

## Taxis (pg 326)

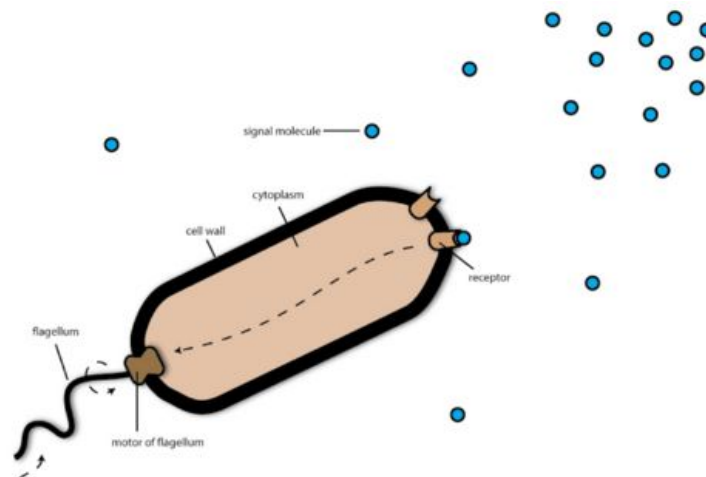
Taxis is *directional* movement in response to stimuli.

Positive taxis is directional movement *towards* the stimuli

Negative taxis is directional movement *away from* the stimuli

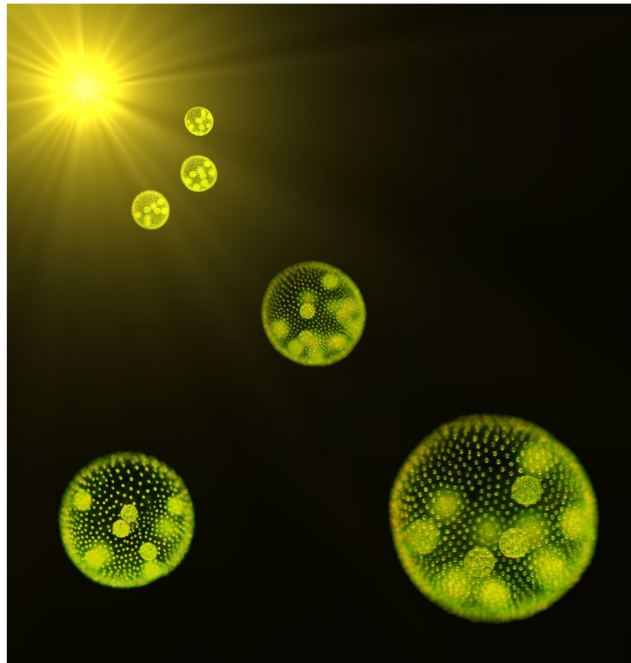
**Chemotaxis** - movement towards a chemical gradient

E.g. bacteria can detect nutrients in their environment



**Phototaxis** - light sensitive movement

E.g. moths and algae move towards the light

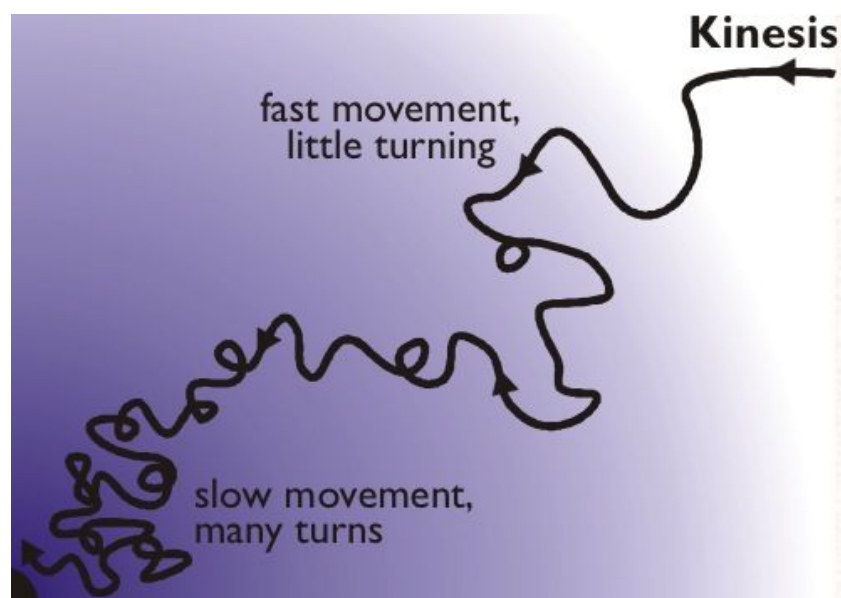


**Geotaxis** - taxis in response to gravity

E.g. earthworms burrow into the ground, where it is moist, and they can avoid predators

**Kinesis** is a *random, non-directional* movement in a response to stimuli, in order to increase the organism's chances of survival.

E.g. when put in a choice chamber with dry and humid areas, woodlice move faster and turn less in the dry area. Their movement slows down and they make more turns once they are in the humid area. This keeps them in a favourable environment.



## Tropisms

Tropism is *directional growth* in response to stimuli.

Most commonly used by plants in order to maintain a position most favourable for survival.

Tropisms can be **positive** (towards a stimulus) or **negative** (away from a stimulus)

**Phototropism** - growth in response to light intensity

E.g. shoot tips grow towards light and root tips grow away from light

**Geotropism** - growth in response to gravity

E.g. roots grow towards gravity

**Hydrotropism** - growth in response to amount of water available

E.g. plant roots grow towards water

## What is a Plant Growth Factor? (pg 328)

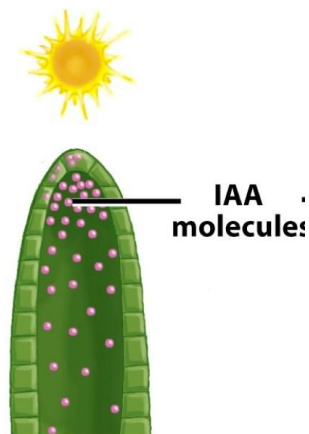
- made by cells throughout the plant - meristem cells
- only affects cells locally
- Meristem cells can make all the growth factors needed by tissues

An example of a plant growth factor is **Indol Acetic Acid** ( a type of auxin)

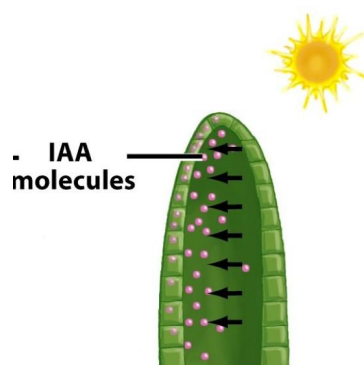
IAA promotes growth in the shoot, inhibits growth in the root

## Positive phototropism in flowering plants

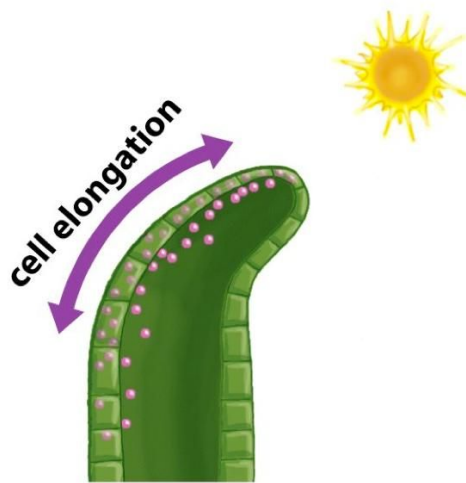
A shoot tip produces IAA, sending it down both sides. In uniform light the shoot tip will grow upwards.



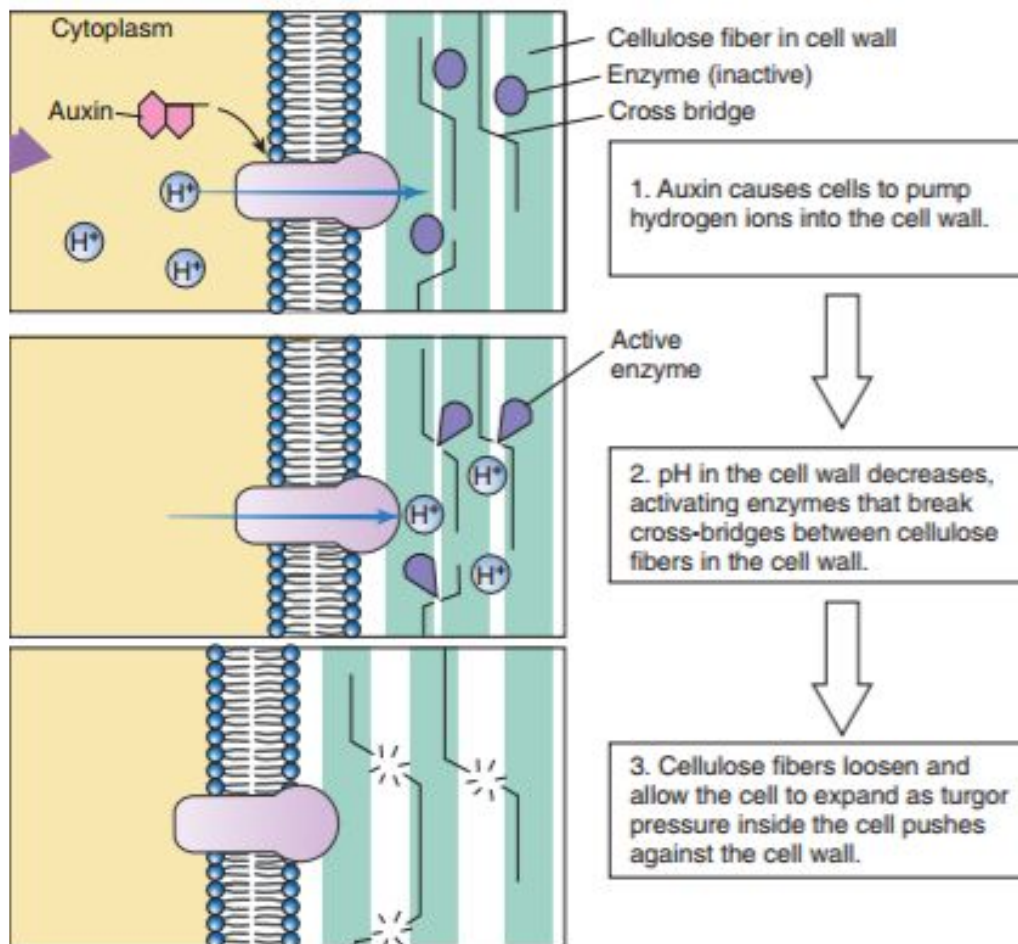
However, if light only shines from one direction (unilateral), the auxin in the tip gets redistributed



The shoot tip bends on the side with high IAA concentration, towards the light



## How does IAA work?

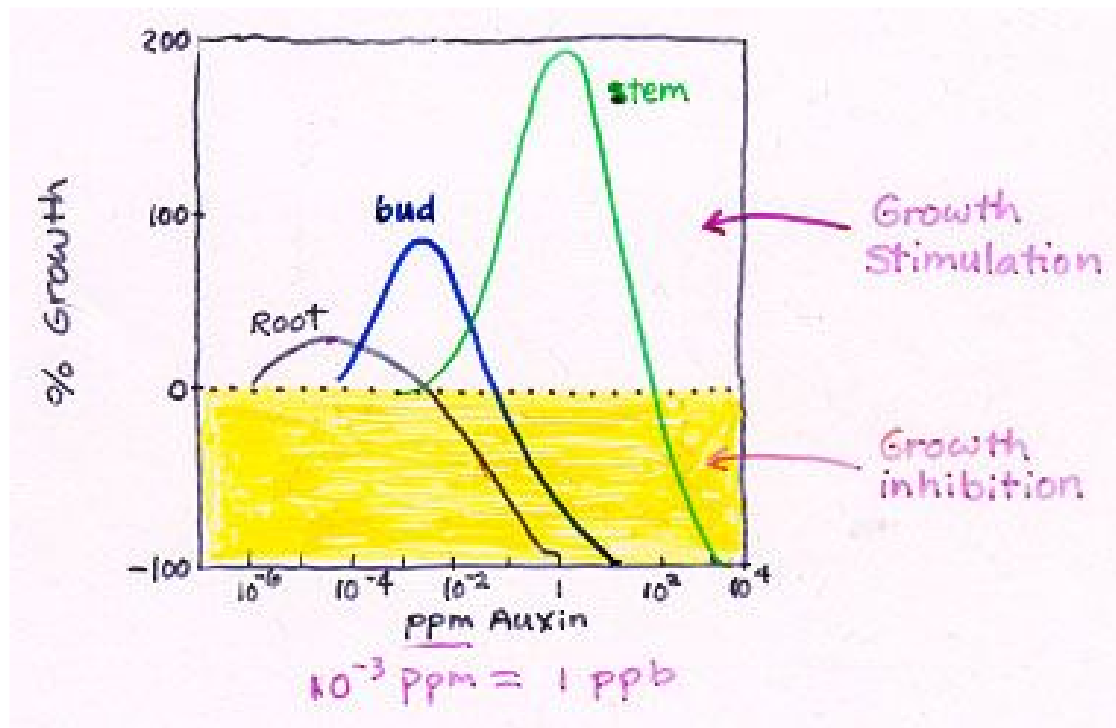




Pg 328 & pg 330 (**Acid growth hypothesis**)

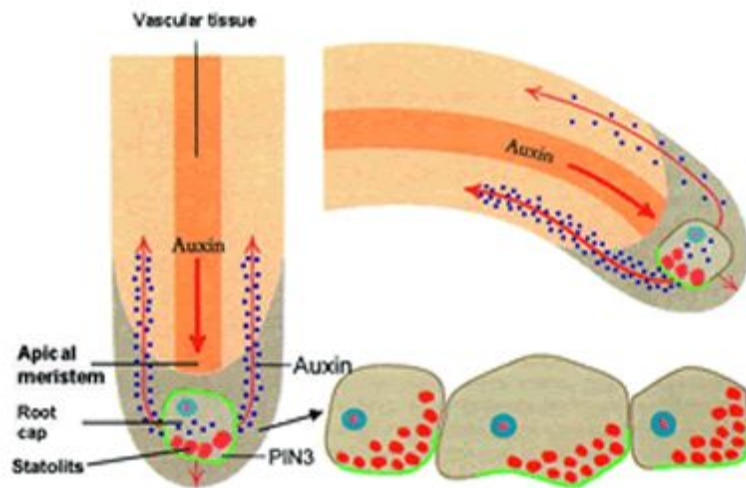
- Meristem cells at the shoot tip produce IAA
- IAA diffuses down both sides of the shoot
- when exposed to unilateral light, IAA is transported from the illuminated to the shaded side
- IAA activates a proton pump (**ATP synthase**) that transports  $H^+$  from cytoplasm into the cell wall
- the pH in the cell wall drops
- this activates the enzyme **expansin**
- expansin breaks down some of the hydrogen bonds in the cellulose
- the cells on the shaded side can now take in more water, and 'stretch' more
- they stretch faster than the cells on the illuminated side, allowing the shoot tip to bend towards the light

## Effect of IAA on roots and shoots (pg 329)



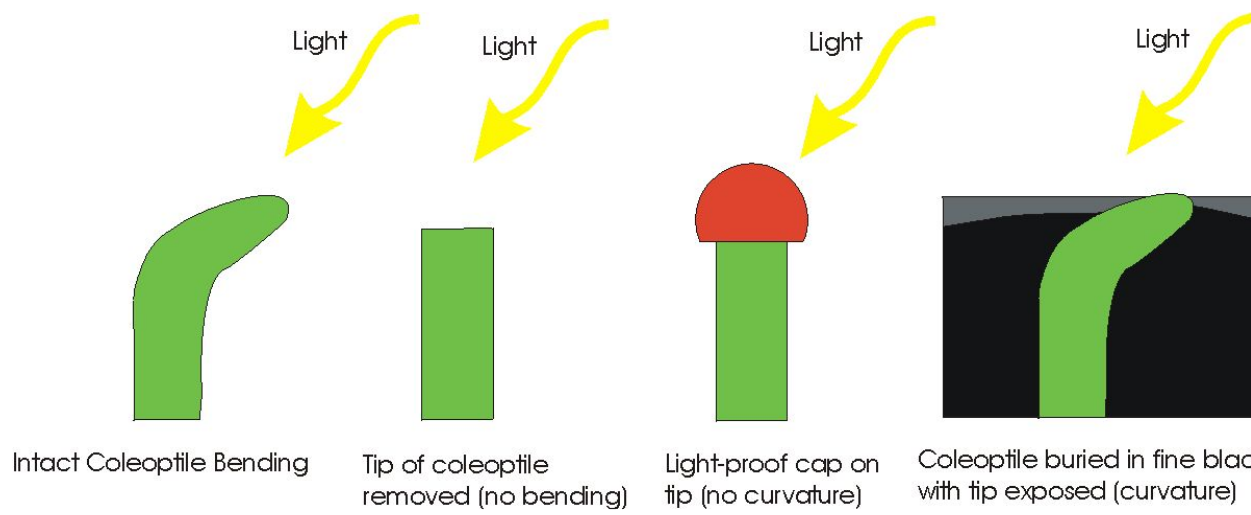
The concentrations of IAA that promote growth in shoots inhibit growth in roots

## Gravitropism in flowering plants (pg 329)

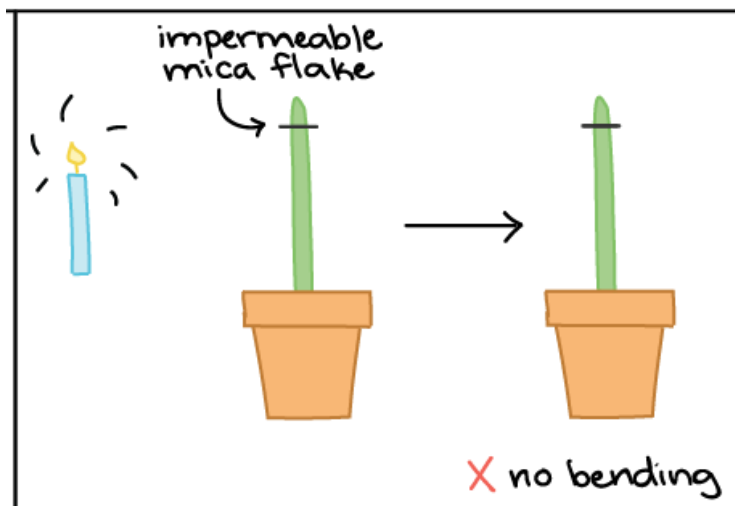
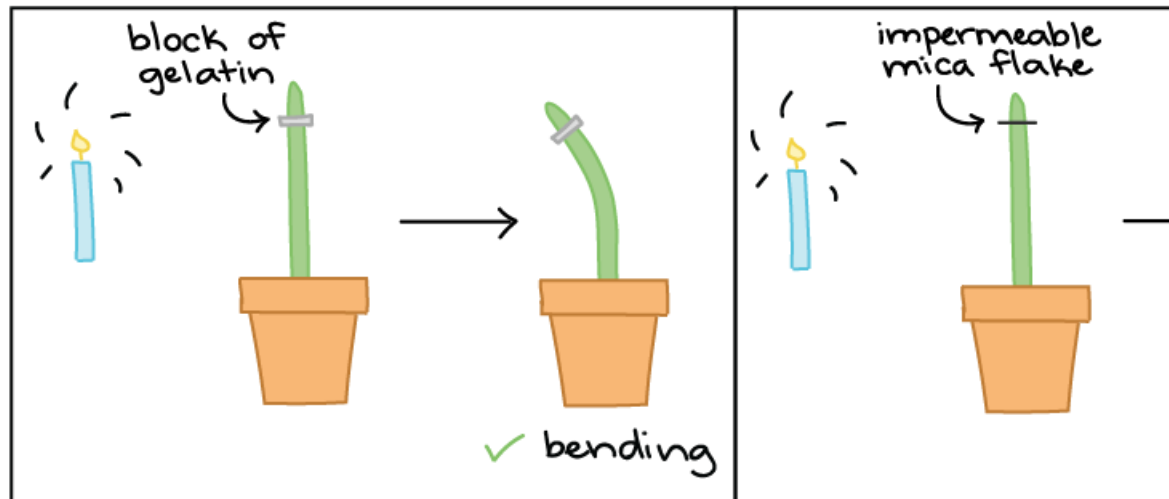


- Gravity causes IAA to move from the upper to the lower side of the root
- High concentration of IAA inhibits the elongation of root cells
- Cells on the upper side can elongate faster
- This causes the root to bend downwards, towards gravity

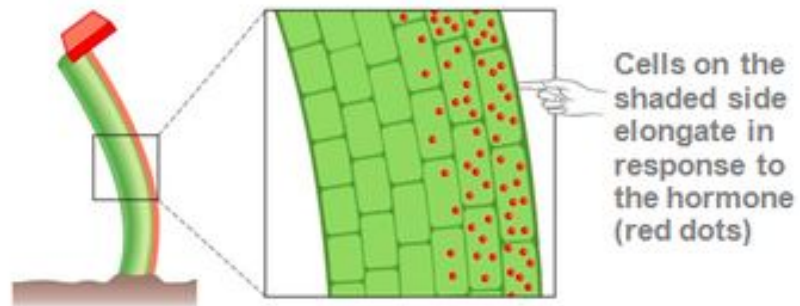
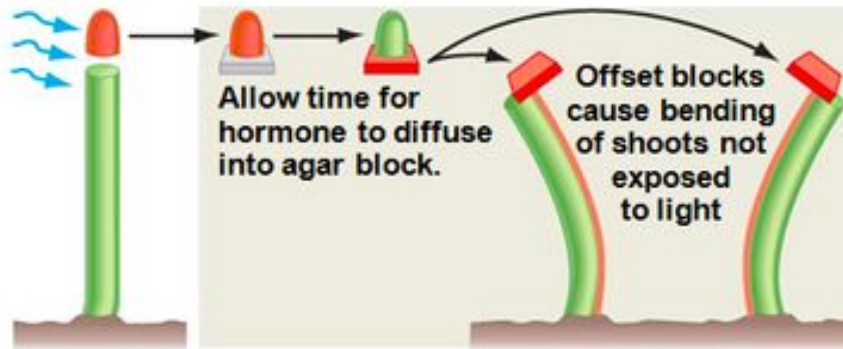
## Evidence for action of IAA (pg 331) - Darwin



Boysen-Jensen experiments (Fig 5, pg 332)



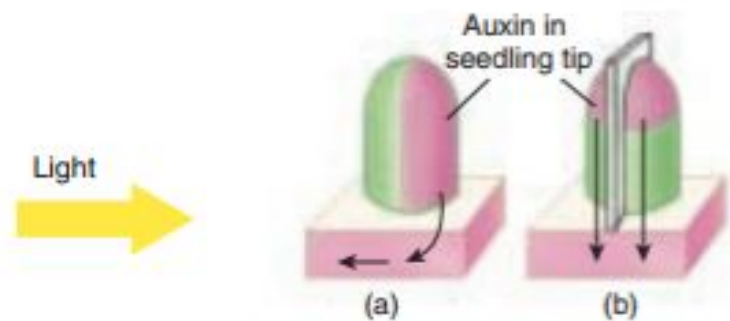
Paal's experiment (Fig 6, page 332)



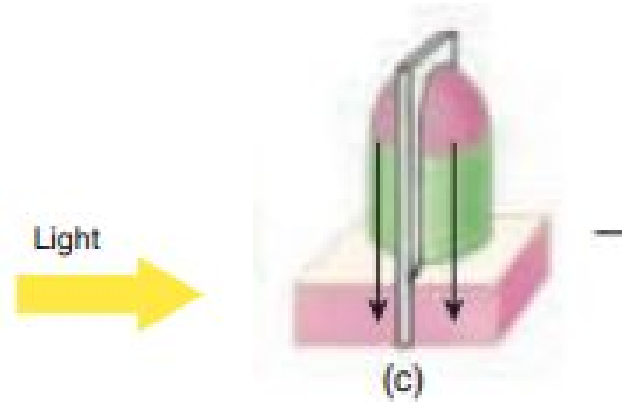
## Brigg's experiment (Fig 7, pg 333)

**Hypothesis 1:** IAA is destroyed by light

**Hypothesis 2:** IAA is transported from the illuminated to the shaded side on exposure to light



Total concentration of IAA in the agar blocks remains the same in the dark and in the light, showing that IAA does not break down in light.



In light, with mica through both the tip and the agar block, the IAA concentration on both sides is equal



When the mica does not pass through the tip, the concentration of IAA in the agar block is unequal