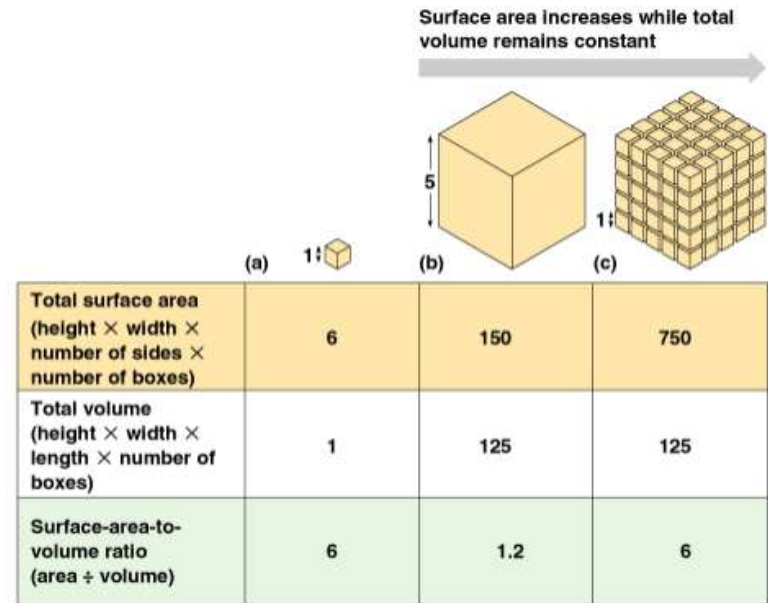


- Chapter 10  
*The Cell Cycle*

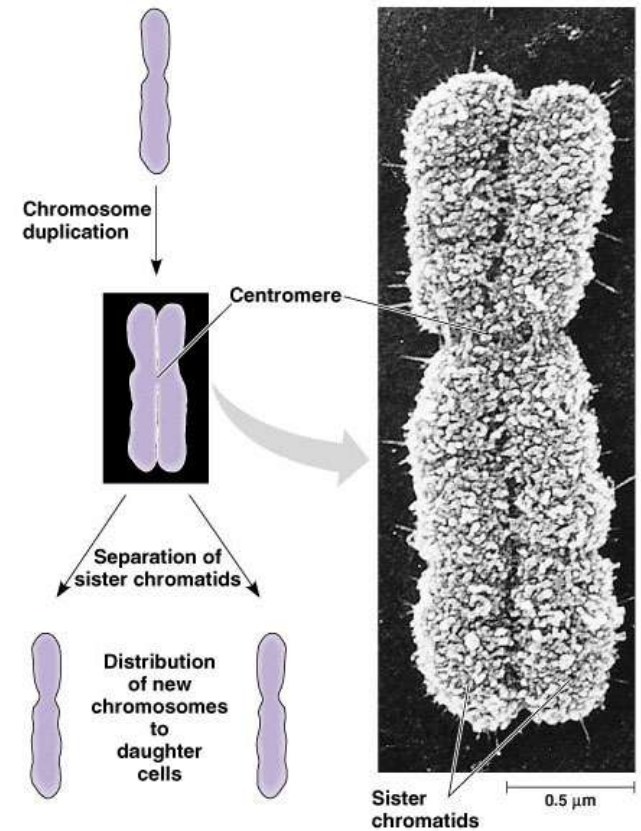
# Cell size

- As cell size increases, the surface area to volume ratio decreases
- Rates of chemical exchange may then be inadequate for cell size
- Cell size, therefore, remains small



# Cell Division: Key Vocabulary

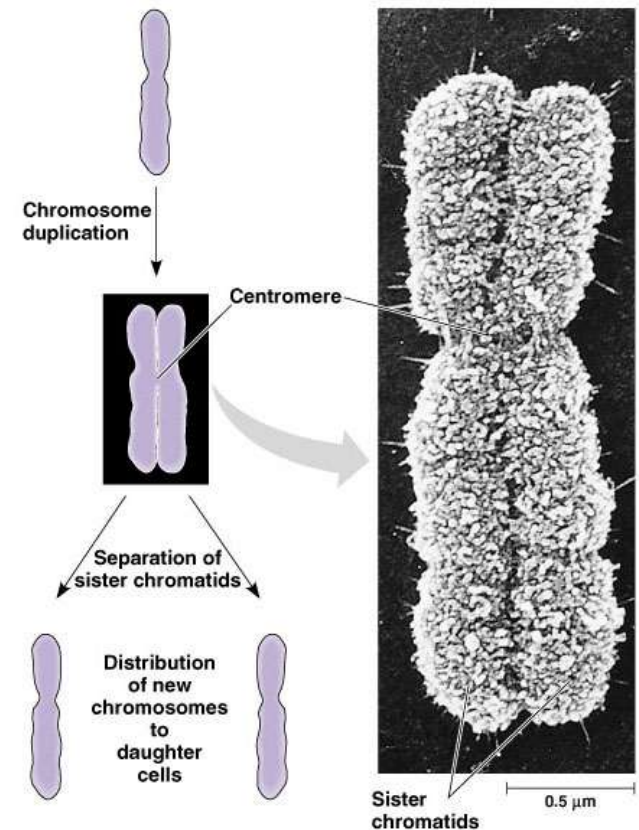
- 1.Genome
- 2.Somatic cells
- 3.Gametes
- 4.Chromosomes:
- 5.Diploid ( $2n$ ):
- 6.Haploid ( $1n$ ):
- 7.Chromatin:
- 8.Chromatids
- 9.Centromere:
- 10.Mitosis
- 11.Cytokinesis
- 12.Meiosis



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# Cell Division: Key Roles

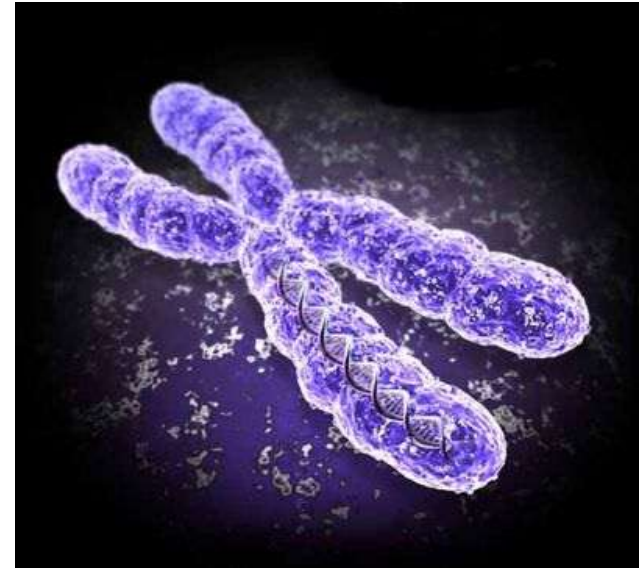
- Genome: cell's genetic information
- Somatic (body cells) cells
- Gametes (reproductive cells): sperm and egg cells
- Chromosomes: DNA molecules
- Diploid ( $2n$ ): 2 sets of chromosomes
- Haploid ( $1n$ ): 1 set of chromosomes
- Chromatin: DNA-protein complex
- Chromatids: replicated strands of a chromosome
- Centromere: narrowing "waist" of sister chromatids
- Mitosis: nuclear division
- Cytokinesis: cytoplasm division
- Meiosis: gamete cell division



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# Chromosome anatomy

- Draw a chromosome and label the following parts:
  - Telomere
  - Centromere
  - Gene
  - Chromatid
  - Chromatin
  - Chromosome
  - (kinetochore)
- Next to each label, write a brief description of each part

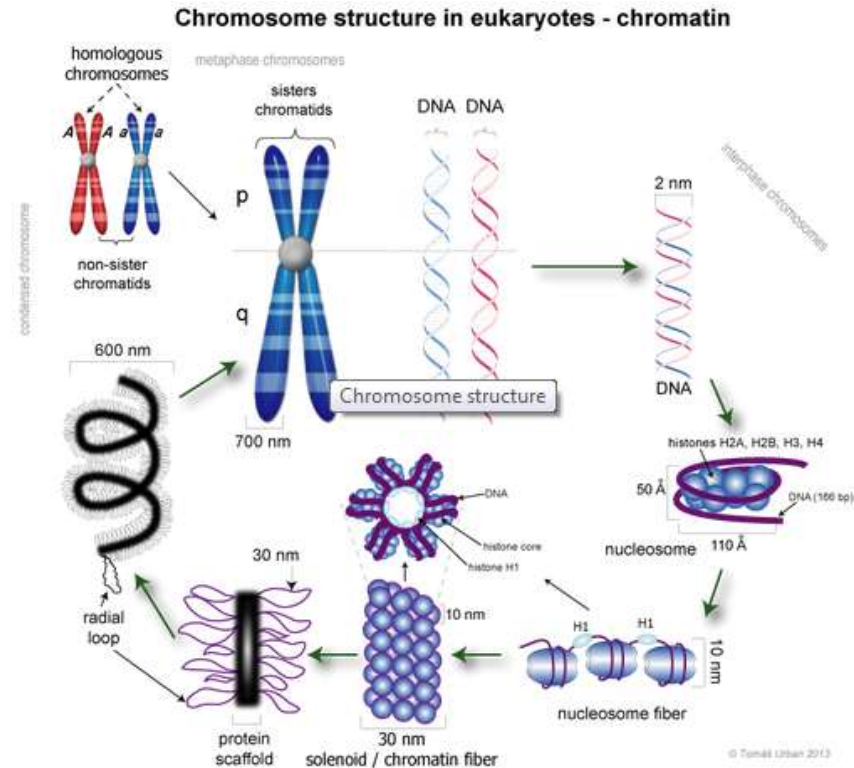


# Chromosome Coiling

- In order to align and separate, chromatin must coil and condense. Draw or make a partially coiled chromosome and label each of the following parts:

- Histone
- Nucleosome
- Scaffold
- Supercoil

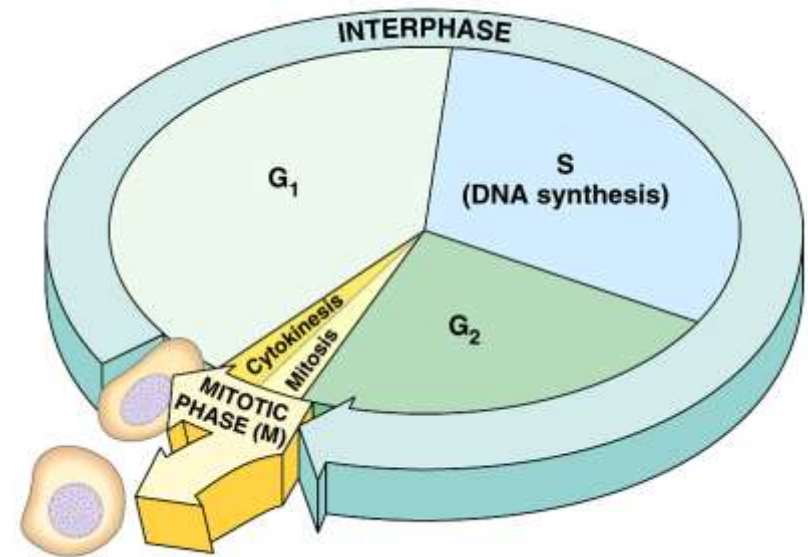
- Next to each part, include a brief description



DNA in the eukaryotic chromatin is compacted by its association with histones in nucleosomes and by higher levels of folding of the nucleosomes into chromatin fibers. Each chromosome contains a large number of looped domains of 30-nm chromatin fibers attached to a protein scaffold. The functional state of the chromosome is related to the extent of coiling: The more condensed a part of a chromosome is, the less likely it is that the genes in that region will be active.

# The Cell Cycle

- Interphase (90% of cycle)
  - G<sub>1</sub> phase-growth
  - S phase-synthesis of DNA
  - G<sub>2</sub> phase- preparation for cell division
- Mitotic phase
  - Mitosis-nuclear division
  - Cytokinesis- cytoplasm division

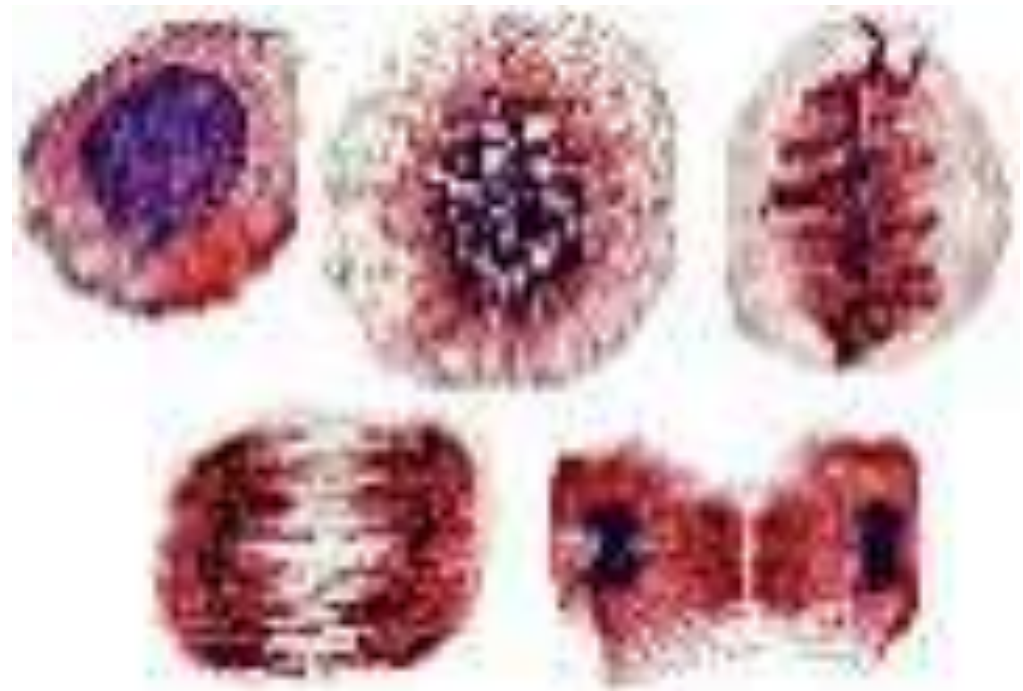


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# Mitosis

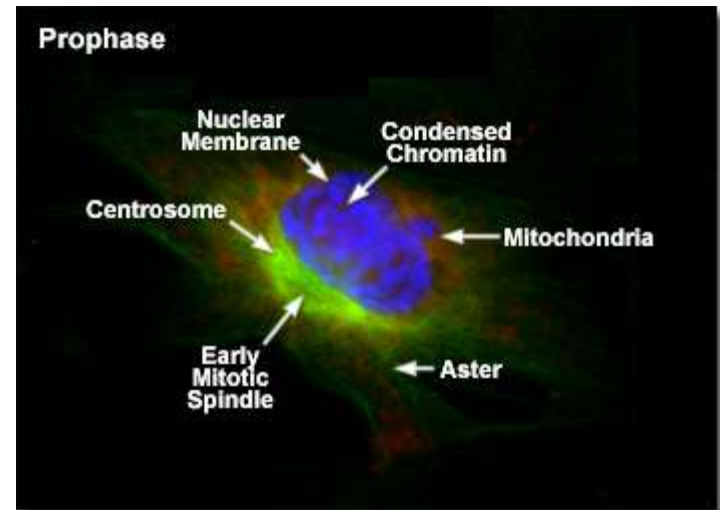
- Prophase
- Prometaphase
- Metaphase
- Anaphase
- Telophase





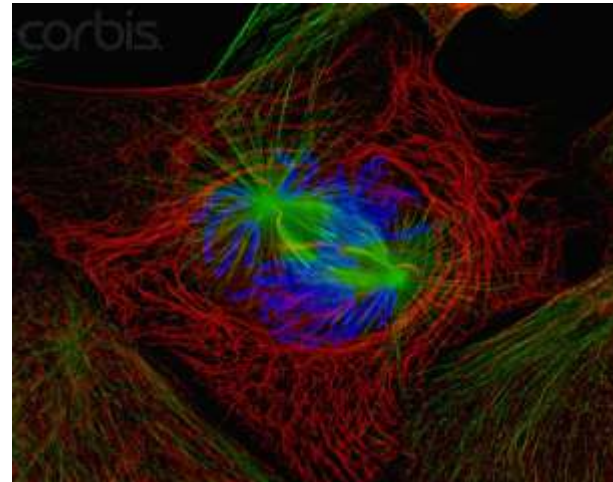
# Prophase

- Chromosomes visible
- Nucleoli disappear
- Sister chromatids
- Mitotic spindle forms
- Centrosomes move



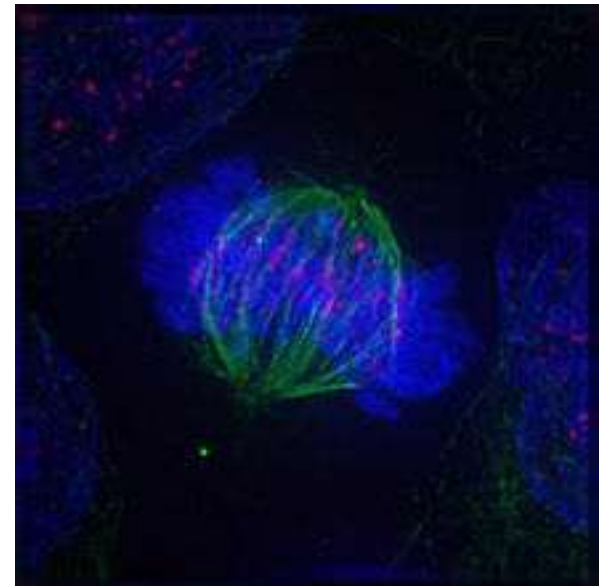
# Prometaphase

- Nuclear membrane fragments
- Spindle interaction with chromosomes
- Kinetochore develops



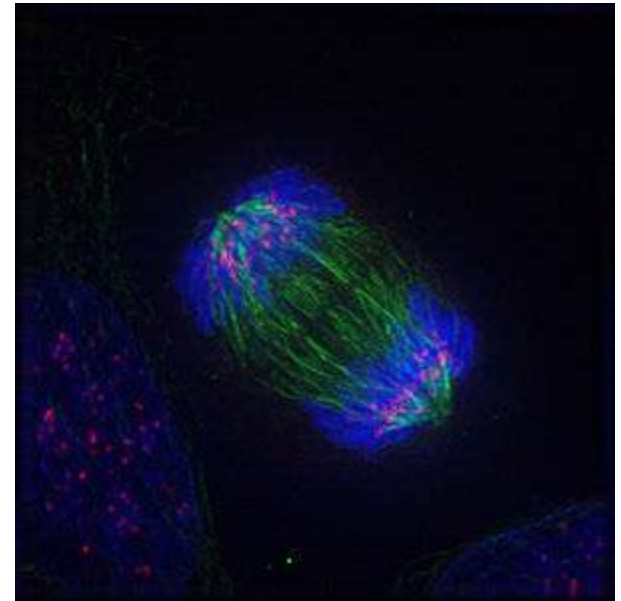
# Metaphase

- Centrosomes at opposite poles
- Centromeres are aligned
- Kinetochores of sister chromatids attached to microtubules (spindle)



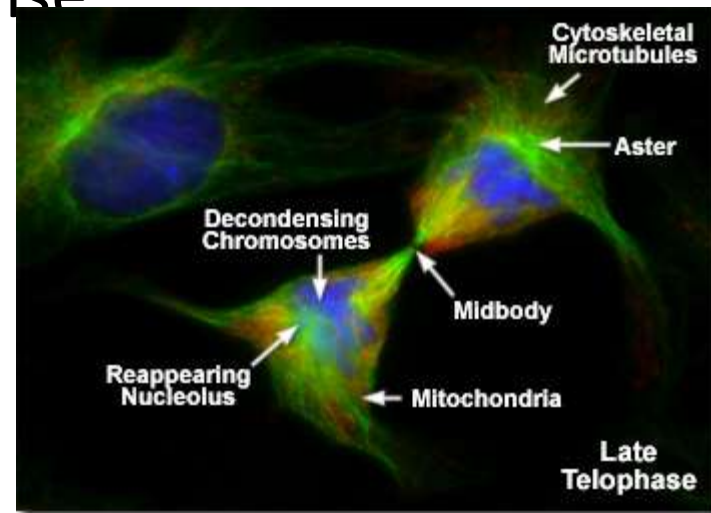
# Anaphase

- Paired centromeres separate; sister chromatids liberated
- Chromosomes move to opposite poles
- Each pole now has a complete set of chromosomes



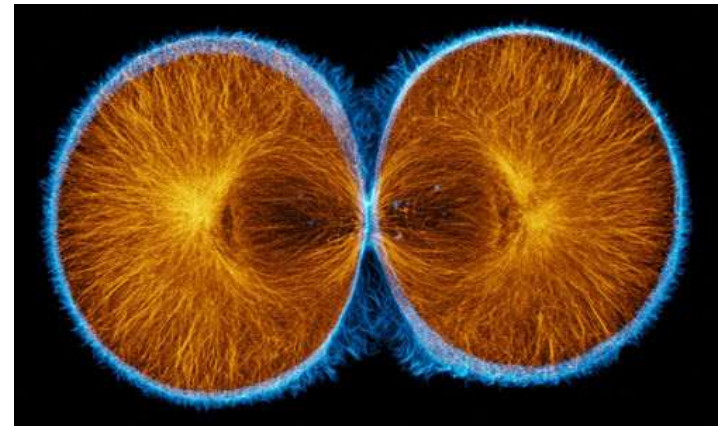
# Telophase

- Daughter nuclei form
- Nuclear envelopes arise
- Chromatin becomes less coiled
- Two new nuclei complete mitosis



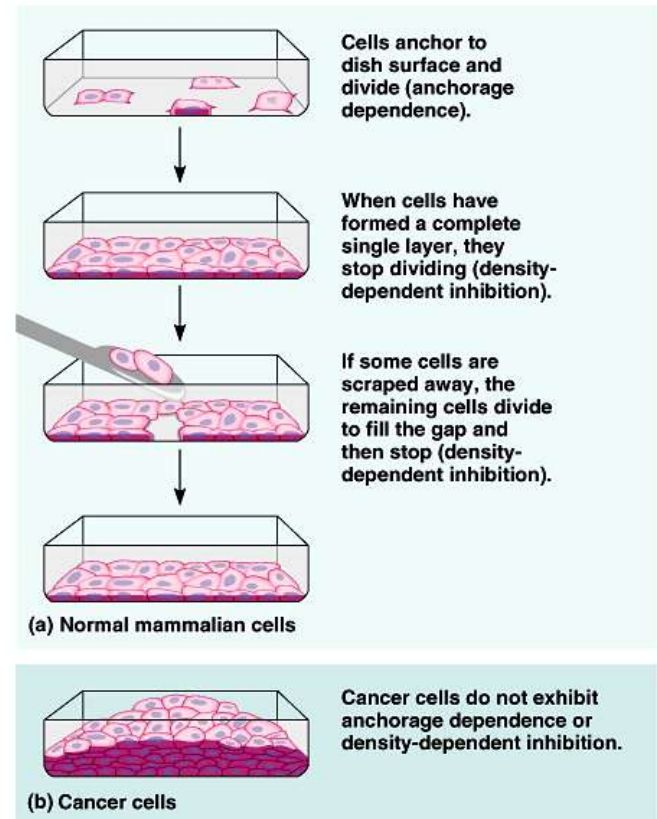
# Cytokinesis

- Cytoplasmic division
- Animals:  
    cleavage furrow
- Plants:  
    cell  
    plate



# Cell Cycle regulation

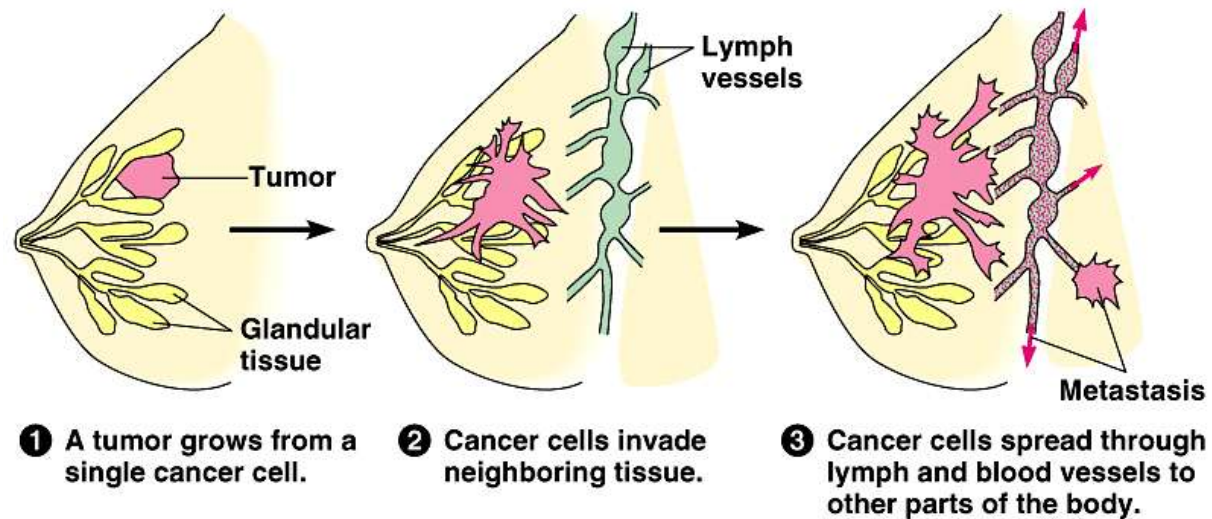
- Growth factors
- Density-dependent inhibition
- Anchorage dependence



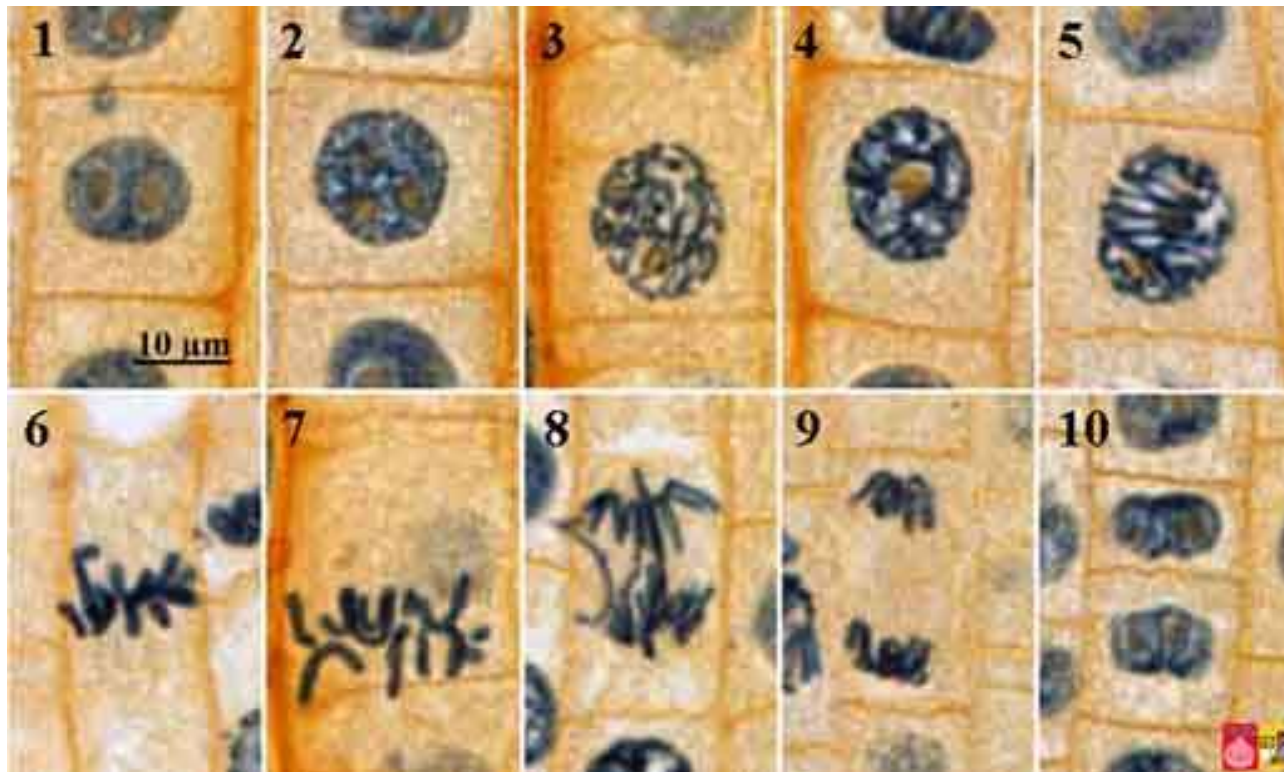


# Cancer

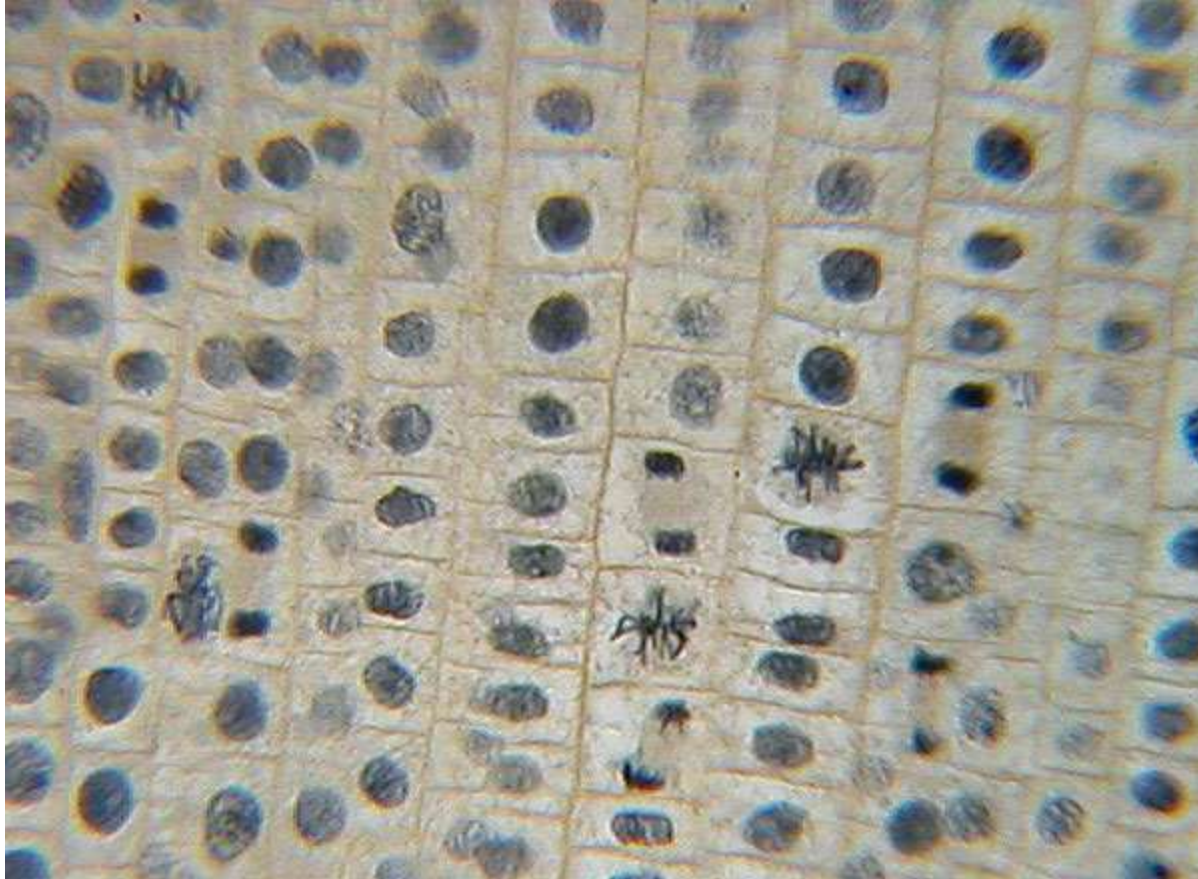
- Transformation
- Tumor: benign or malignant
- Metastasis



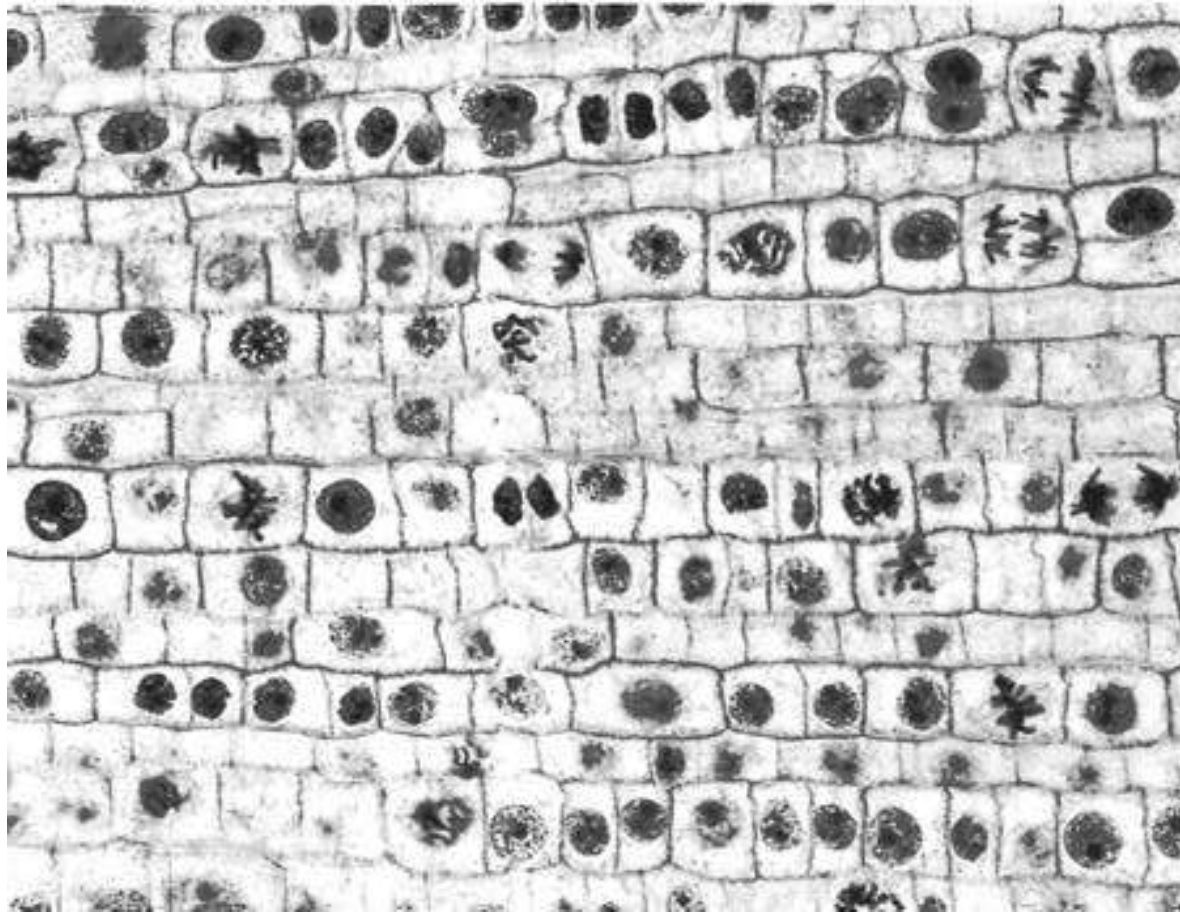
# Onion Root Tip Mitosis



# Field 1



## Field 2





# Field 3

