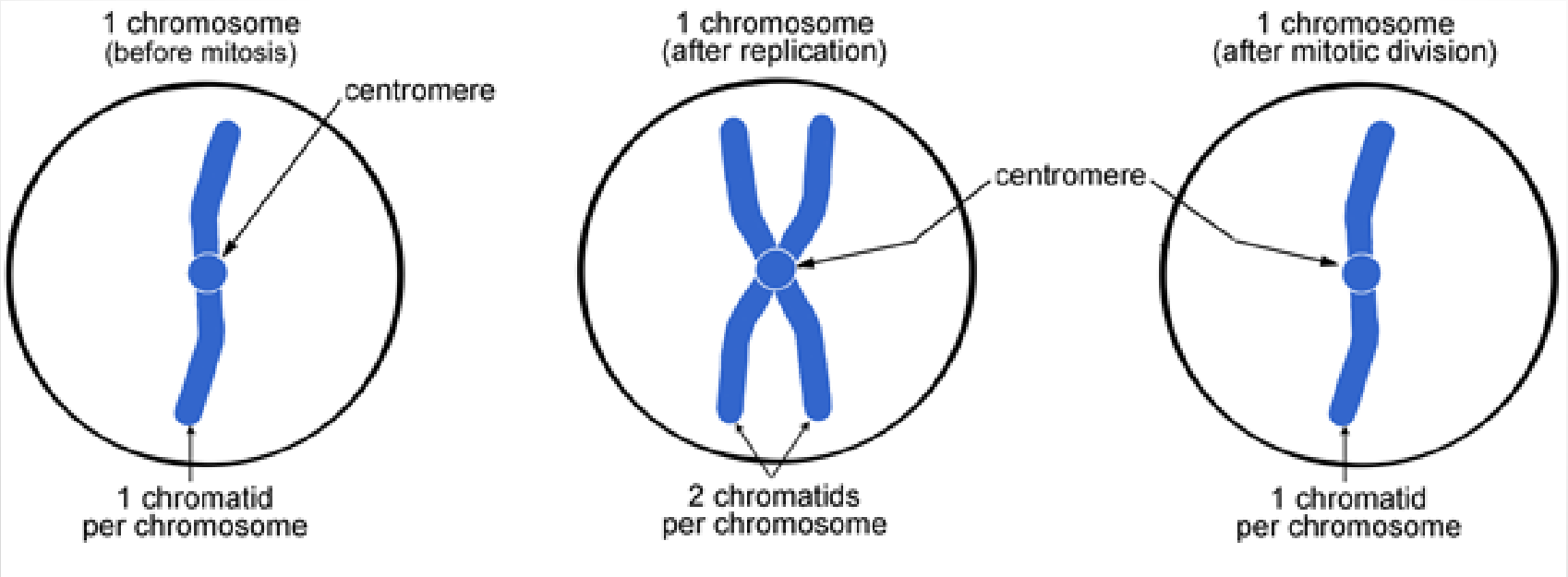
10-2 Cell Division



10-2 Cell Division

- Structure of chromosomes
- Human cells have 46



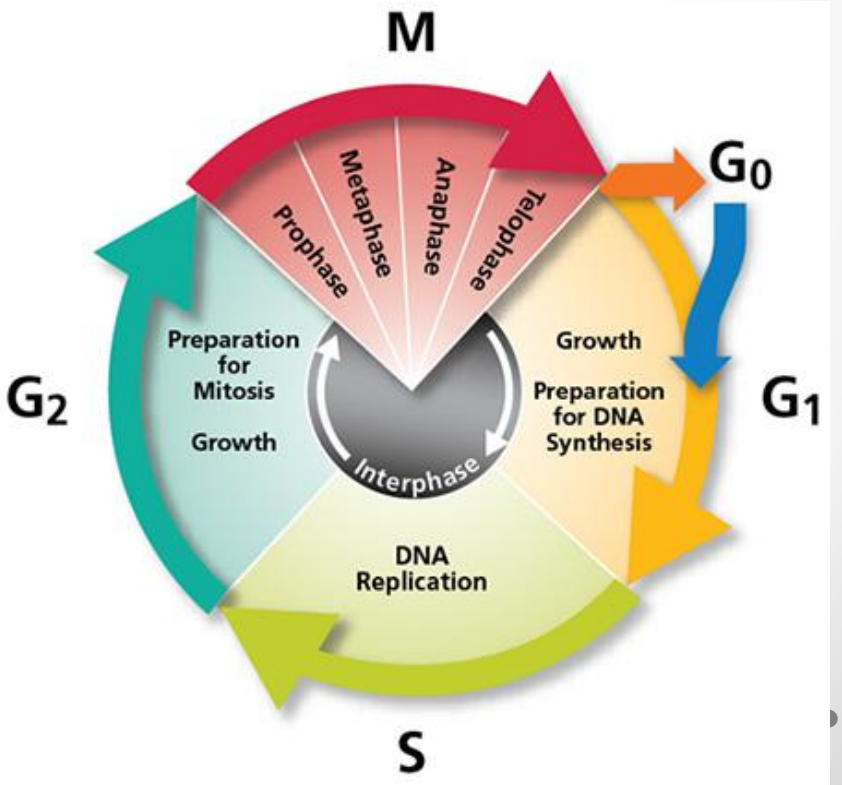


10-2 Cell Division

- Cell cycle-Cell grows, prepares for division, and divides to form 2 daughter cells
- 4 phases-M phase, S phase, G1 and G2 phases
- M=mitosis
- S=synthesis
- G1&G2=gap phases

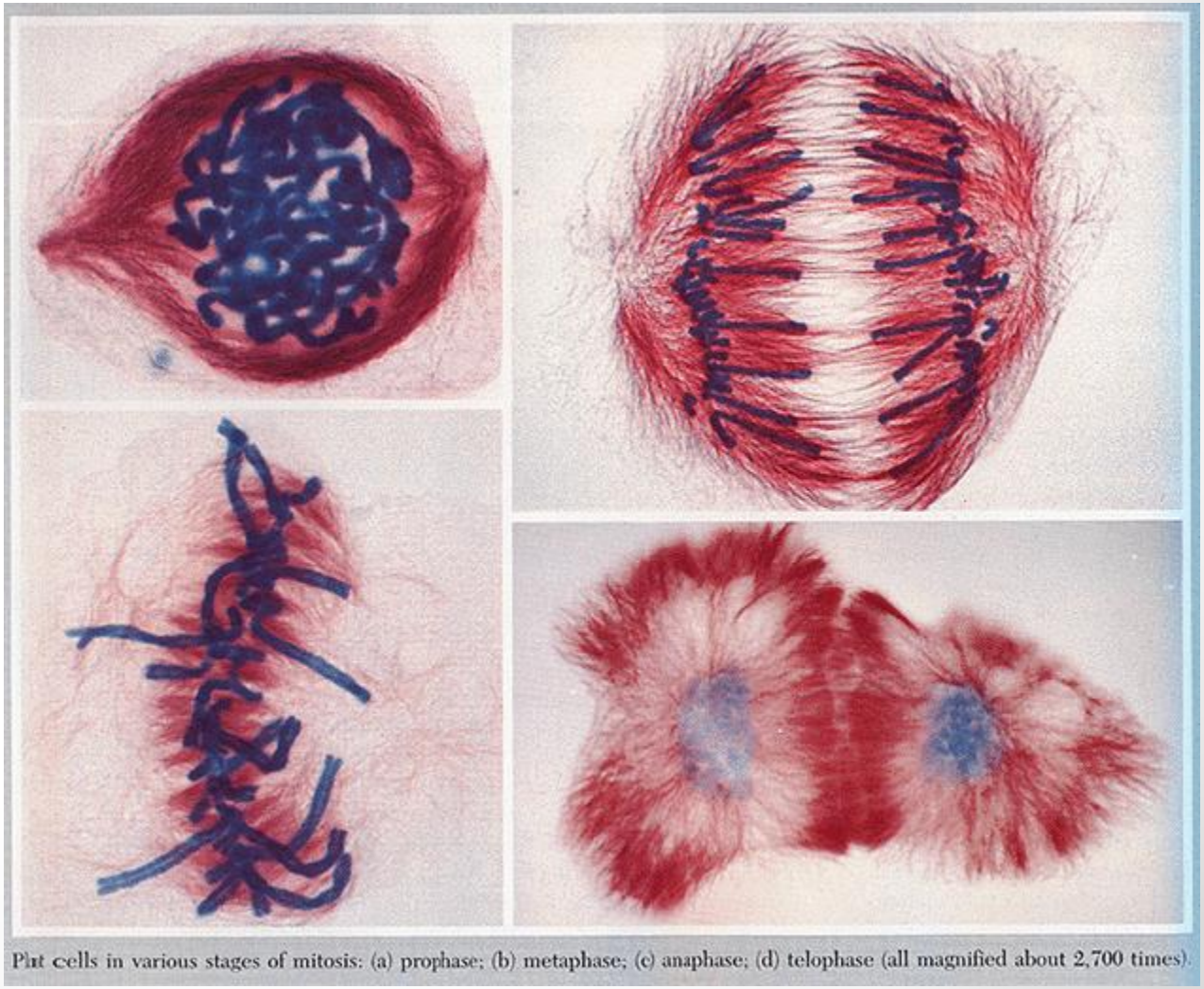
10-2 Cell Division-Cell cycle

- G1-most of the cell growing happens in this phase
- S-chromosomes are replicated, DNA is synthesized
- G2-shortest; organelles and molecules necessary for cell division are made
- M-Mitosis



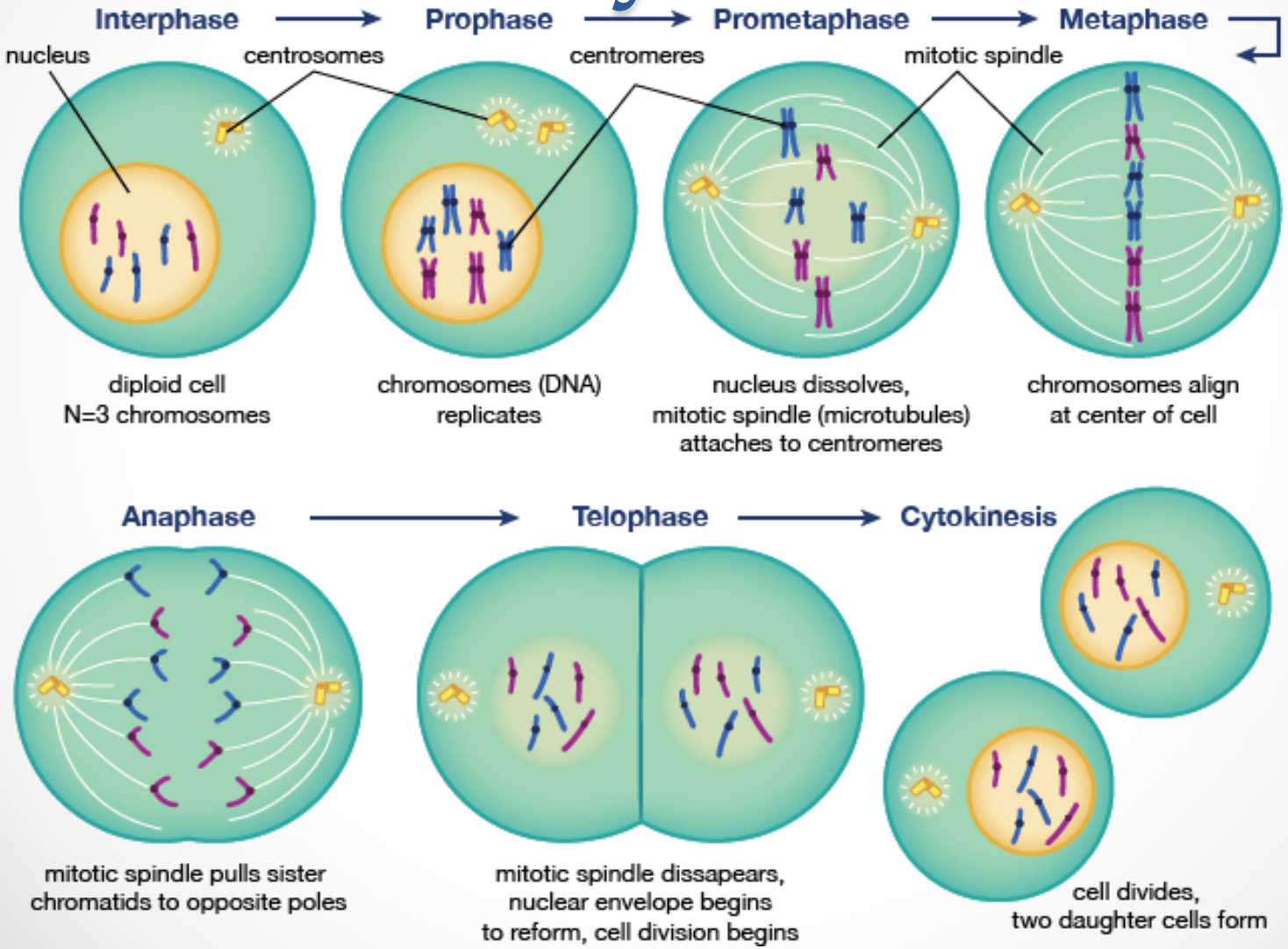
10-2 Cell Division-Cell cycle

- Mitosis



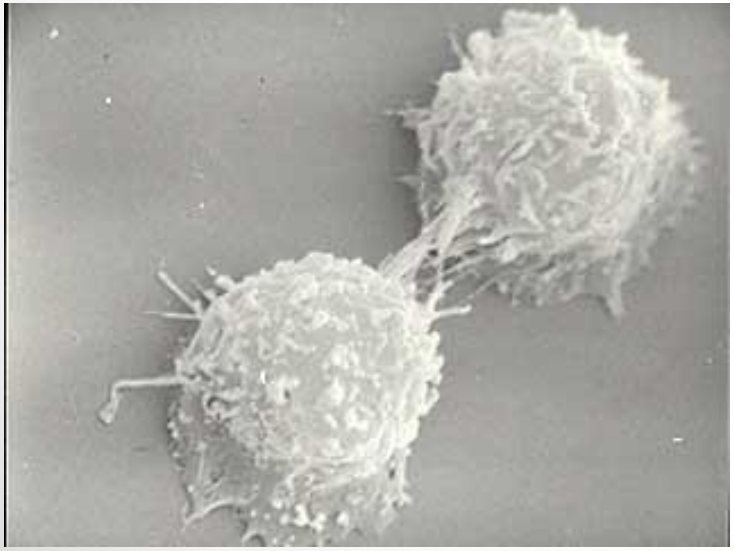
Plat cells in various stages of mitosis: (a) prophase; (b) metaphase; (c) anaphase; (d) telophase (all magnified about 2,700 times).

10-2 Cell Division-Cell cycle



10-2 Cell Division- Cytokinesis

- Division of cytoplasm
- Membrane pinches and divides cell in two equal part (animal cells)
- Cell plate forms midway between the 2 nuclei (plant cells)



10.2 Cell Cycle-Overview

- https://www.youtube.com/watch?v=JcZQkmooyPk

10-3 Regulating the cell cycle

- Proteins, Nutrients and space regulate cell division
- Contact inhibition-when cells stop dividing when they touch each other-Lost in caner/tumor cells
- Cyclins are proteins that regulate timing of the cell cycle in eukaryotes
- Other proteins (regulators)-Can respond to events inside cells(internal regulators) or outside cells (external regulators)

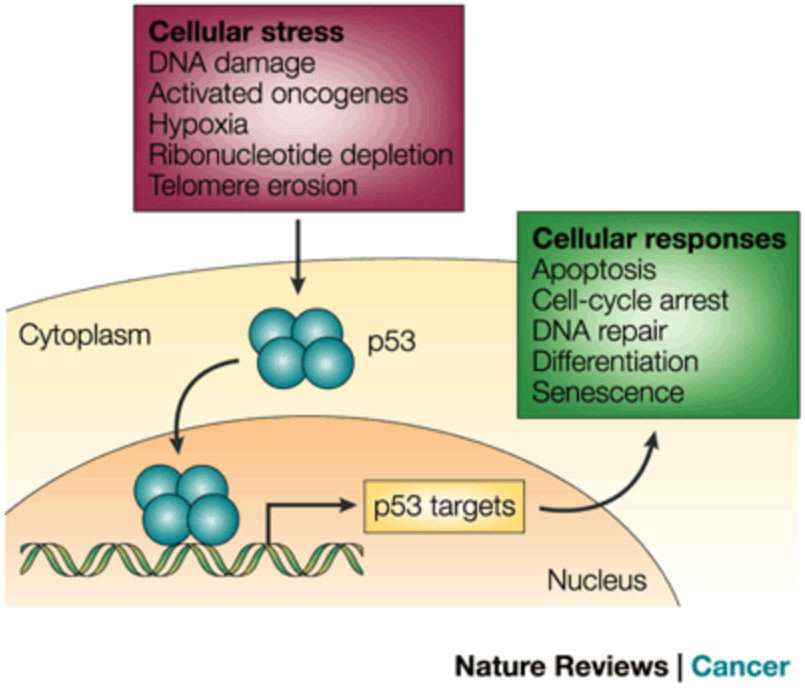
10-3 Regulating the cell cycle-Cancer

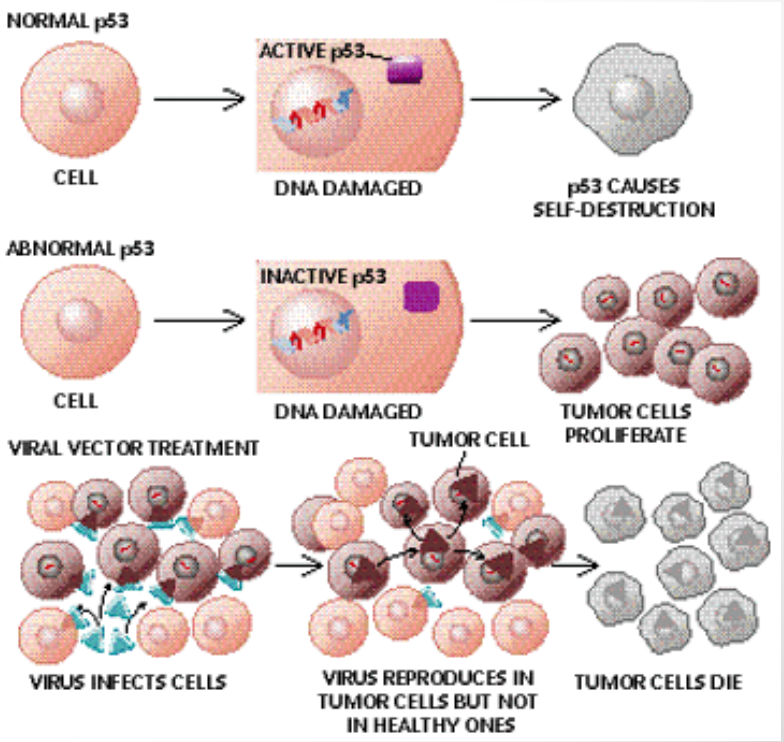
- Uncontrolled cell growth=cancer
- Cancer cells do not respond to signals that regulate cell growth of most cells
- Form cell masses (tumors) that can damage surrounding tissue
- Tobacco, radiation, viruses, mutations
- All cause control of cell cycle to break down

10-3 Regulating the cell cycle-Cancer and p53

- P53 is a tumor suppressor gene that regulated repair of DNA, keeps cells from regulating until DNA damage is repaired
- More than 50% of all cancers have a mutation in the p53 gene, and therefore an incorrect amino acid(s) in the p53 protein

10-3 Regulating the cell cycle





10-3 Regulating the cell cycle-Cancer

- https://www.youtube.com/watch?v=LEpTTolebqo