

EXPLORING BIOLOGY

PLANT & ANIMAL BIOLOGY



Contents

The Plantae and Animalia Kingdoms	4
Plants	6
Plant Cells	8
Plant Bodies	10
Plant Reproduction	12
Photosynthesis and Respiration	14
Plants in Extreme Habitats	16
Animalia	18
Animal Cells	20
Simple Invertebrates	22
Arthropods	24
Lower Vertebrates	26
Birds	28
Mammals	30
Social Groups	32
Animal Bodies	34
Animal Locomotion	36
Animal Reproduction	38
Other Senses	40
More to Explore	42
Review and Reflect	44
Glossary	46
Read More	47
Learn More Online	47
Index	48

The Plantae and Animalia Kingdoms

All living things on Earth are split into six different biological kingdoms. Together, the Plantae and Animalia kingdoms account for more than nine million species worldwide—with many more yet to be discovered. Within these kingdoms, there is a vast and diverse variety of species. They come in different shapes and sizes. Many have characteristics that they share and some that are unique to that species specifically.

Common Ancestor

Scientists believe that all plant and animal species share a single common ancestor. This cell from around four billion years ago is often referred to as the last universal common ancestor. Scientists theorize that this shared ancestor lived hidden away in deep-sea vents on the ocean floor, where it made its own food and survived without air.

Eukaryotes

Eukaryotes are living things made of cells that have a nucleus. They can range in size from as small as a microscopic single-celled organism to as large as a blue whale. Eukaryotes can be either unicellular or multicellular. Bacteria and yeast are both examples of unicellular eukaryotes. Palm trees, toucans, and many other plants and animals are multicellular.



Blue whales can be up to 90 feet (27 m) long, and they can weigh more than 200,000 pounds (9,000 kg).

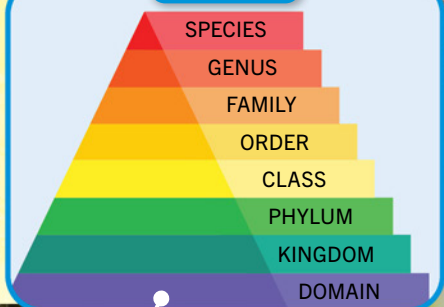


Brazil is the world's most biodiverse country. It is home to around 15 to 20 percent of the plant and animal species currently known.

Taxons

Living things are divided into a series of groups called taxons. These are organized according to how the different members within each group are related to one another. Taxon members share a common ancestor. This means that all members of a class or order evolved from one species a long time ago.

Taxonomy



The science of classification is called taxonomy. Groups of living things are divided from broader to more detailed categories. This allows scientists to identify organisms based on their shared characteristics.

Plants

There are around a quarter of a million species of plants that make up the kingdom Plantae, with members ranging from tiny mosses to towering trees. Plants power their bodies through photosynthesis—a process that uses the energy in sunlight to make sugar from water and carbon dioxide. Aside from the coldest and driest habitats, plants are found in all parts of the world.

The giant sequoia is one of the largest and longest-living organisms on Earth. It grows to about 280 ft. (85 m) tall and lives for more than 3,000 years!

Internal Vessels

Moss is one of the simplest kinds of plants. It grows over surfaces, and its flat body has no distinct roots, stem, or leaves. Mosses are nonvascular plants, which means they don't have a channel to transport water or nutrients. Vascular plants, such as ferns, conifers, and flowering plants, have vessels that can transport water and sugar around them.

This makes their bodies stiff enough to grow up toward the light.

The giant sequoia is a conifer. It uses cones to breed and make seeds. Most plants grow flowers, not cones, for this purpose.

Moss is mostly green because it is full of a green chemical called chlorophyll that absorbs red and blue sunlight in order to make food.



Janaki Ammal
1897–1984

Janaki Ammal was one of the first women to study botany. She bred new kinds of crops that would grow better in her home country, India. This allowed the country to produce more of its own food. At the same time, Ammal also campaigned to keep India's habitats as natural as possible.

HALL OF FAME

Seaweed

Seaweeds are plants that live in the oceans. They are not usually included in the Plantae kingdom. Instead, seaweeds are types of algae that grow into large, multicellular bodies. They photosynthesize and need sunlight to survive as land plants do, and so they grow mostly in shallow, sunlit water. Seaweeds have no roots but are anchored to the seabed. Instead of leaves, they have fronds that float in the water.



When the tide goes out, seaweeds are exposed to the air. Many seaweeds cover their fronds in waterproof slime to stay moist.

Trees usually grow above smaller plants to collect more sunlight. They strengthen their bodies with wood to grow tall.



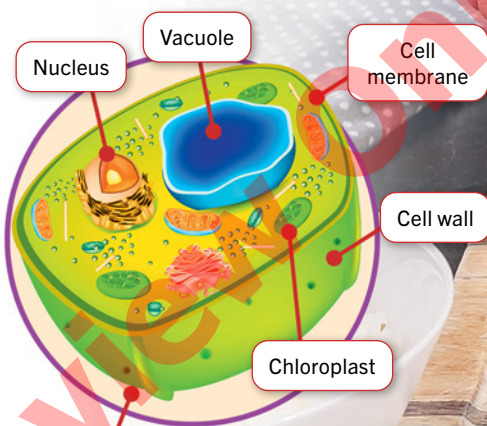
Plant Cells

Plants have a distinctive cell structure that sets them apart from other kingdoms of life. The most obvious feature is the cell wall that surrounds the cell's outer membrane and provides structural support.

Additionally, the cells in the green parts of a plant have chloroplasts that are used for photosynthesis.

Internal Structures

All cells share some basic features. They are filled with a watery liquid called cytoplasm, which is contained inside an enveloping cell membrane. The cells of complex life, such as plants, have a nucleus where the deoxyribonucleic acid (DNA) is stored. Plant cells typically have a large vacuole. This is a bag used to store water, salts, and sugars.



The cell wall of one plant cell is glued to its neighbors, creating strong plant bodies.

This wooden cutting board is composed of dead plant cells made of cellulose walls filled with a hard polymer called lignin.



Hay is almost pure cellulose. Farm animals have stomach bacteria that can digest this dried grass stalk.

Tough Cell Wall

The plant cell wall is made from a carbohydrate called cellulose. This is a polymer, or chainlike chemical, that is made from smaller glucose molecules joined together. The structure of cellulose makes it a very sturdy substance, which strengthens plant bodies enough to stand upright. Cellulose is left behind even after all the other parts of the cells have rotted away.

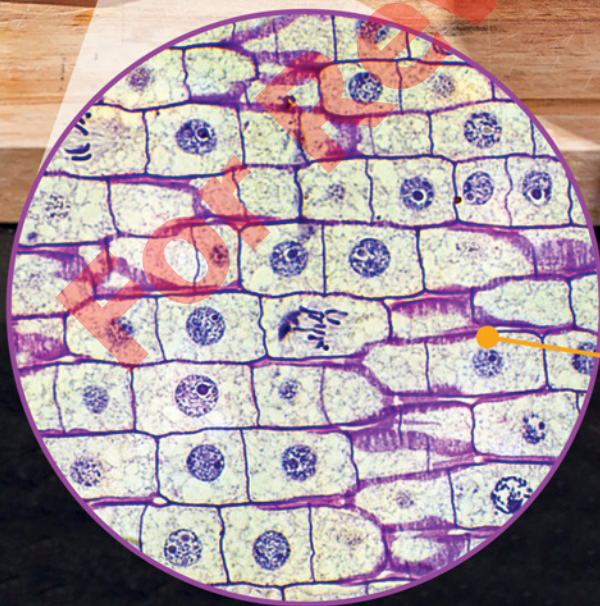
HALL OF FAME

Robert Hooke 1635–1703



Robert Hooke was one of the first scientists to use a microscope. In 1665, he used the tool to study a thin piece of cork from the bark of a cork oak tree. Hooke found that it was made from many tiny compartments. He thought they looked like the cramped living quarters in monasteries—rooms called cells. That term has been used ever since.

An onion is a plant body part called a bulb. During winter, this body part allows a plant to store food underground so that it can sprout again in spring.



The individual cells of a thin layer of onion skin are easy to see under a microscope. These have been dyed so the starch stored in the cells shows up as purple.

DID YOU KNOW? Plant cells are often rectangular in shape. They are usually between 0.0004 and 0.004 inches (0.01 and 0.1 mm) long.