

**Standard**: Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

**Element**: Relate plant adaptations, including tropisms, to their ability to survive in stressful environments.

**EQ**: What tropisms have plants developed in order to respond to the environment?

One of the seven characteristics of all living things is **responsiveness**.

Responsiveness means that an organism can adjust to a change in the environment or react to a **stimulus**. A stimulus is anything that causes a change or reaction in an organism.

Plants are normally anchored to one spot by their roots. They don't have the option of moving to a different location if the environment changes.

A **tropism** is a response in which a plant grows toward or away from a stimulus. Plant hormones are responsible for producing tropisms.

If a plant grows *toward* a stimulus, it is called a **positive tropism**.

If a plant grows *away* from a stimulus, it is called a **negative tropism**.

One of the most obvious tropisms that we see in plants is called **phototropism**.

Phototropism is plant growth or movement in response to light.



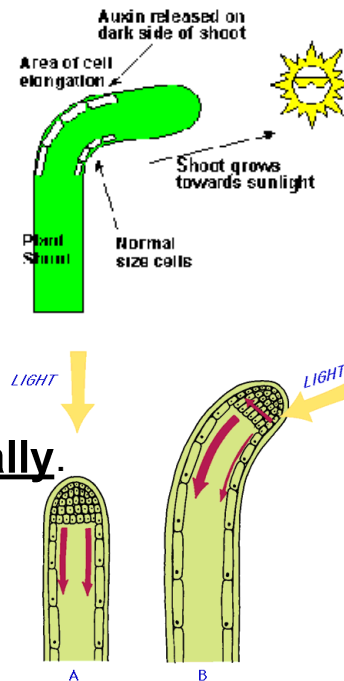
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Phototropism occurs because of the plant hormone **auxin**.

Auxin causes plant cells to **elongate**. When one part of a plant is in the dark, it **stimulates** the production of auxin, which makes the cells grow longer.



Cells in the light grow **normally**.

If you have ever noticed a vine wrapped around a fence, you have seen an example of **thigmotropism**.

Thigmotropism is the growth or movement of a plant in response to touch.



Thigmotropism happens when a part of a plant comes into contact with a surface.

The "touched" cells stop elongating while the untouched cells continue to grow, causing the stem or vine to bend.



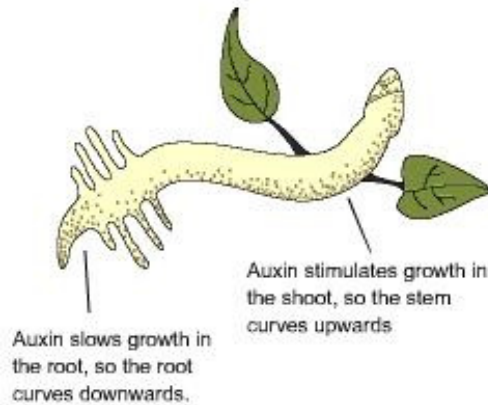
Think about a seed buried in the ground. It is dark, so the seed can't respond to light. So how does the seedling manage to sprout in the right direction? The answer is by **gravitropism**.

Gravitropism is the growth of a plant in response to gravity.



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Gravitropism is also caused by auxin. However, auxin has a different effect on root cells than it does on the stem. In the root, auxin will actually slow the cell growth.



**Nastic movements** are also movements of a plant in a response to a stimulus. However, these movements are not in a particular direction.



Pulvini at bases of leaflets

Response of the 'sensitive plant' (*Mimosa pudica*) to shock.(left) before(right) after.

How do tropisms allow plants to survive?

***Phototropism***

- Plants need light for photosynthesis; without photosynthesis they wouldn't have a source of glucose

How do tropisms allow plants to survive?

***Thigmotropism***

- Plants such as vines can grow so large that they fall over and break. Thigmotropism allows them to "hold on" to a nearby object.

How do tropisms allow plants to survive?

***Gravitropism***

- A germinating seed can't respond to light because it is normally buried underground. By growing against the pull of gravity, a seedling is guaranteed to grow upward, where there is light.

Other Plant Responses

- Seasonal response: plants lose their leaves in the fall when there is **less light** and the temperature is **colder**
- **Dormancy**: plants produce seeds, spores, bulbs, etc. that are dormant, or not actively growing. When the conditions are right for growth, the seed responds by sprouting.