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Timothy Walker

# PLANTS

A Very Short Introduction

OXFORD

Timothy Walker

PLANTS  
A Very Short Introduction

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Martin Redfern

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# Chapter 1

## What is a plant?

Plants, like love, are easier to recognize than to define. At the entrance to many areas of outstanding natural beauty in England can be seen a sign that asks visitors to avoid 'damaging trees and plants'. It is fair to ask in what way is a tree not a plant. A plant is often defined simply as a green, immobile organism that is able to feed itself (autotrophic) using photosynthesis. This is a heuristic definition for plants that can be refined if some more characters are added. Sometimes plants are described as organisms with the following combination of features:

- 1) the possession of chlorophyll and the ability to photosynthesize sugar from water and carbon dioxide;
- 2) a rigid cell wall made of cellulose;
- 3) storage of energy as carbohydrate and often as starch;
- 4) unlimited growth from an area of dividing and differentiating tissue known as a meristem;
- 5) cells with a relatively large vacuole filled with watery sap.

So trees are clearly plants, and it is not difficult to think of other organisms that are unequivocally plants even though they lack one or more of these characteristics. For example, the orchid *Corallorhiza wisteriana* has the flowers of an orchid, produces tiny seeds typical of the family Orchidaceae, and has the vascular tissue that you find in the majority of land plants. However, what

it does not have green leaves, because this orchid is mycotrophic, meaning that it lives off fungi which themselves derive their energy from decaying material in the forest floor. It is able to do this because of a very intimate relationship with a fungus, a characteristic found to varying degrees throughout the orchid family. In a similar vein, *Lathraea clandestina*, which can be seen growing on the banks of the River Cherwell in Oxford, has flowers reminiscent of a foxglove, yet it too has neither shoots nor leaves. Its flowers emerge directly from the soil because this plant has roots that are able to infiltrate the roots of willow trees and divert the nutritious contents of their vascular tissue. Both of these plant species have lost the ability to photosynthesize, but they are still plants because they share many, many other features with those plants which do still photosynthesize.

The problem with the definitions above is that they are too limited, because they do not take into account some of the algae that live in water. In order to arrive at a sensible and unambiguous definition for plants, we need to consider how we classify biological organisms. Similar individuals are grouped together into a species. Similar species are then grouped into a genus. Similar genera are grouped together into a family; and similar families are grouped into an order; similar orders into a class; similar classes into phylum; and similar phyla into a kingdom. Each of the groups in this hierarchy can be referred to as a taxon, and the study of groups is known as taxonomy. Prior to the 19th century, taxonomists tried to create a *natural* classification that revealed the plan of the Creator. Since the 19th century, biologists have questioned whether species can change and evolve by retaining those changes and passing them on to their offspring.

A great deal of work is currently being carried out to build the 'tree of life' (or phylogeny) that shows how all living organisms are related to each other. This work received its kickstart in 1859 with the publication of Darwin's *On the Origin of Species*, and it is still ongoing. An evolutionary tree is the only illustration in





1. *Orobanche flava* is one of many parasitic plants that do not photosynthesize but which steal from other plants