

# How does microgravity affect root growth?

## Background

Have you ever wondered why roots grow downward into the soil? It is due to gravity! But what happens in microgravity? Will roots grow differently in space? In this investigation, we are going to be space scientists, right here on earth!



### *Key vocabulary-*

Microgravity: The condition of an object appearing to be weightless due to free fall. Did you know that the astronauts on the International Space Station are in a constant state of free fall? They are just traveling so fast they are constantly missing the earth due to it's curvature. That's microgravity!

Gravitropism (Geotropism): The growth of a plant part in response to gravity. There are two types of gravitropism:

*Positive gravitropism* occurs when a plant part grows in the direction of gravity, like a root growing downward into the soil.

*Negative gravitropism* occurs when a plant part grows in the opposite direction of gravity, like a plant shoot growing upward toward light.

Germination: The emergence and growth of a seed into a seedling.

When a seed is planted in soil on Earth, gravity causes the seed to orient itself with the root growing downward, a process known as gravitropism. Plants perceive gravity using *statoliths*, cellular organelles located in root tips. These organelles help to orient the plant so that roots grow downward toward water and nutrients, and shoots grow upward for photosynthesis. In space, the absence of gravity can affect plant root and shoot growth, and therefore plant development.

This experiment investigates the effect of microgravity on root development of radish seed. But how do we model microgravity on Earth- where there is always gravity?

**Question:** Can we model the effects of microgravity on root development in our classroom?

**What do you think and *why*?**

**Gather materials for your group:**

- 6 radish seed
- 2 Ziplock bags (small, sandwich size)
- 2 Paper towels
- Water
- Mister
- Sharpie
- Tape

**Let's get started!**

1. Radish seed are divided into two groups:
  - Control (Gravity)
  - Experimental (Microgravity)
2. Label one ZipLock bag "Gravity" and one "Microgravity (TURN)" Include the following information on each bag:
  - Gravitropism Experiment
  - Date
  - Initials of group members or group name
3. Mist a folded paper towel so that it is fully damp, but not wet.
4. Lay 3 radish seed on paper towel and fold over so that the seed is between both sides. Lay flat in Ziplock bag labeled "Gravity", push most of the air out of bag, and seal.
5. Repeat with bag labeled "Microgravity"
6. Ensure that bags are fully closed and tape side by side to window.
7. Turn the bag labeled "Microgravity (TURN)" upside down and retape to the window. Do this twice each day. Do no turn the bag labeled "gravity".
8. After 5 days open each bag and write down observations

## Observations: Root Development

Illustrate your observations

Gravity (Control)	Microgravity (Experimental)

### What happened?

Compare your results to the other groups! What effect does microgravity have on roots?

What implications could this have on growing plants in space? What other aspects of plant development could be affected by microgravity?