

Chapter 1. Introduction to plant biology

1. Introduction

Plant biology, is the study of plants and plant-like organisms. Plants and plant-like organisms provide many ecological services. That is, by merely living they serve the needs of other organisms, including humans. For example, they are sources of food, fabric, shelter, and medicine. They produce atmospheric oxygen and organic nitrogen. They build new land and inhibit its loss by erosion. They control atmospheric temperature. They decompose and cycle essential mineral nutrients (Murphy et al., 2015).

The light is transformed by plant tissue into chemical energy in a process called photosynthesis. Technically, a plant is an organism that is green and photosynthetic (producing organic sugar from inorganic carbon dioxide, water vapor, and light). In addition, plant cells (the basic units of which all organisms are composed) are surrounded by a rigid wall made of cellulose, a molecule rarely found in other organisms. Plants have multicellular bodies usually well suited to life on land because they can control water loss, they have strengthening tissue that keeps them upright, they can somewhat regulate their temperature, and they can reproduce with microscopic drought-tolerant cells called spores.

2. A brief survey of plant classification

Twenty years ago, the majority of biologists embraced a five-kingdom classification system that was initially elaborated by plant ecologist Robert Whittaker in 1969. This system identified five kingdoms: Monera, Fungi, Protista, **Plantae**, and Animalia.

The kingdom Monera included bacteria; Fungi included molds, mildews, and mushrooms; Protista included a great variety of simple organisms, some of which were photosynthetic, and largely aquatic organisms informally called algae; Plantae included more complex photosynthetic organisms that typically grew on land; and Animalia included typically motile, multicellular, non photosynthetic organisms distributed in habitats throughout the world.

Domain Eukarya includes what we commonly recognize as the plant, animal, and fungal kingdoms and the Protista.

In this semester's plant biology course, we will focus exclusively on the Plantae kingdom.

Each kingdom can be divided into divisions or phyla, the members of each having originated from a common ancestor. In the kingdom Plantae, Division (phylum) names end in phyta. Below divisions are classes (ending in -opsida), orders (ending in -ales), families (ending in -aceae), genera (genus), and species. This hierarchy is part of the **Linnaean system of taxonomy**.

Linnaean system of taxonomy is so called according to **Carl von Linné**: also known as Carolus Linnaeus, was a Swedish botanist, zoologist, and physician who is best known for his work in taxonomy, the science of classifying living organisms. Linnaeus developed the **binomial nomenclature system**, which is still used today to name species.

Binomial nomenclature system: The binomial nomenclature system, developed by Carl Linnaeus, is a standardized system for naming species of living organisms. According to this system, each species is given a two-part Latin name, consisting of the genus name (capitalized) followed by the species name (lowercase), both of which are italicized or underlined when written.

Example:

- *Solanum tuberosum* is the scientific name of the potato, where "*Solanum*" is the genus and "*tuberosum*" is the specific epithet.
- *Lavandula angustifolia* is the scientific name of the lavender, where "*Lavandula*" is the genus and "*angustifolia*" is the specific epithet.

3. What do we mean by plant taxonomy?

Plant taxonomy is the branch of biology that deals with the classification, identification, naming, and description of plants. It is a sub-discipline of taxonomy that focuses specifically on plant species, their relationships, and their classification into hierarchical groups.

Plant taxonomy is essential for understanding the diversity of plant life on Earth and for organizing this diversity into a coherent and logical system. It helps botanists and other scientists to:

- Identify and describe plant species: Plant taxonomy involves the identification and description of new plant species, as well as the documentation of existing species.

- **Classify plants:** Plant taxonomists classify plants into hierarchical groups based on their evolutionary relationships and shared characteristics. These groups include divisions, classes, orders, families, genera, and species.
- **Name plants:** Plant taxonomists use the binomial nomenclature system to assign each plant species a unique two-part Latin name. The first part of the name indicates the genus, and the second part indicates the species.
- **Understand plant evolution:** Plant taxonomy helps us understand how different plant species are related to each other and how they have evolved over time. It provides insights into the evolutionary history of plants and how they have adapted to different environments.

Overall, plant taxonomy is essential for organizing and understanding the vast diversity of plant life on Earth and for communicating about plants in a standardized way.

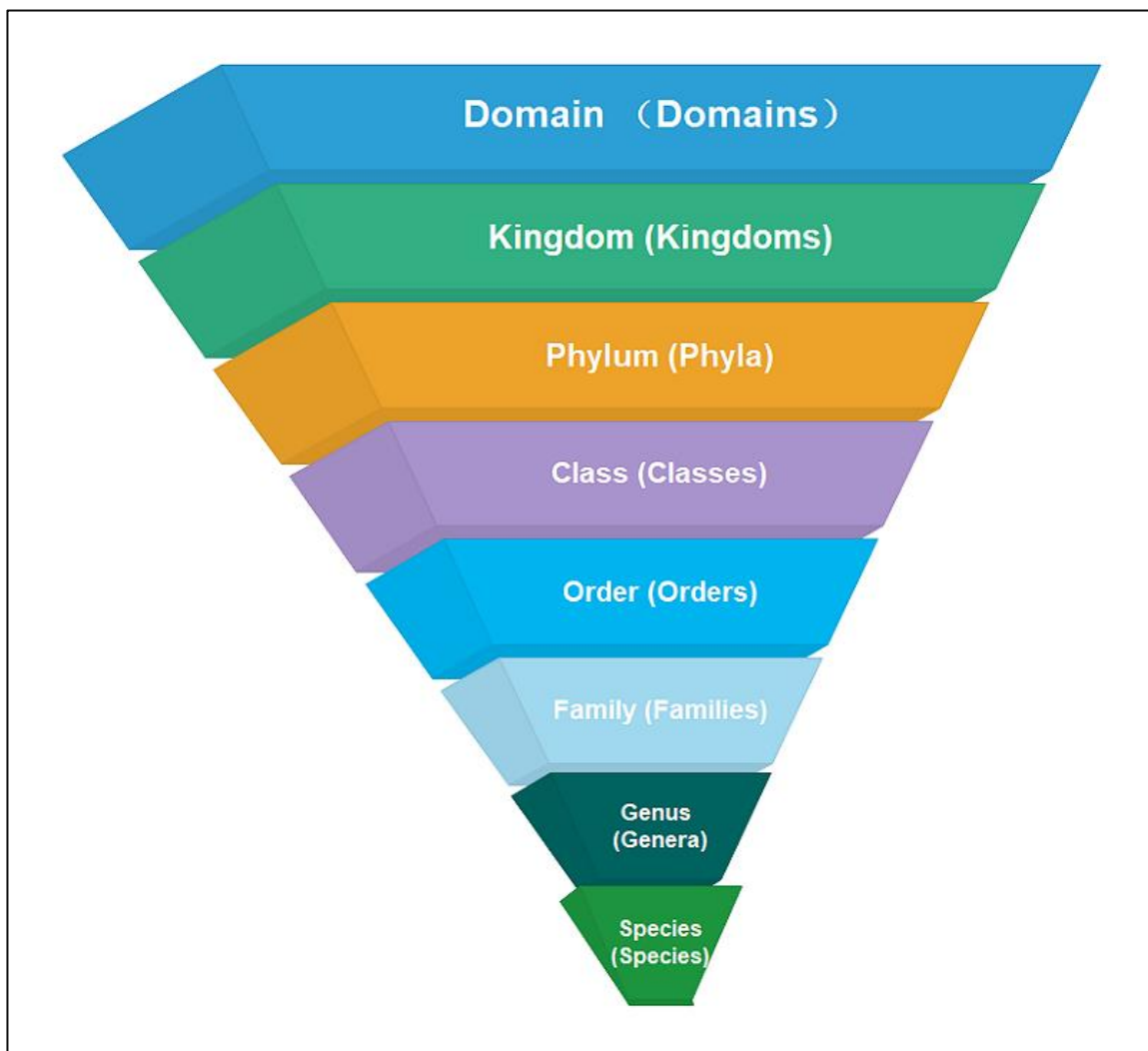


Figure 1 : Relationships among domains, kingdoms, phyla (divisions), and smaller classification units.

4. Plant kingdom diversity

The **plant kingdom** contains mosses, ferns, pine trees, oak trees, shrubs, vines, grasses, and broad-leaved herbs--the organisms we informally call plants. Organisms in this kingdom are adapted to life on land, and some of them are among the more recent forms of life to evolve and appear in the fossil record. Plants that produce seeds, cones, and flowers are relatively large and abundant and give the landscapes of the planet their characteristic appearance, making up most of the biomass of forests, meadows, shrub lands, deserts, marshes, woodlands, and grasslands.

Members of the kingdom **Plantae** share certain unique biochemical traits. They have eukaryotic cells with walls made of cellulose, they accumulate starch as a carbohydrate storage product, and they have special types of chlorophylls and other pigments. Only green algae have these same traits, which is why they are also part of the plant kingdom.

Plants have more complex bodies than bacteria, fungi, or protists. The complexity is visible from cell to cell and from region to region within the plant's body. Some cells and tissue are specialized to transport fluids, to store reserves, to perform photosynthesis, or to add strength. Different parts or regions of the plant form such unlike structures as leaves, stems, roots, flowers, and seeds. Plants have major ecological and economic importance. They form the base of terrestrial food chains, they are the principal human crops, and they provide building materials, clothing, cordage, medicines, and beverages. Our terrestrial ecosystems are dependent on organisms in the kingdom Plantae.