TOPIC 9.3: PLANT GROWTH

Meristems

Meristems are undifferentiated cells in plants that are capable of indeterminate growth *(analogous to totipotent stem cells)*
- They have specific regions of growth or development and allow for regrowth and vegetative propagation

Meristematic tissue can be characterised as either:
- **Apical** – Occurs in shoots and roots and is responsible for primary growth (i.e. lengthening) and leaf development
- **Lateral** – Occurs at the cambium and is responsible for secondary growth (i.e. widening) and the production of bark

Auxin

Plant hormones (specifically auxins) control growth in the shoot apex by stimulating or inhibiting cell division (mitosis)
- Auxin efflux pumps can set up concentration gradients of auxin in plant tissues to allow for differentiated growth rates

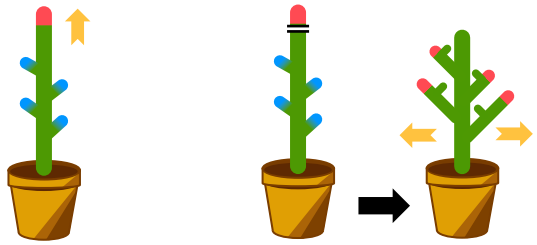
Auxin is released by the shoot apical meristem and coordinates both apical growth and directional growth (tropism)
- Auxin influences cell growth rates by changing the pattern of gene expression within the plant tissue

Apical Growth

Growth in the shoot apex allows for the extension of the stem and the development of leaves (primary growth)

In the stem, growth occurs in sections called nodes, with the remaining meristem tissue forming inactive axillary buds
- Axillary buds have the potential to form new shoots

Auxins promote growth in apex but inhibit growth in buds
- This condition is known as **apical dominance**



Apical Dominance
vertical growth

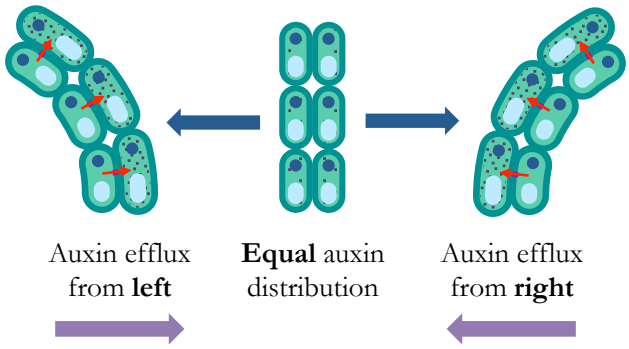
Pruning Terminal Bud
lateral growth

Tropisms

A tropism is the turning of an organism in response to a directional external stimulus (e.g. light = phototropism)

Plant tropisms are caused by the differential elongation of plant cells (plant turns *away* from side with cell elongation)

Tropisms may differ according to the type of plant tissue
- In plant **shoots**, auxin *promotes* cell elongation
- In plant **roots**, auxin *inhibits* cell elongation



Auxin efflux from **left**

Equal auxin distribution

Auxin efflux from **right**

Micropropagation

Micropropagation is an in vitro technique used to produce large numbers of identical plants (i.e. clones) from a selected stock plant
- Tissue sample *(explant)* is grown in agar and treated with growth hormones
- Growing shoots are divided and transferred to soil to form new plants

Micropropagation can be used for the rapid bulking up of new plant varieties, the production of virus-free stains of existing varieties and the propagation of rare plant species (e.g. certain types of orchids)