

# Principles for Teaching Plant Biology

## Heredity

### Central Dogma

Plant traits are dictated by genes, which direct the synthesis of RNAs and proteins.



### Transmission Genetics

DNA, stored as chromosomes, is the genetic material of plants and is inherited from one generation to the next via sexual or asexual reproduction.



### Population & Quantitative Genetics

Phenotypic variation of many traits depends on the interaction of genotypes and environmental factors.



### Alternation of Generations

Plant reproduction is characterized by the property of the alternation of generations.



### Breeding

Selection of particular plant phenotypes has been integral to the development of human society as it is the basis for plant breeding and agriculture.



## Evolution

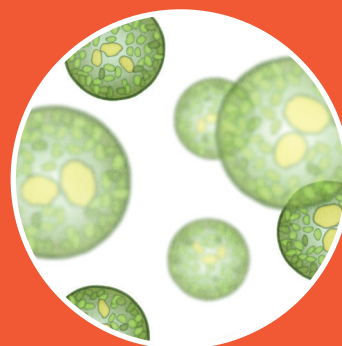
### Species Biodiversity

Plant biodiversity can be seen at the genetic level, the species level, and the ecosystem level.



### Common Ancestry

Land plants evolved from water-dwelling algae-like ancestors that could perform photosynthesis.



### Natural Selection

The cells of all living organisms, including plants, contain DNA as their genetic material.



### Environmental Response

Plants live in and have adapted to a wide variety of environments.



## Molecules to Organisms

### Photosynthesis

During photosynthesis, plants convert energy from sunlight to produce sugars from carbon dioxide, providing energy and carbon to the plant and the biosphere.



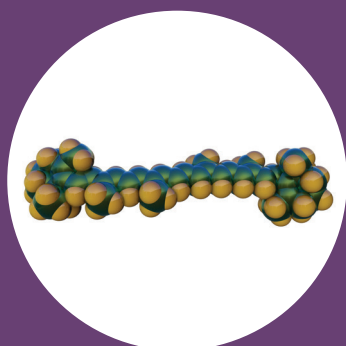
### Phytohormones

Throughout a plant's life cycle, plant hormones are essential for growth, development, and responses to the environment.



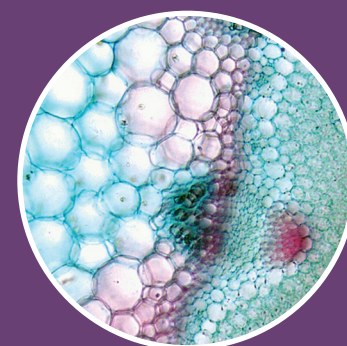
### Specialized Metabolites

Plants produce specialized compounds that provide an advantage to the organism in their environment even though they are not required for growth and development.



### Cell Walls

Cell walls provide plant cells with support and protection against mechanical and osmotic stress.



### Development

Plants have special areas that contain stem cells. These cells continuously divide to help the plant grow and can become many different organs.



## Ecosystems

### Biogeochemical Cycles

Plants, as primary producers, play an essential role in the nutrient cycling through the biosphere.



### Impact of Biodiversity

Plants are key to maintaining complex natural systems.



### Ecosystem Services

Plants provide many supporting, provisioning, regulatory and cultural ecosystem services.

