

Chapter 1

Introduction to the Introduction

1.1 Plants, Botany, and Kingdoms

Botany is the scientific study of plants and plant-like organisms. It helps us understand why plants are so vitally important to the world. Plants start the majority of food and energy chains, they provide us with oxygen, food and medicine.

Plants can be divided into two groups: **plants₁** and **plants₂**. Plants₁ contain **all photosynthetic organisms** which use light, H₂O, and CO₂ to make organic compounds and O₂. Plants₁ are defined *ecologically* (based on their role in nature).

Some plants₁ can be bacteria or even animals! One example of this is a green slug, *Elysia chlorotica* (see Fig. 1.1). Green slugs collect chloroplasts from algae and use them for their entire life as food producers. Therefore, green slugs are both animals and plants₁.

Plants₂ are **all organisms from Vegetabilia kingdom**. Normally, plants₂ are green organisms with a stem and leaves. We can define them also as **multi-tissued, primarily terrestrial and photosynthetic eukaryotes**. This definition is *taxonomical* (based on evolution).

It is possible for the organism to be plant₂ but not plant₁ (see Fig. 1.2). Those who fall into that category, are fully parasitic plants (mycoparasites like *Pterospora*, root parasites like *Hydnora*, stem parasites like *Cuscuta*, and internal parasites like *Piostyles*) which do not practice photosynthesis but have tissues, terrestrial lifestyle and originated from photosynthetic ancestors.



Figure 1.1. Green slug *Elysia chlorotica* captures chloroplasts from the alga *Vaucheria litorea*.

Plants may be understood on several levels of organization: (from top to bottom) (a) ecosystems or taxa, (b) populations, (c) organisms, (d) organs, (e) tissues, (f) cells, (g) organelles, and (h) molecules (Fig. 1.3).

Botany is considered to be a “slice science” because it covers multiple levels of organization.

1.1.1 Taxonomy

Taxonomy, systematics and **classification** are terms with similar meanings; they are all about the overwhelming diversity of living organisms, for there are more than 2,000,000 species (and 300,000 of them belong to plants₂). **Phylogenetics** is a more fashionable term; it emphasizes the evolutionary history (**phylogeny**) of taxonomic groups (**taxa**).

This taxonomic organization is hierarchical. Most scientists accept seven main levels of taxonomy (**ranks**): the highest is **kingdom**, followed by **phylum**, **class**, **order**, **family**, **genus**, and lastly, **species**.

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The highest rank, kingdoms are easy to understand as the *pyramid of life* (Fig. 1.4) which is divided into four levels—kingdoms. At the bottom is **Monera**, which con-

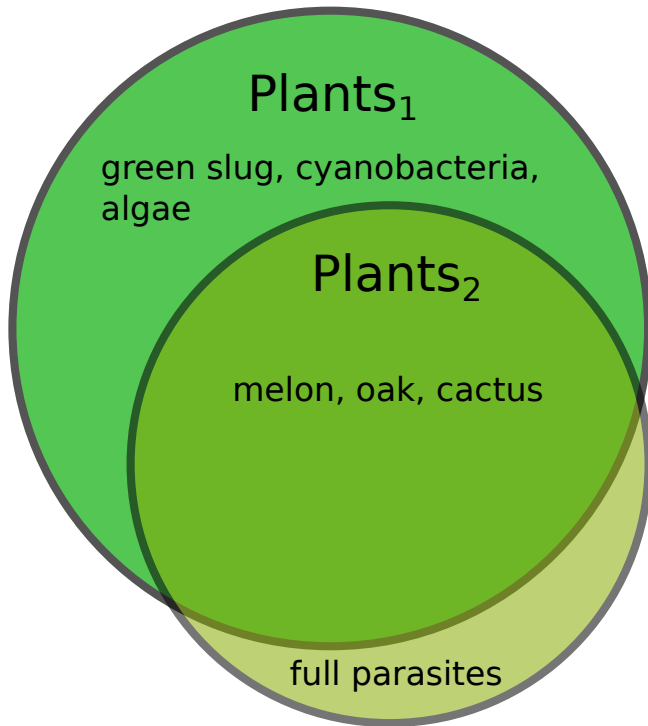


Figure 1.2. Plants_1 and plants_2 .

sists of prokaryotes (Bacteria and Archaea). This is the first level of life: Monera have simplest cells without nucleus. The next level is **Protista**. These are eukaryotes (nuclear cells) without tissues; some examples are algae and fungi. The final level consists of two groups: **Vegetabilia** and **Animalia**. They both have tissues but have obtained them for completely different purposes. Animals have tissues *to hunt and digest*, while plants have tissues mainly *to survive on land*. Viri which are mentioned sideways, are not living things but merely pieces of DNA or RNA which “went astray” out of cells of living organisms of all four kingdoms. Despite of being non-living, viruses are capable of evolution.

Plants_2 (kingdom Vegetabilia) contain more than 300,000 species and divided in multiple subgroups (Fig. 5.1).

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Ranks are used to compare taxonomic groups (**taxa**) from different major groups. No precise definitions are available for particular ranks, but it is believed that they