

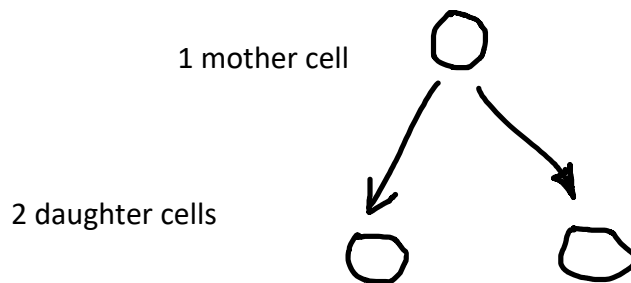
## Mitosis and cell division (cytokinesis)

For all of you students of biology, mitosis is a central process to all life.

The best mitosis resource I can find for the written details are here

<https://courses.lumenlearning.com/boundless-biology/chapter/the-cell-cycle/>

Mitosis is the process in which cells divide to form two “daughter” cells from a single “mother” cell. The cells copy their DNA prior to entering mitosis and, during mitosis, equally divide up their chromosomes between the daughter cells to ensure they are genetically identical to the mother cell and to each other.

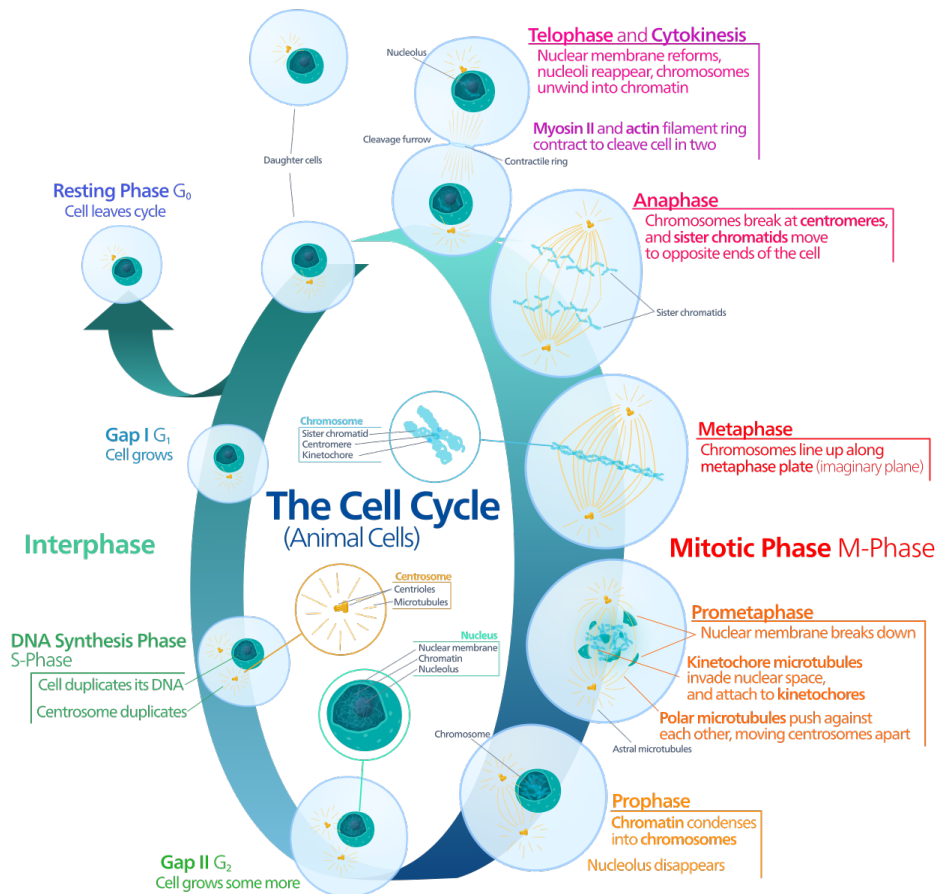


The following Youtube lesson is a nice video primer

<https://www.youtube.com/watch?v=mXVoTj06zww>

There are some minor inaccuracies/incomplete statements in the video that are addressed below:

Refer to the cell cycle diagram below for an animal cell...yes plant cells are different...



Interphase has 3 stages  $G_1$ , S, and  $G_2$ .

In  $G_1$  (Gap 1) the cell has a growth spurt as stated but also, many of the proteins and cellular machinery for copying DNA in the S phase are made and some molecules for cell division are made. This is also a “check point” for whether a cell can proceed to S phase

The same thing goes for  $G_2$ ...many of the proteins and machinery for cell division are being made and readied. This is also a “check point” for whether a cell can proceed to mitosis.

For an average population of bone marrow cells in a human that is actively dividing the entire cycle from one mitosis to the next takes about 18 hours...M takes about a 2 hours.

When cells are not actively dividing, it is referred to as being in  $G_0$ ...or has left the active cell cycle. Nearly all cells in  $G_0$  can be either stimulated or tricked into entering active cell cycle.

There is a place in the presentation that states the microtubules “push” the chromosomes apart. There may be some pushing forces, but we know that microtubules of the spindle pull the chromosomes towards opposite ends of the spindle during anaphase.

One last point...mitosis is exceptionally complex and entire books are written on parts of it. This only scratches the surface of what is going on and it's still an area of active research. Our Dr. Salmon did her entire PhD on how the microtubules interact with chromosomes during mitosis to allow the chromosomes to move around to align in metaphase and then pull apart in anaphase.