1 | Cell Cycle Regulation

The Problem: **Cells need to know whence to divide itself.**

1.1 | Cell Cycle Regulators

1.1.1 | Drivers

=> Drivers tell cells when to divide. The processes that move a cell forward through its life are called ”drivers”.

Drivers consists of two parts: a switch + a cyclin. A ”switch” — informed by environmental factors and checkpoints (see below) — turns on a ”cyclin” protein this cyclin protein actually drive cell forward.

1.1.2 | Checkpoints regulate drivers' actions

Should the cells not meet the requirements of a checkpoint, its driver would be stopped; and/or it will be called to self-destruct.

There are two main types of regulators:

Positive Regulators push the cell cycle forward, CDK, upon lots of cycling binding to it and the meeting of checkpoint.

Negative Regulators hold the cell cycle back due to a response to a checkpoint or an environmental factor

Here are some common checkpoints:

- **G1/S Checkpoint** (After S) — external factors and growth factors (nutrients, raw material, DNA damage) , along with measurements of the volume, shape of the cell and the duplicated DNA, ensure that the pre-G2 cell is intact and healthy before moving onto G2
- **Inter s-checkpoint** (During S) — during S, check for DNA damage.
- **G2/M Checkpoint** (After G2) — before mitosis, check that the cell has correctly duplicated parts and tools needed for replication
- **Spindle Checkpoint** — checking for the attachment of all kineticores to the spindles such that all the chromasomes could be correctly lined up and seperated later

Growth Factors that the cells measure: the 1) Size of the cell 2) the nutritional state of the cell.