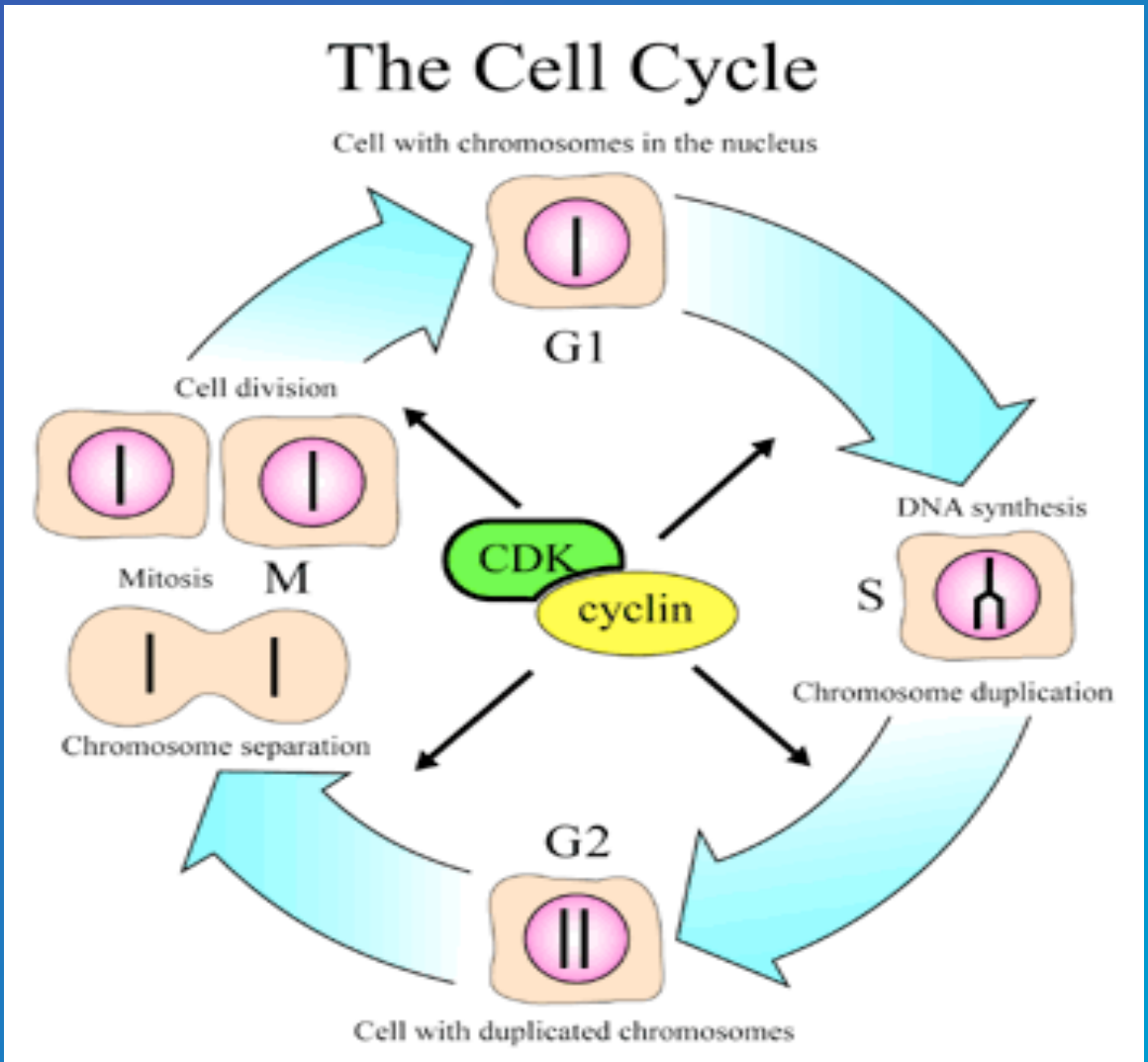
The Cell Cycle

Presenter:

- Hello, my name is insert name here.
- I am in insert grade here.
- Today, we are going to discuss mitosis and meiosis. Most of this should be a review, so you do not need to write down all the notes, just information that you are not familiar with. These notes will be online if you would like to review them further.

The Cell Cycle



http://www.nobel.se/medicine/laureates/2001/press.html

Animated Cycle

http://www.cellsalive.com/cell_cycle.htm

MITOSIS

Mitosis

The process of somatic (body) cell division which results in the production of two daughter cells from a single parent cell.

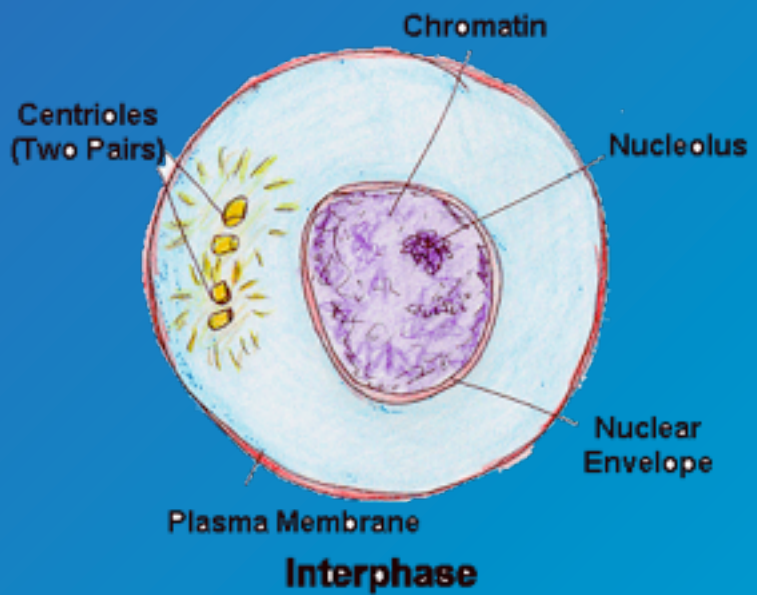
The daughter cells are identical to one another and to the original parent cell.

Mitosis can be divided into stages

- Interphase
- Prophase
- Metaphase
- Anaphase
- Telophase & Cytokinesis

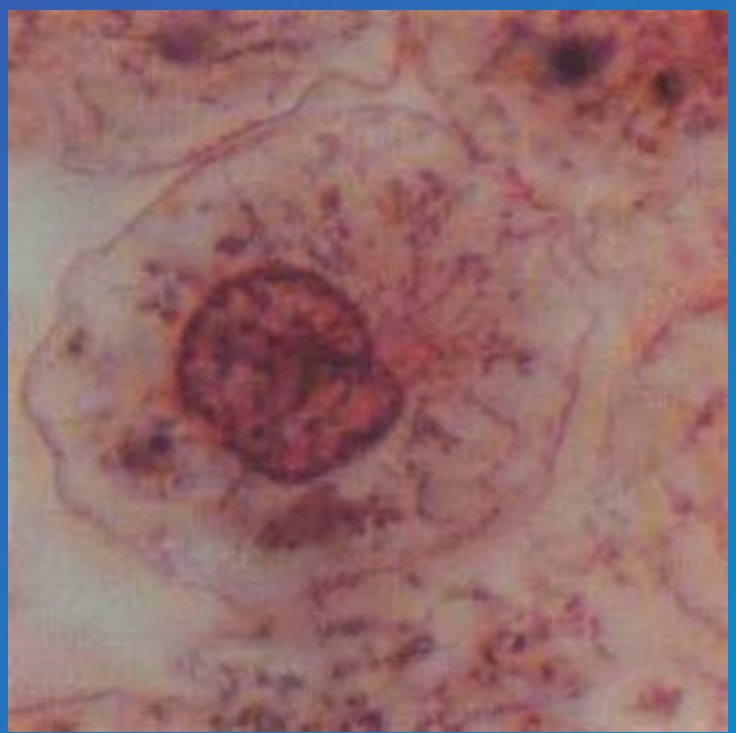
Interphase
The cell prepares for division

- Animal Cell
  - DNA replicated
  - Organelles replicated
  - Cell increases in size
- Plant Cell
  - DNA replicated
  - Organelles replicated
  - Cell increases in size



Interphase

Animal Cell

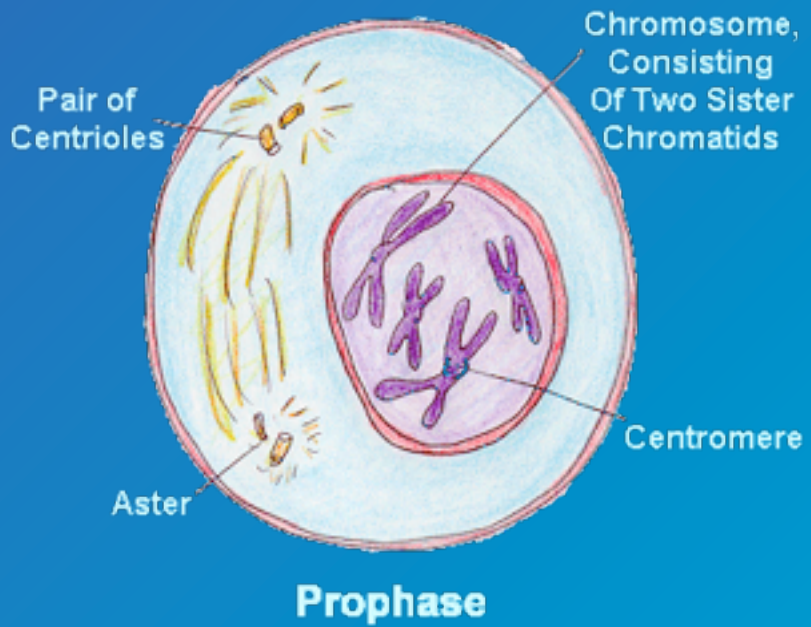


Plant Cell

Photographs from: http://www.bioweb.uncc.edu/biol1110/Stages.htm

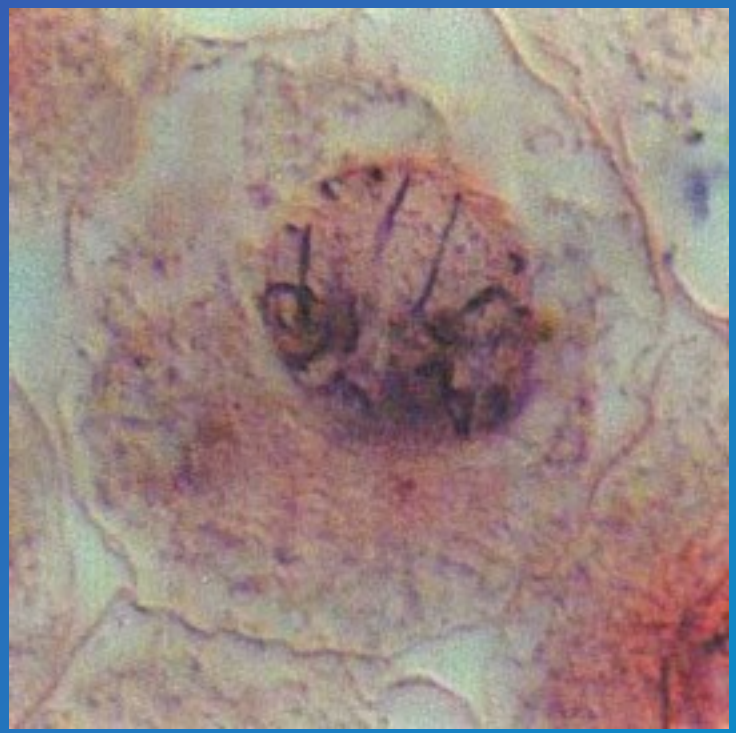
Prophase
The cell prepares for nuclear division

- Animal Cell
  - Packages DNA into chromosomes
- Plant cell
  - Packages DNA into chromosomes

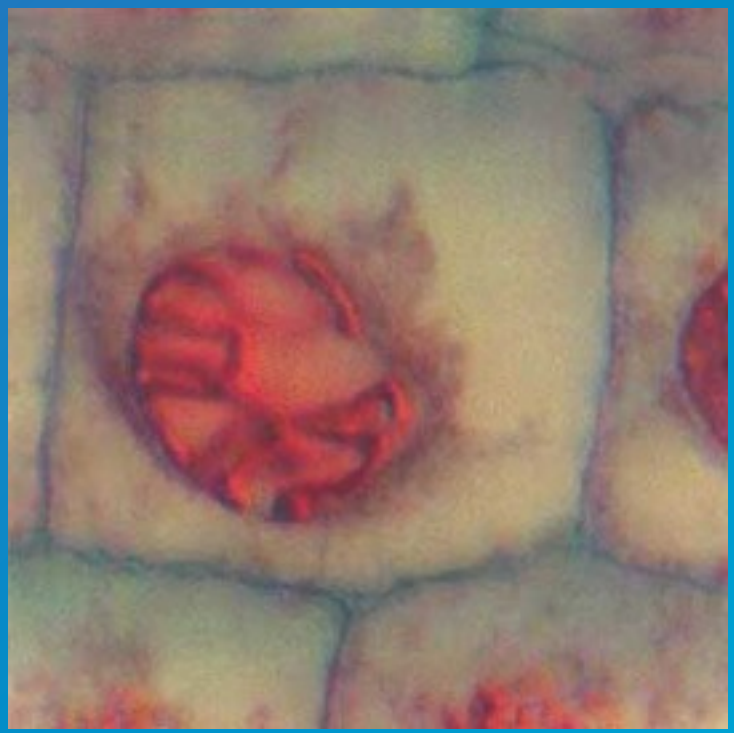


Prophase

Animal Cell



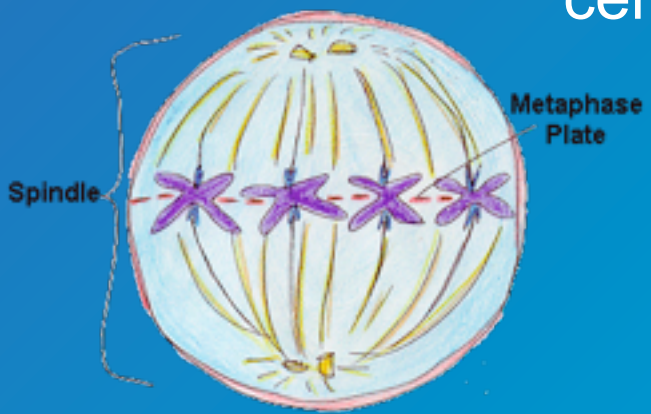
Plant Cell



Photographs from: http://www.bioweb.uncc.edu/biol1110/Stages.htm

Metaphase
The cell prepares chromosomes for division

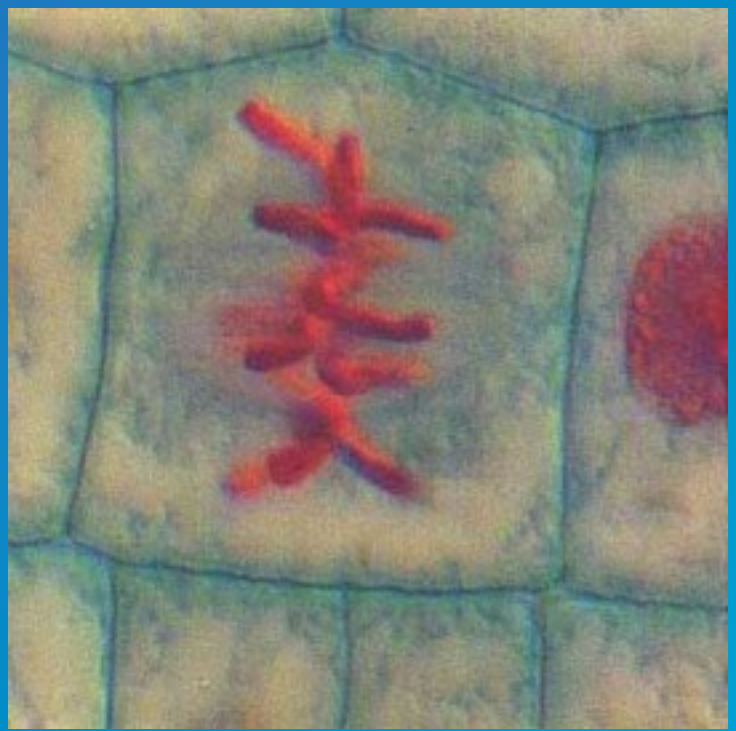
- Animal Cell
  - Chromosomes line up at the center of the cell
  - Spindle fibers attach from daughter cells to chromosomes at the centromere
- Plant Cell
  - Chromosomes line up at the center of the cell
  - Spindle fibers attach from daughter cells to chromosomes at the centromere



Metaphase

Animal Cell

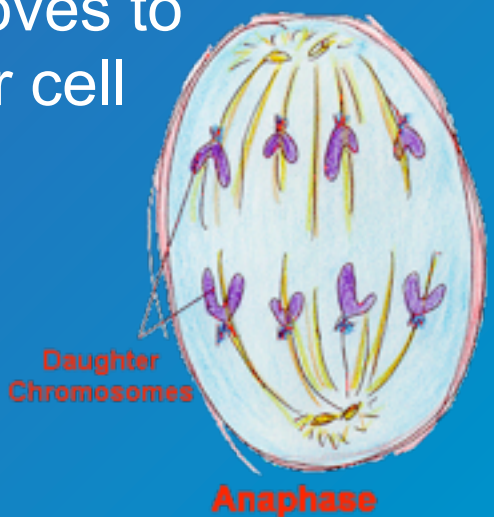
Plant Cell



Photographs from: http://www.bioweb.uncc.edu/biol1110/Stages.htm

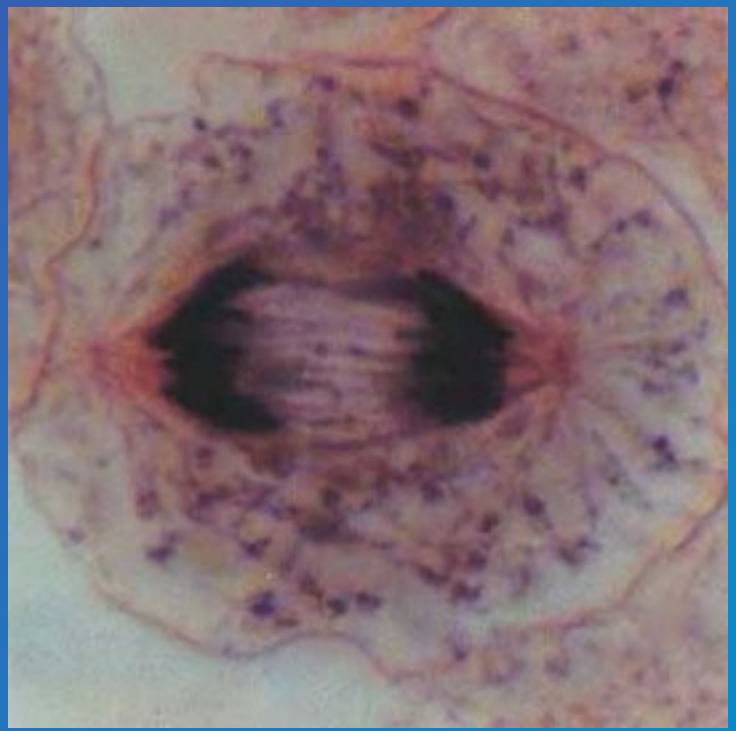
Anaphase
The chromosomes divide

- Animal Cell
  - Spindle fibers pull chromosomes apart
  - ½ of each chromosome (called chromotid) moves to each daughter cell
- Plant Cell
  - Spindle fibers pull chromosomes apart
  - ½ of each chromosome (called chromotid) moves to each daughter cell

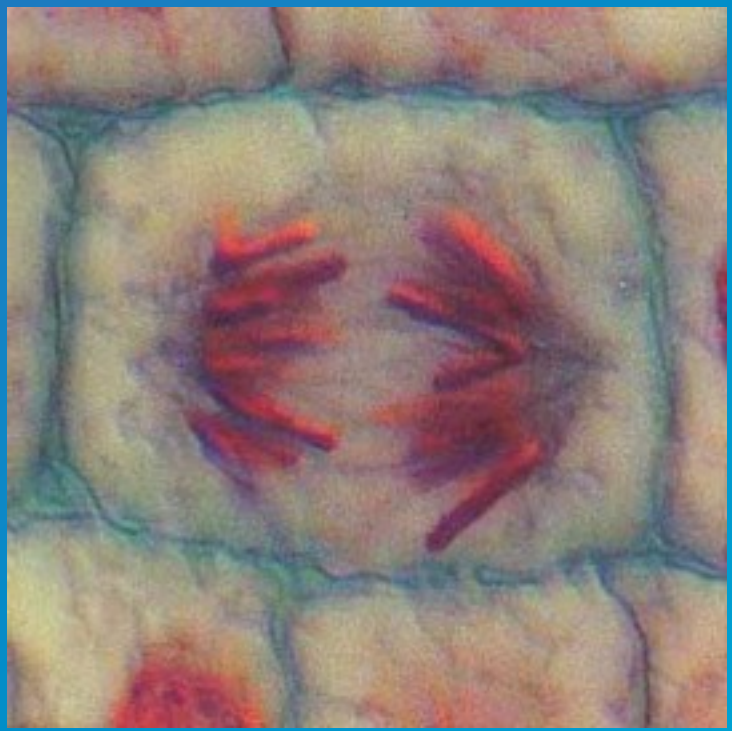


Anaphase

Animal Cell



Plant Cell



Photographs from: http://www.bioweb.uncc.edu/biol1110/Stages.htm

Telophase
The cytoplasm divides

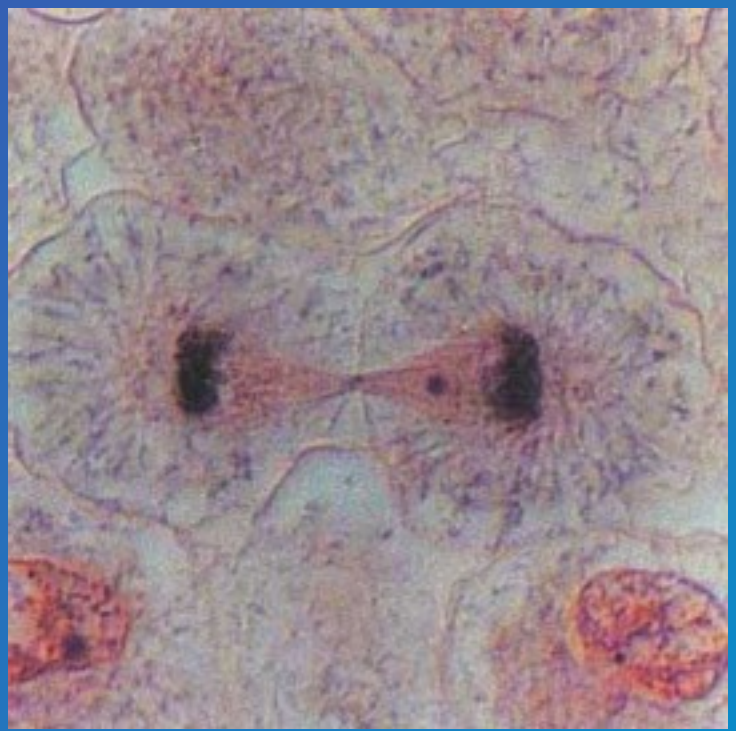
- Animal Cell
  - DNA spreads out
  - 2 nuclei form
  - Cell membrane pinches in to form the 2 new daughter cells

- Plant Cell
  - DNA spreads out
  - 2 nuclei form
  - New cell wall forms between to nuclei to form the 2 new daughter cells

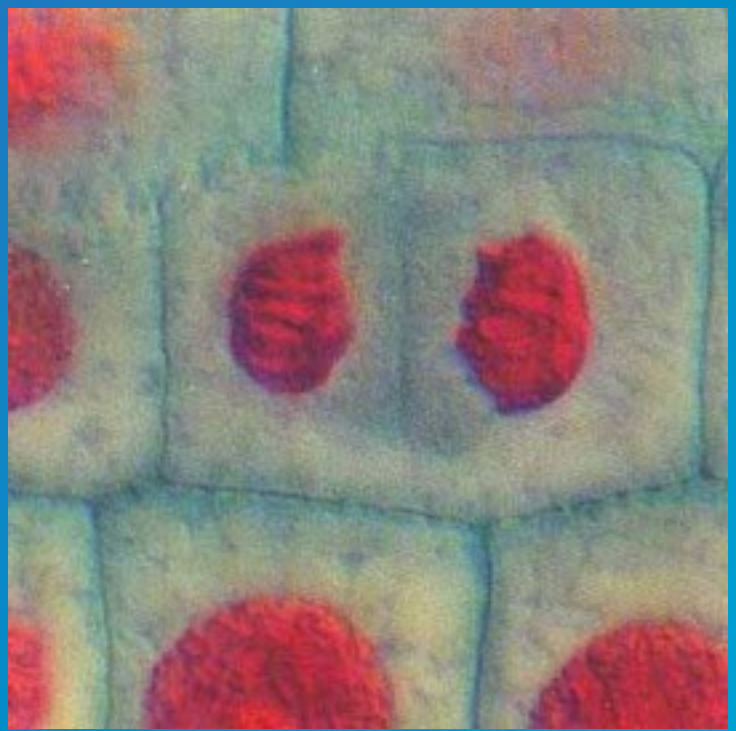
Telophase and Cytokinesis

Telophase

Animal Cell



Plant Cell

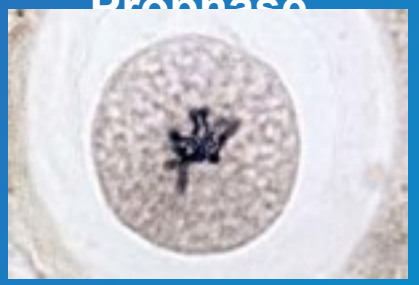


Photographs from: http://www.bioweb.uncc.edu/biol1110/Stages.htm

Mitosis Animation

http://www.cellsalive.com/mitosis.htm

Animal Mitosis -- Review

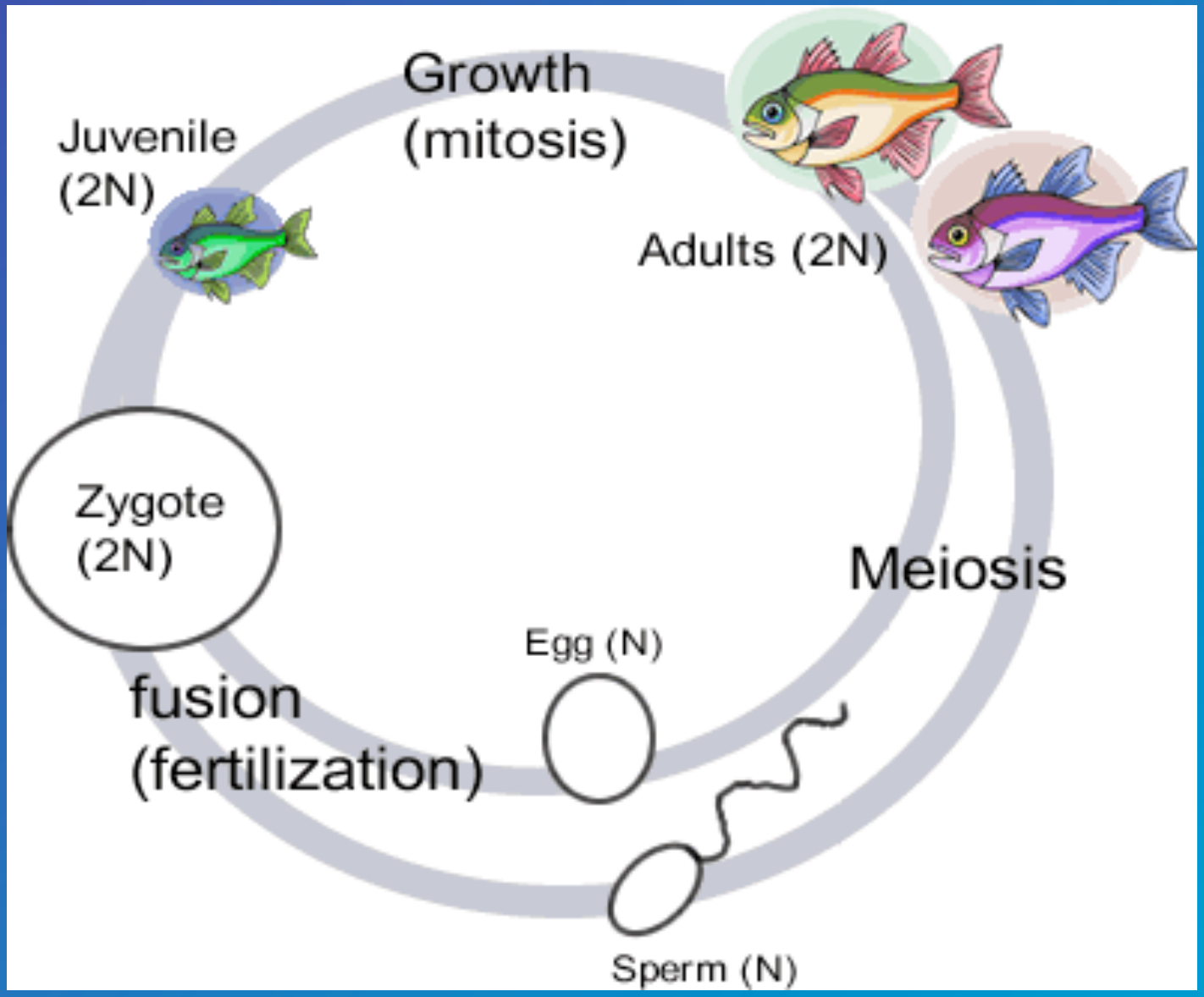
Interphase 	Prophase 
Metaphase 	Anaphase 
Telophase 	Interphase 

Plant Mitosis -- Review

Interphase 	Prophase 
Metaphase 	Anaphase 
Telophase 	Interphase 

Diploid vs. Haploid

Ploidy- Number of ***sets*** of chromosomes in a biological cell.


Growth
(mitosis)
Juvenile
(2N)
Adults (2N)
Zygote
(2N)
Meiosis
Egg (N)
fusion
(fertilization)
Sperm (N)

Diploid vs Haploid

- **Diploid** (2n)
  - Means 2
  - two complete sets of chromosomes
  - In humans: 23 pairs= 46
  - mitosis
- **Haploid** (n)
  - Means half
  - Half the number of diploid
  - In humans: Only 23 in Egg Only 23 in Sperm
  - Meiosis

Diploid vs Haploid

- A frog has 26 total chromosomes (2n). What is the haploid number?
- Carp fish eggs have 52 chromosomes. What is the total number of chromosomes in the fish (diploid)?
- Broad beans have 12 chromosomes. How many chromosomes does the bean pollen have (haploid)?

MEIOSIS

Meiosis

Meiosis is the type of cell division by which **germ** cells (will become eggs and sperm- called **gametes** if they will undergo meiosis) are produced.

The joining of these cells will produce **zygotes**.

Meiosis

One parent cell produces four daughter cells.

Daughter cells have half the number of chromosomes found in the original parent cell.

Meiosis

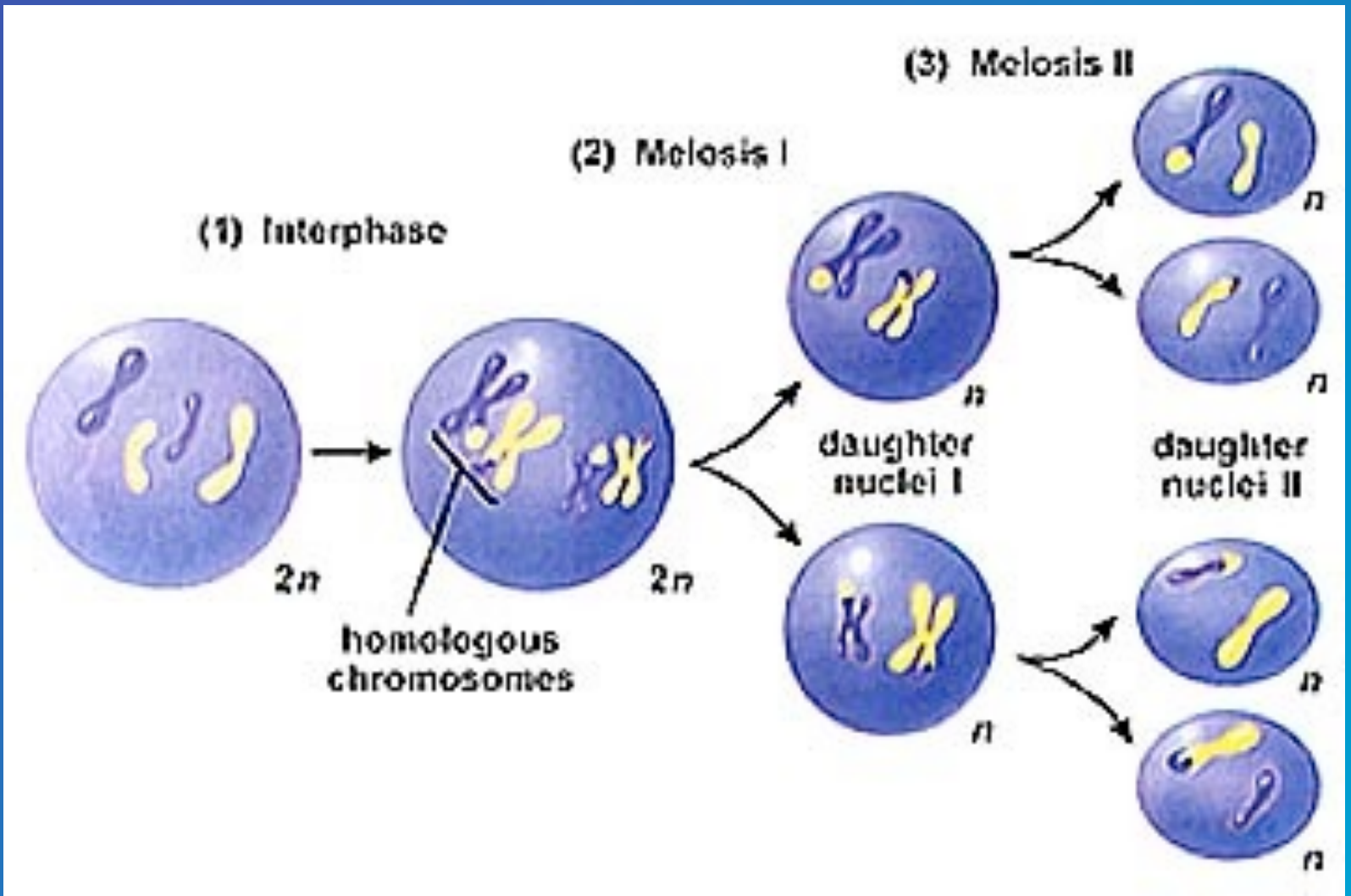
During meiosis, DNA replicates ***once***, but the nucleus divides *twice*.

Four stages can be described for each division of the nucleus.

Meiosis I

First division of meiosis

Meiosis

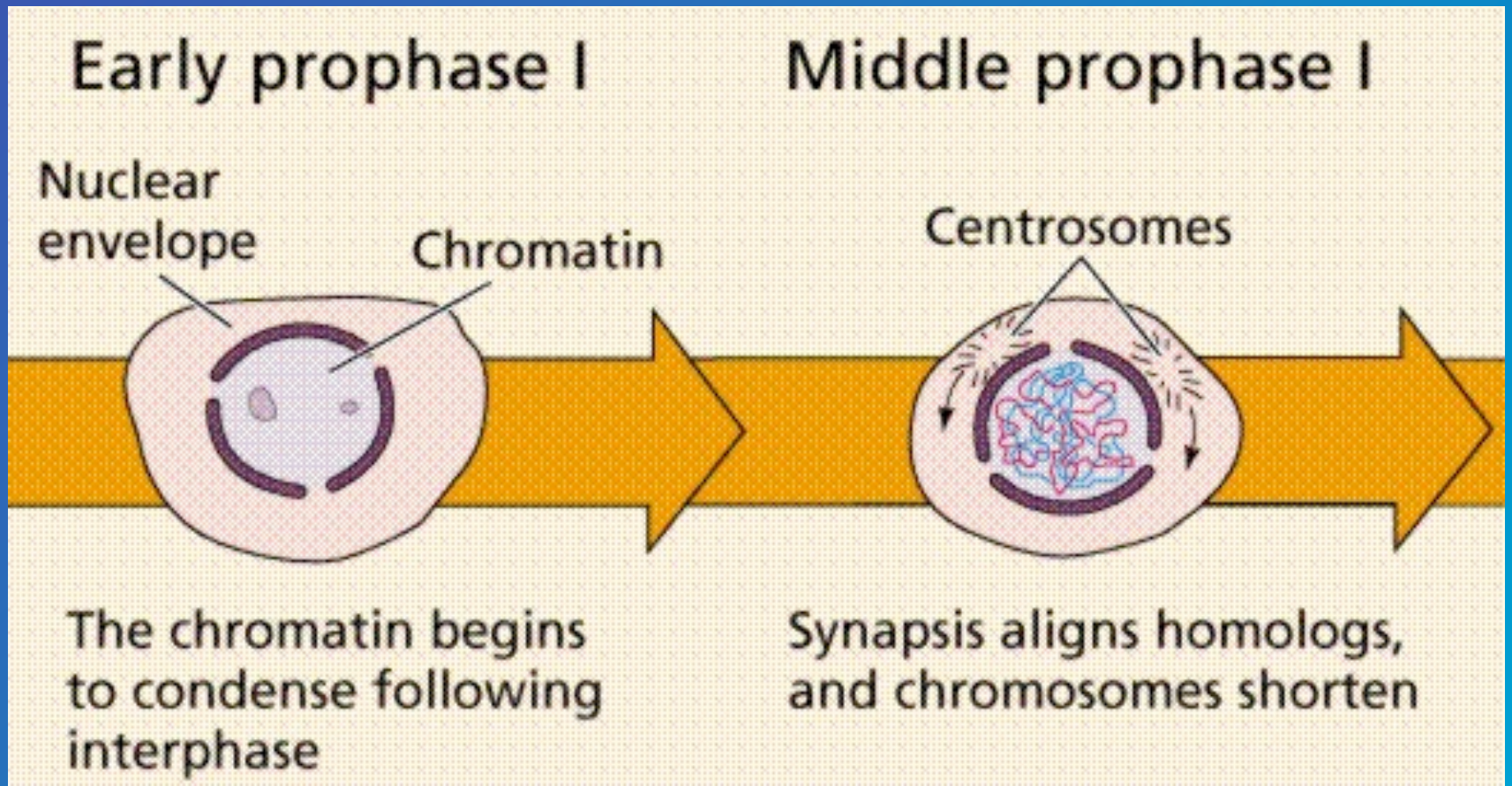


http://www.biosci.uga.edu/almanac/bio_103/notes/apr_3.html.

First Division of Meiosis

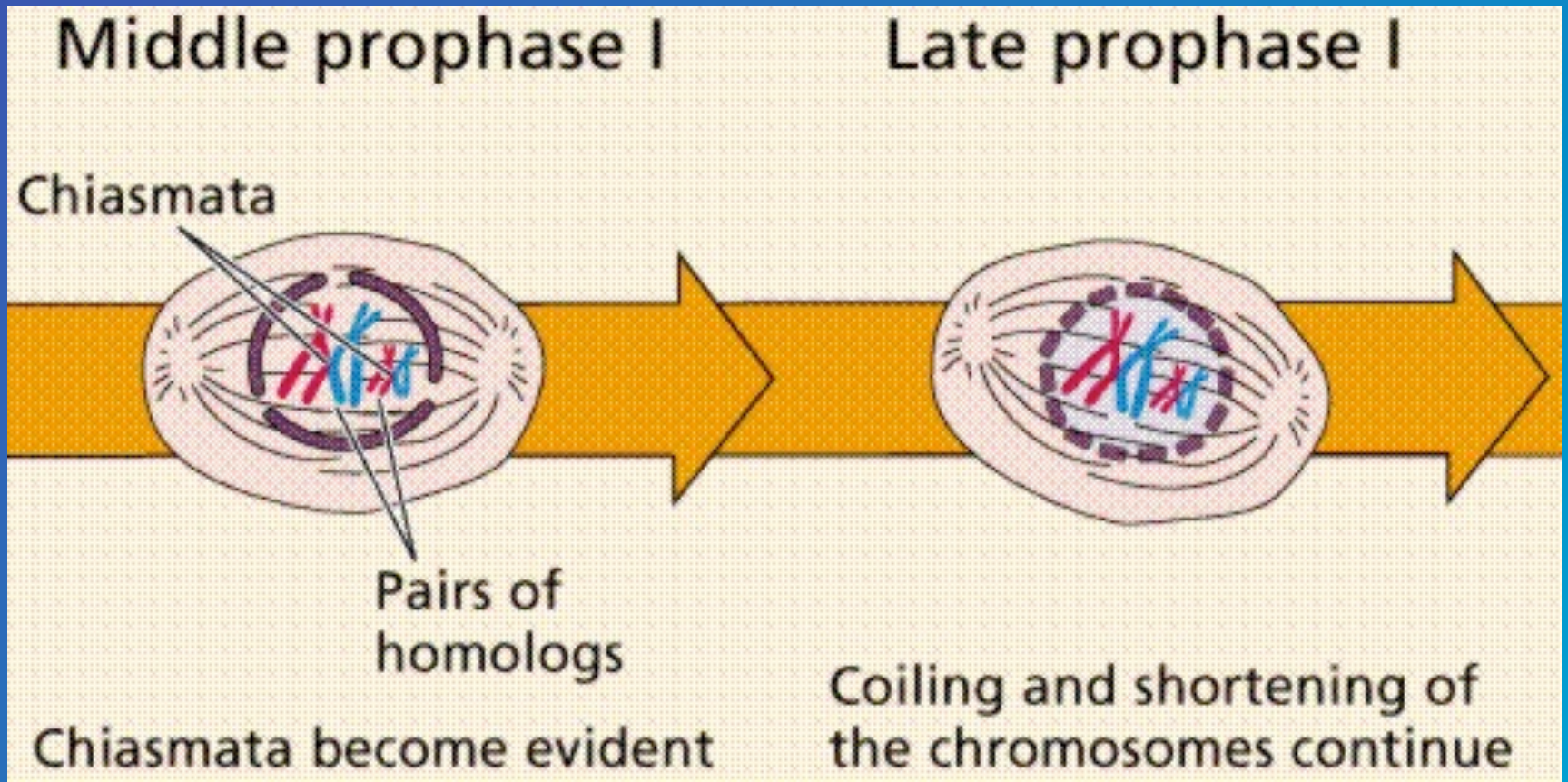
- **Prophase 1:** Each chromosome duplicates and remains closely associated. These are called sister chromatids.
- **Metaphase 1**: Chromosomes align at the center of the cell.
- **Anaphase 1**: Chromosome pairs separate with sister chromatids remaining together.
- **Telophase 1**: Two daughter cells are formed with each daughter containing only one chromosome of the chromosome pair.

Prophase I



http://everyschool.org/u/logan/cellreproductionx/rogersa/research/meiosis.html

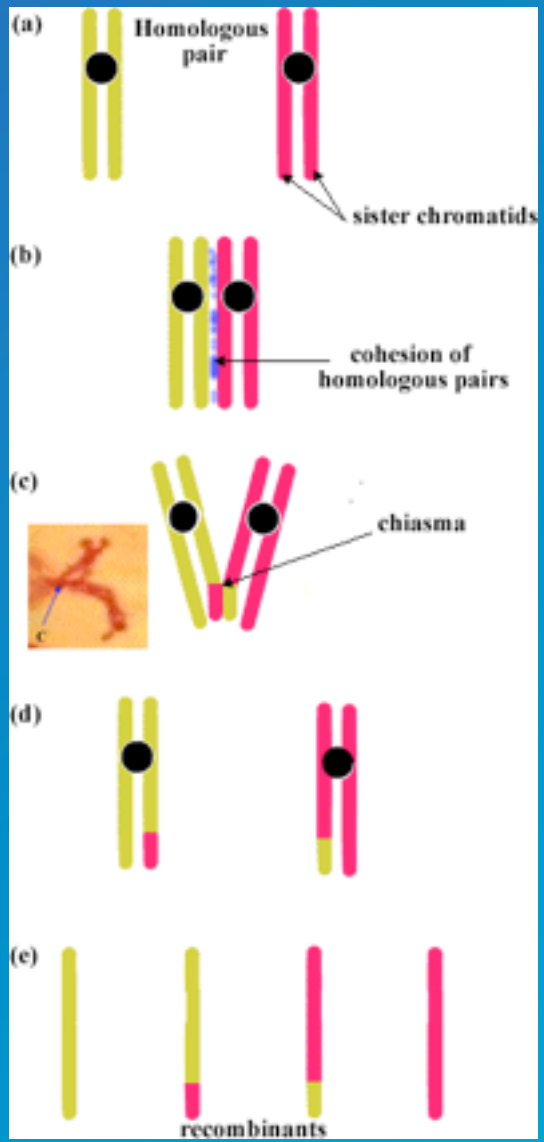
Prophase I



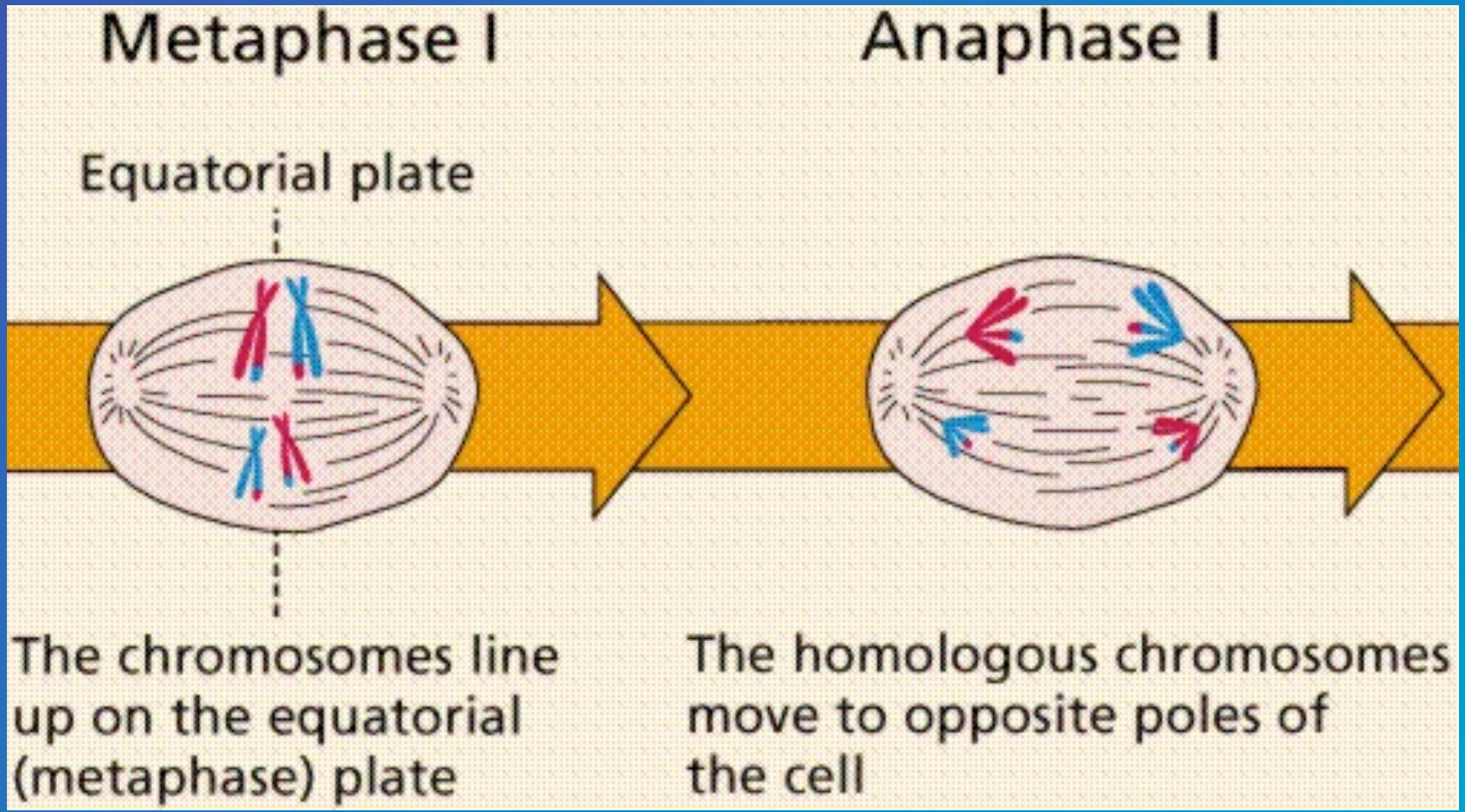
http://everyschool.org/u/logan/cellreproductionx/rogersa/research/meiosis.html

Cross Over (During Prophase I)

- A process where two chromosomes pair up and exchange segments of their genetic material.
- Results in new combinations of genes creating genetic diversity (why EVERYONE is different).



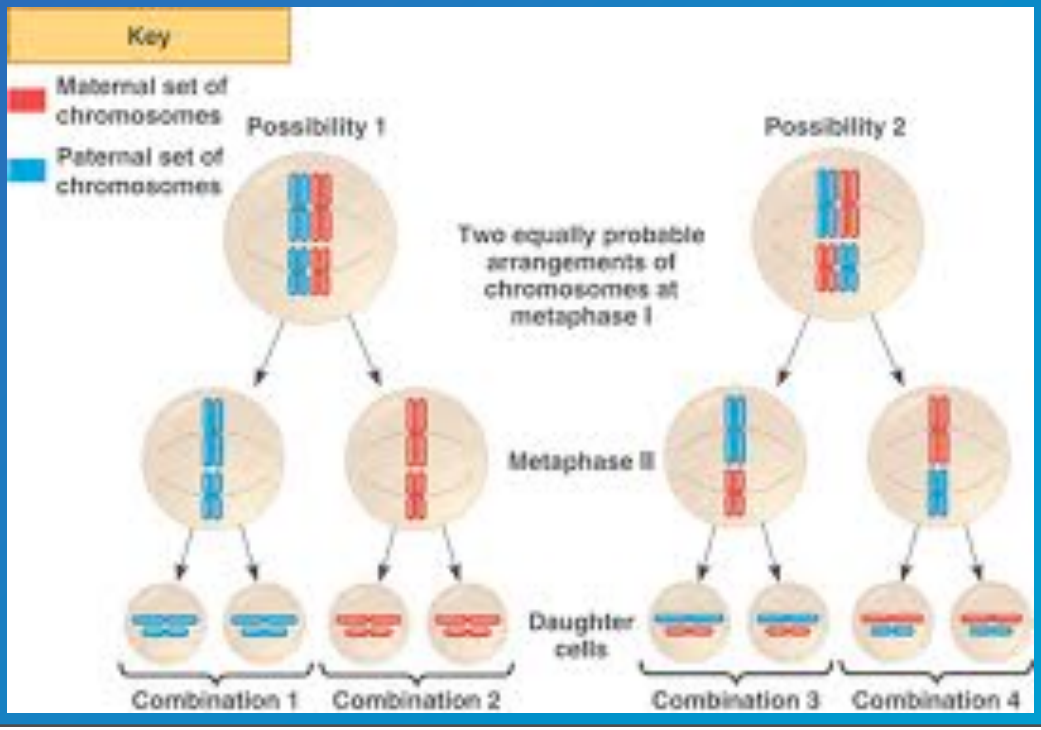
Metaphase I



http://everyschool.org/u/logan/cellreproductionx/rogersa/research/meiosis.html

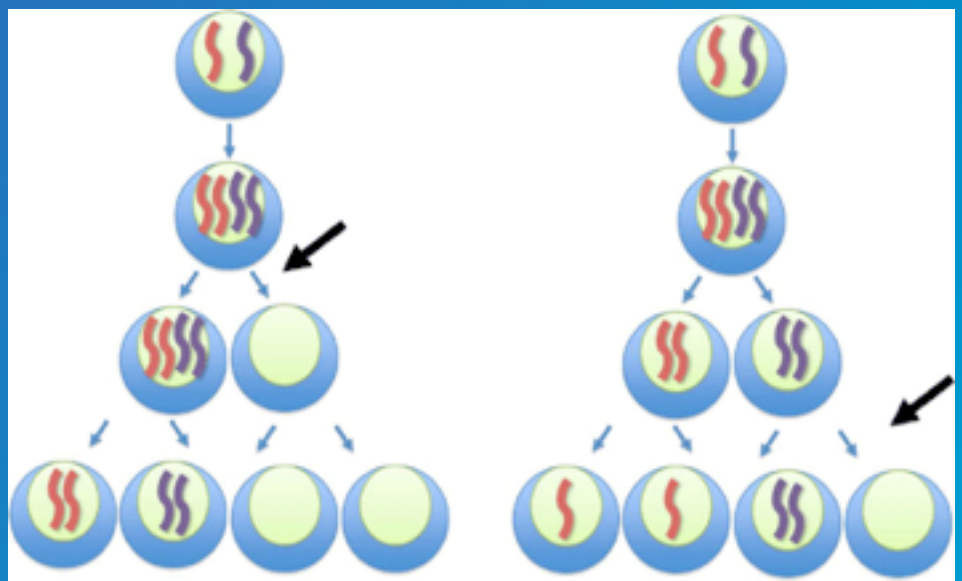
Independent Assortment

- The process of random segregation and assortment of the maternal and paternal chromosomes, resulting in unique gametes.
- Various ways chromosomes may be aligned during metaphase I.

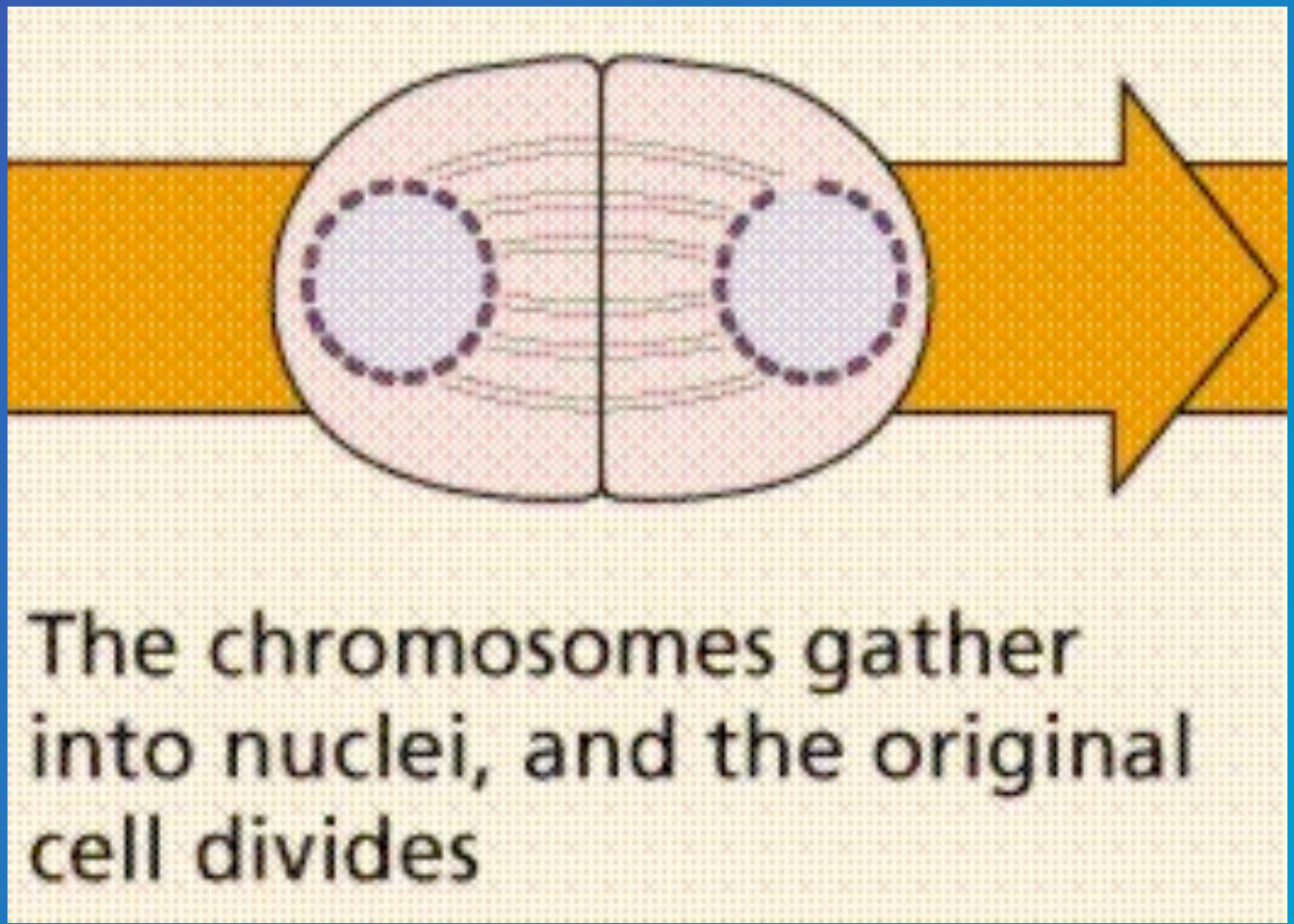


Nondisjunction

- “Not coming apart”
- Failure of chromosome pairs to separate during anaphase of meiosis I or II
- This could result in a loss of chromosome (Monosomy- Turner Syndrome) or gain in chromosomes (Trisomy- Down Syndrome).



Telophase I



http://everyschool.org/u/logan/cellreproductionx/rogersa/research/meiosis.html

Meiosis

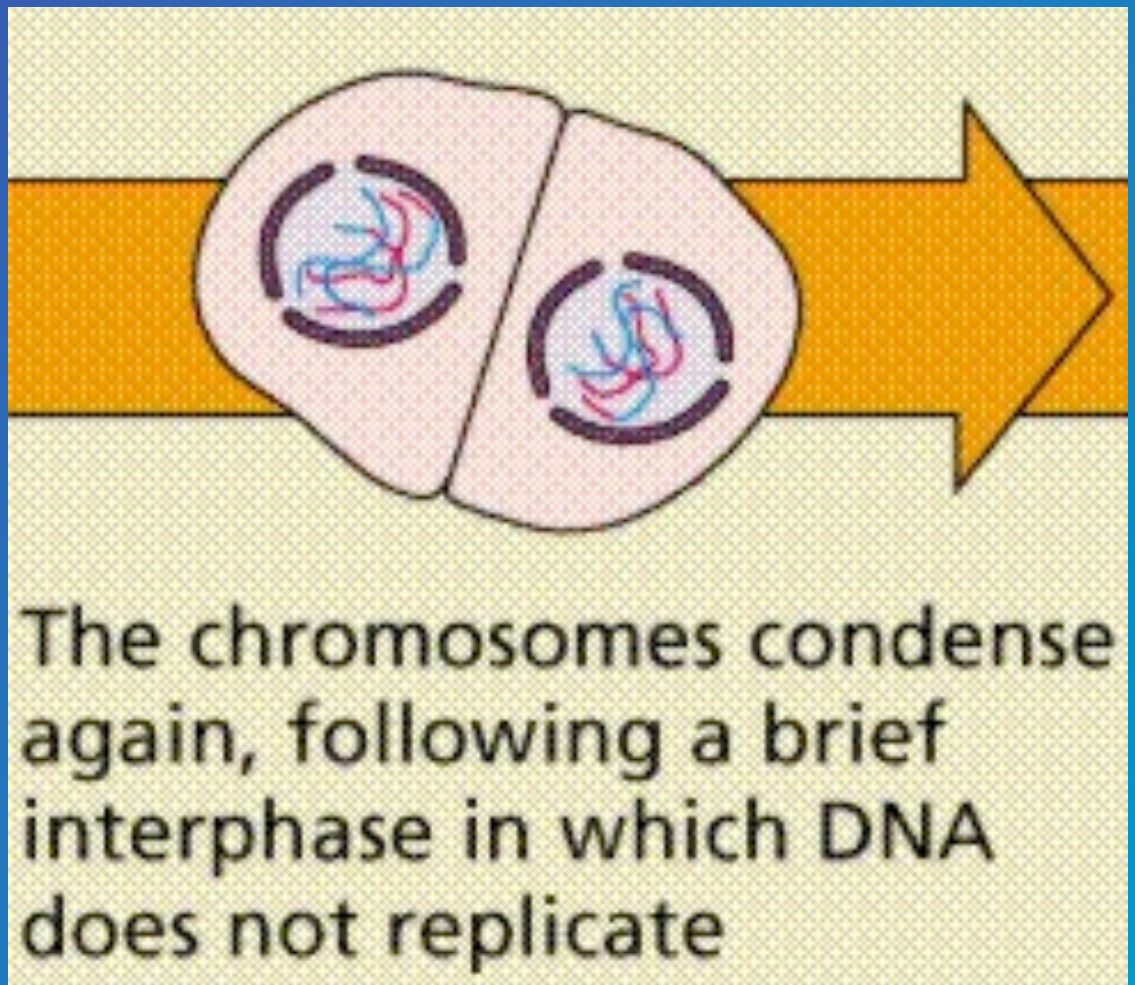
Second Division of Meiosis

Second Division of Meiosis

- **Prophase 2**: DNA does not replicate.
- **Metaphase 2**: Chromosomes line up at the center of the cell
- **Anaphase 2**: Centromeres divide and sister chromatids move separately to each pole.
- **Telophase 2**: Cell division is complete.

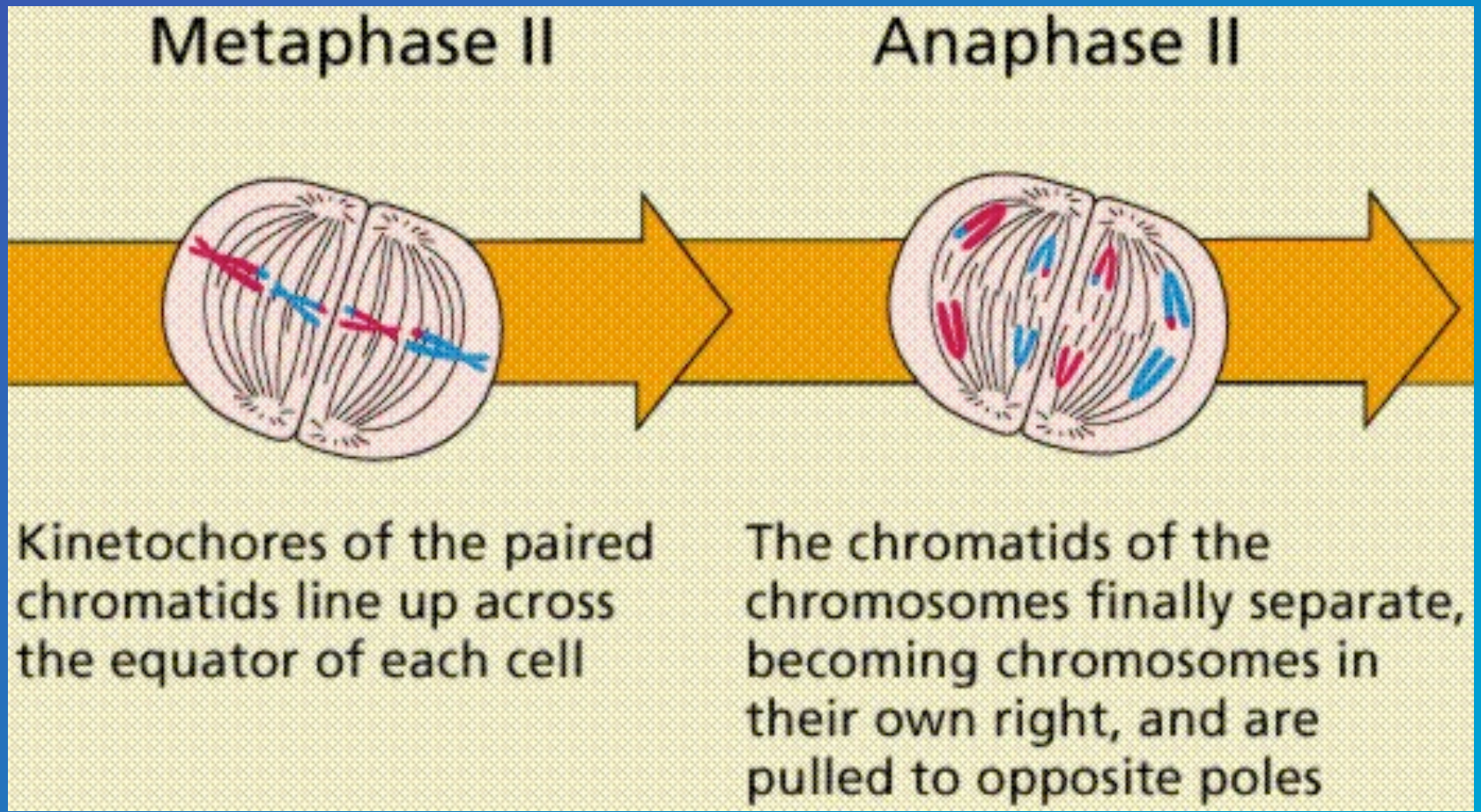
Four haploid daughter cells are formed.

Prophase II



http://everyschool.org/u/logan/cellreproductionx/rogersa/research/meiosis.html

Metaphase II



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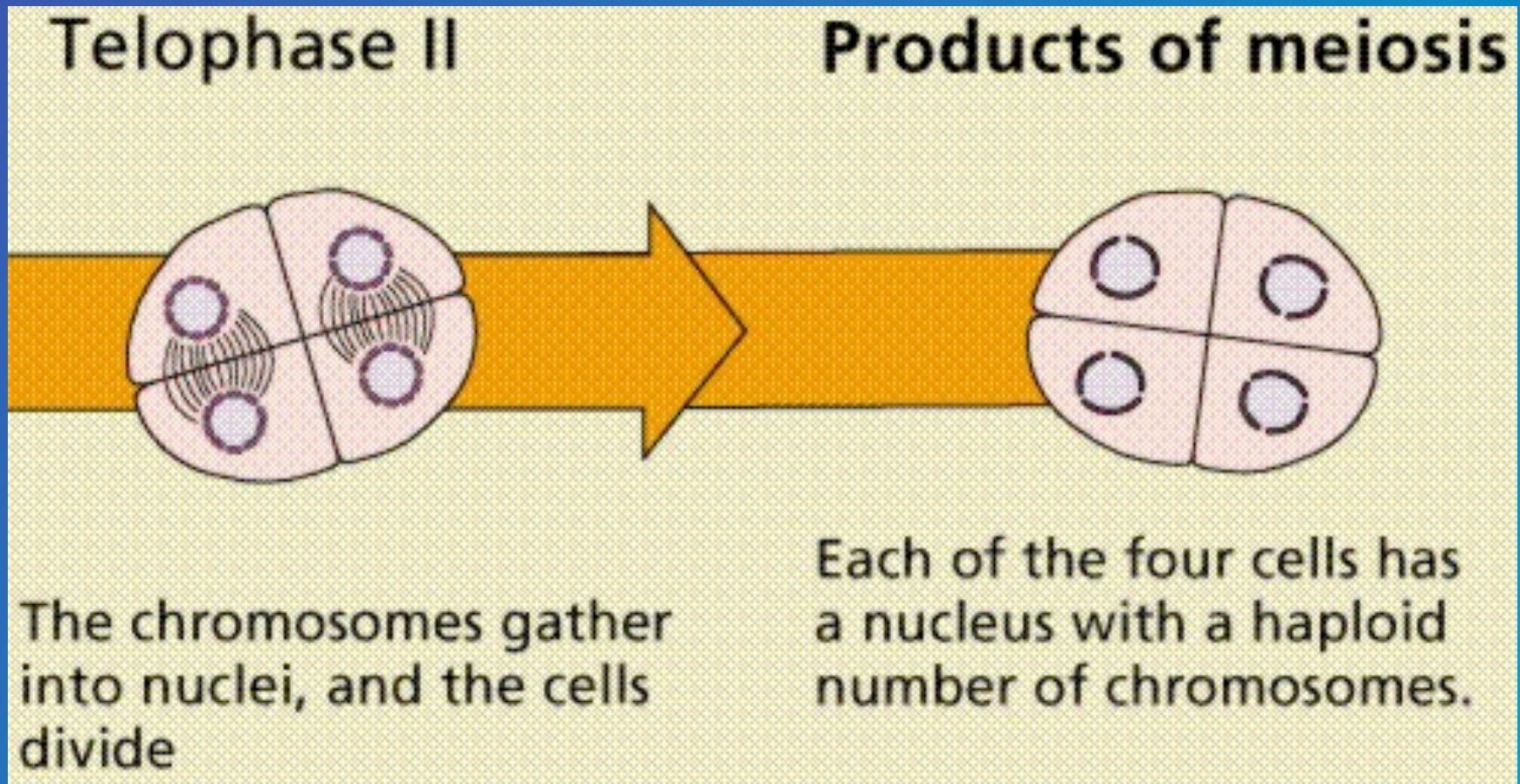
Telophase II



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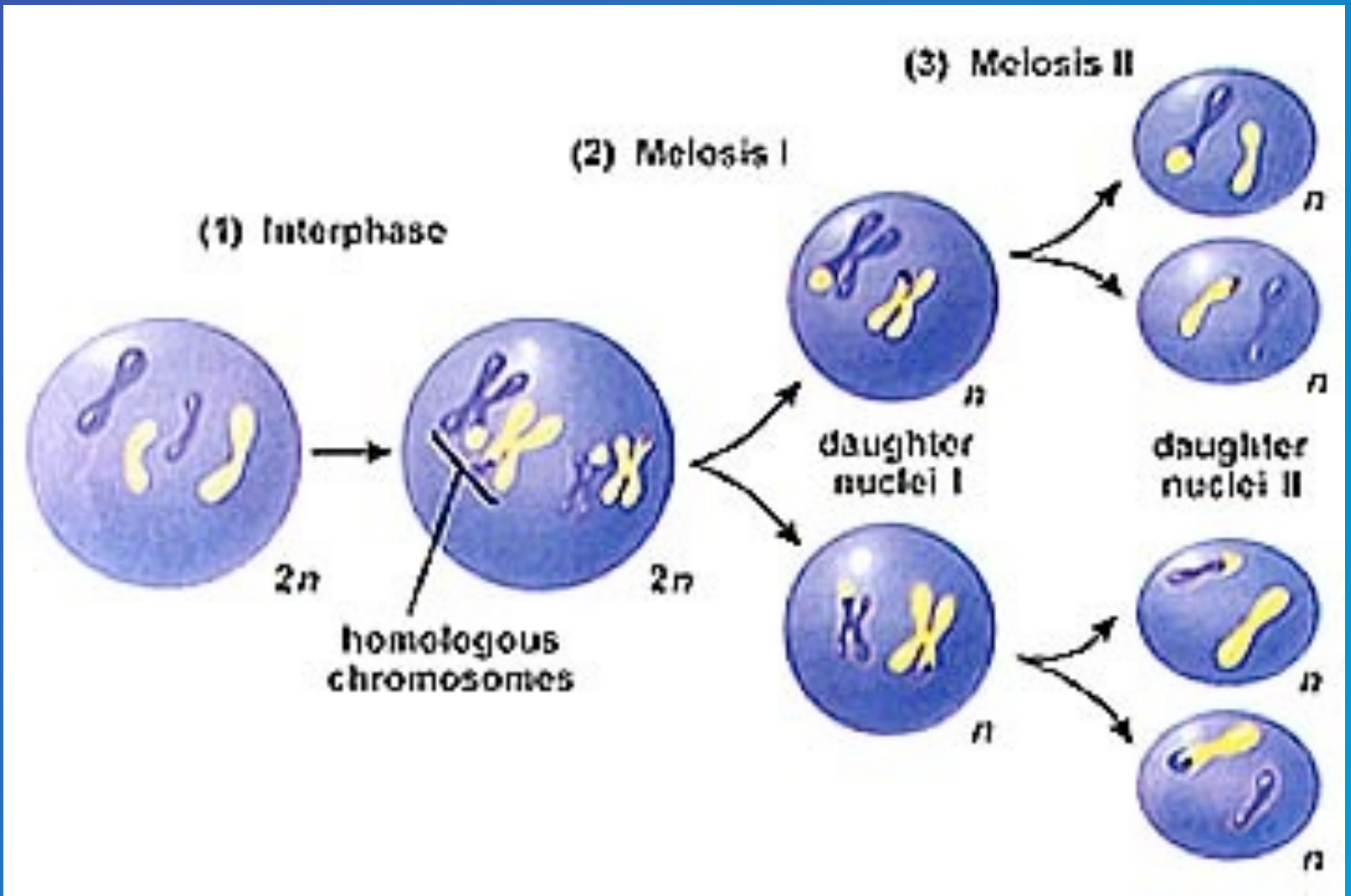
Meiosis



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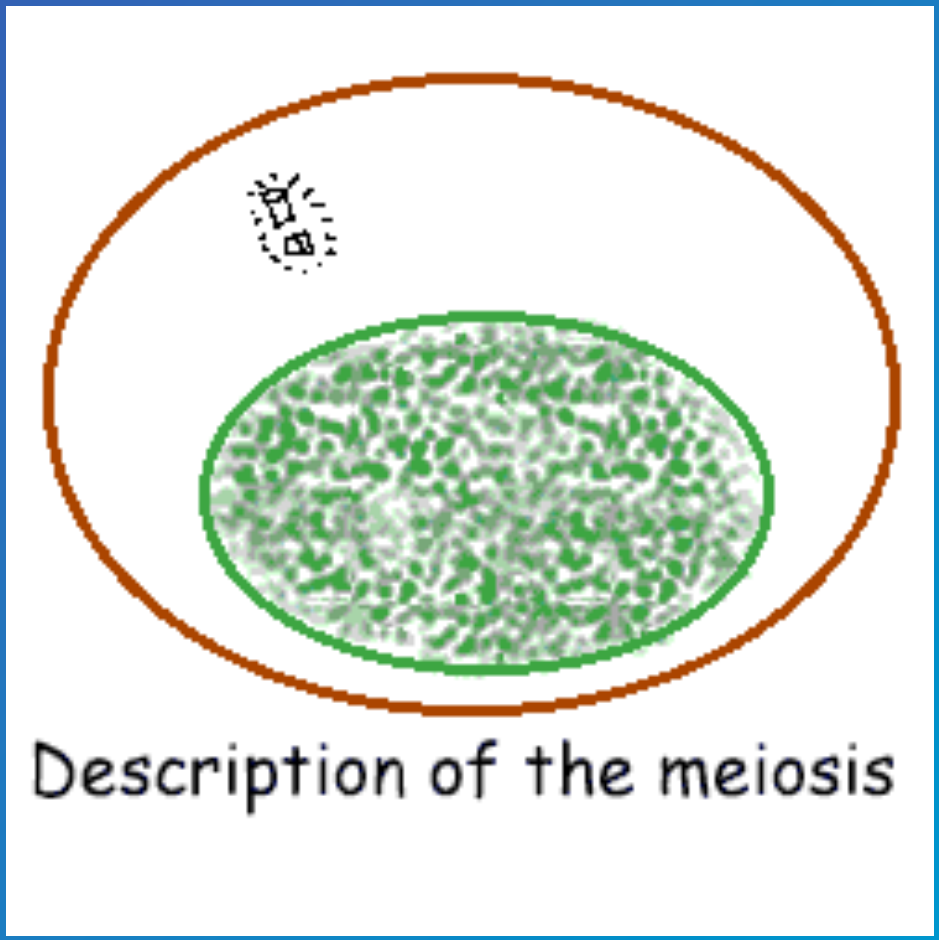
Meiosis Animation



http://www.rothamsted.bbsrc.ac.uk/notebook/courses/guide/movie/meiosis.htm

Mitosis vs Meiosis

- MITosis takes the cell and Makes It Two (diploid)
- Meiosis has to do with sex
- From the cell's point of view:
  - mITosis results in Identical Twins
  - mEioSis results in Egg and Sperm (haploid)

Differences in Mitosis & Meiosis

- Mitosis
  - Asexual
  - Somatic Cells
  - Cell divides once
  - Two diploid daughter cells
  - Genetic information is identical
- Meiosis
  - Sexual
  - Cell divides twice
  - Four haploid daughter cells
  - Genetic information is different

Comparison Animations

http://www.pbs.org/wgbh/nova/baby/divi_flash.html

http://www.usoe.k12.ut.us/curr/science/sciber00/7th/genetics/sciber/animatin.htm