Plant Growth

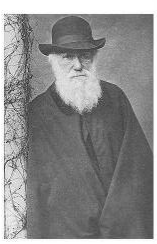
1. **Meristems and overview of plant growth**
2. **Apical meristems and primary growth**
3. **Lateral meristems and secondary growth**
4. **Hormones and control of plant growth**

Plants exhibit phototropism and gravitropism

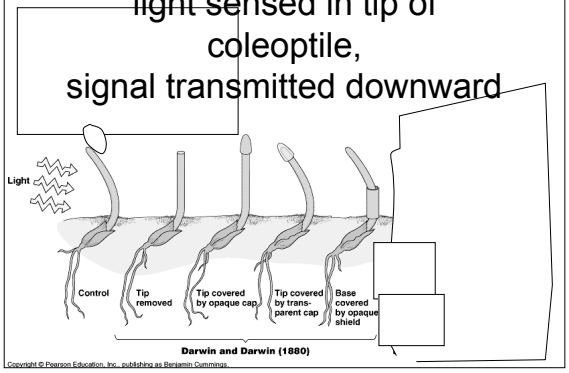
- Photo: light. Shoot growth
  - Positive
  - Negative
- Gravi: gravity. Root growth
  - Positive
  - Negative

How do plants grow toward the light? (phototropism)

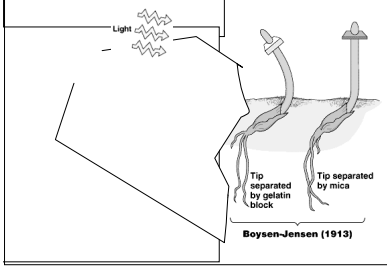
First experiments begun by Charles and Francis Darwin in 1880



Darwin and Darwin concluded: light sensed in tip of coleoptile, signal transmitted downward



Boysen-Jensen showed "signal" is a water-soluble chemical



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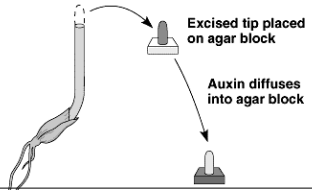
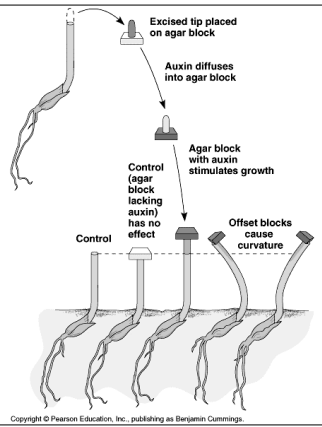




A block of agar infused with auxin can promote growth of coleoptile.

Offsetting block to one side leads to bending growth.

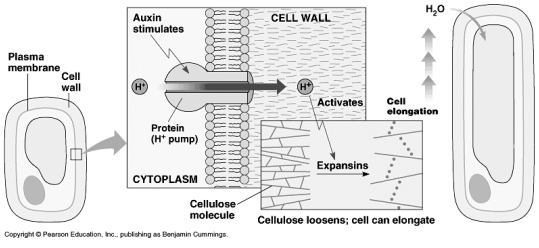
Conclusion: increased concentrations of auxin lead to greater cell elongation

A word about Auxin:

Auxin is a term used for any chemical substance that promotes the elongation of coleoptiles (though they have multiple functions in monocots and eudicots)

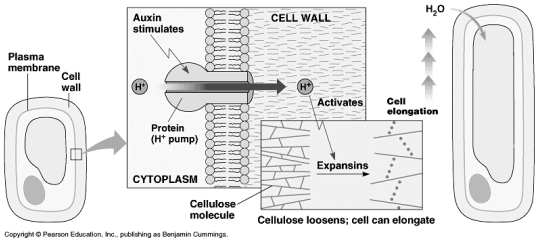
The natural Auxin occuring in most plants is IAA - indoleacetic acid

Acid-Growth Hypothesis



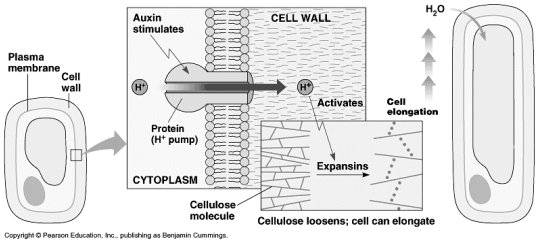
1. Auxin stimulates proton pumps, acidifying cell walls

Acid-Growth Hypothesis



2. Cell walls become more plastic (stretch more easily)

Acid-Growth Hypothesis



3. Water moves into cell, pushing out on and expanding cell wall

What auxin does in plants

- Promotes shoot elongation
- Suppresses shoot branching (apical dominance)
- Inhibits root elongation
- Promotes root branching
- Promotes growth of fruit
- Regulates development through interaction with other hormones

Other plant hormones

- Cytokinins: promote lateral growth of shoots - promote cell division and differentiation. Work with auxins (elongation).
- Gibberelins: promote cell elongation, stimulate fruit development (along with auxin), break seed dormancy
- Abscisic acid: maintains seed dormancy, promotes drought resistance - opens potassium channels in guard cells
- Ethylene: reaction to mechanical stress, promotes leaf abcission, programmed cell death (apoptosis), fruit ripening (positive feedback mechanism)