Title: Leaf Shapes and Arrangements

Purpose:

- to observe variation in leaf shape and arrangement
- to use specific terms to describe leaf shape and arrangement
- to relate leaf shape and structure to leaf function

Materials

- leaves from 10 different plants
- leaf shape and arrangement charts
- text and online resources

Procedure:

- Using textbook pages 506~507 as a reference, draw and label leaf and stem parts
- Select 10 different leaves
- Trace each leaf
- Use the *Leaf Shapes and Arrangements Chart* (http://theseedsite.co.uk/leafshapes.html) and *Plant Structure Chart* (http://www.rbgkew.org.uk/ksheets/pdfs/plant.pdf) to identify shape and arrangement or leaves
- Label the parts of each leaf

Results:

- Labeled drawing of representative leaf
- Labeled drawings and descriptions of leaves' shape and arrangement

Discussion:

- Summarize what you did
- Describe the differences and similarities in leaf shapes and arrangements you noted
- Comment on the functional significance of these similarities and differences

Conclusion:

- A testable statement about leaf structure and/or arrangement

Reflection:

- Commentary on what you learned from the lab

Helpful Sites

- http://waynesword.palomar.edu/termlf1.htm
- http://waynesword.palomar.edu/termlf2.htm
- http://www.csdl.tamu.edu/FLORA/201Manhart/veg/leaf.shapes/leafshapes.html
- http://www.trump.net.au/~joroco/leafglossary.htm
- http://www.hcs.ohio-state.edu/hcs300/glossary/leafpart.htm

Plant structure – leaves, stems and roots

ROYAL BOTANIC GARDENS KEW

Kew **information** sheet **B3**

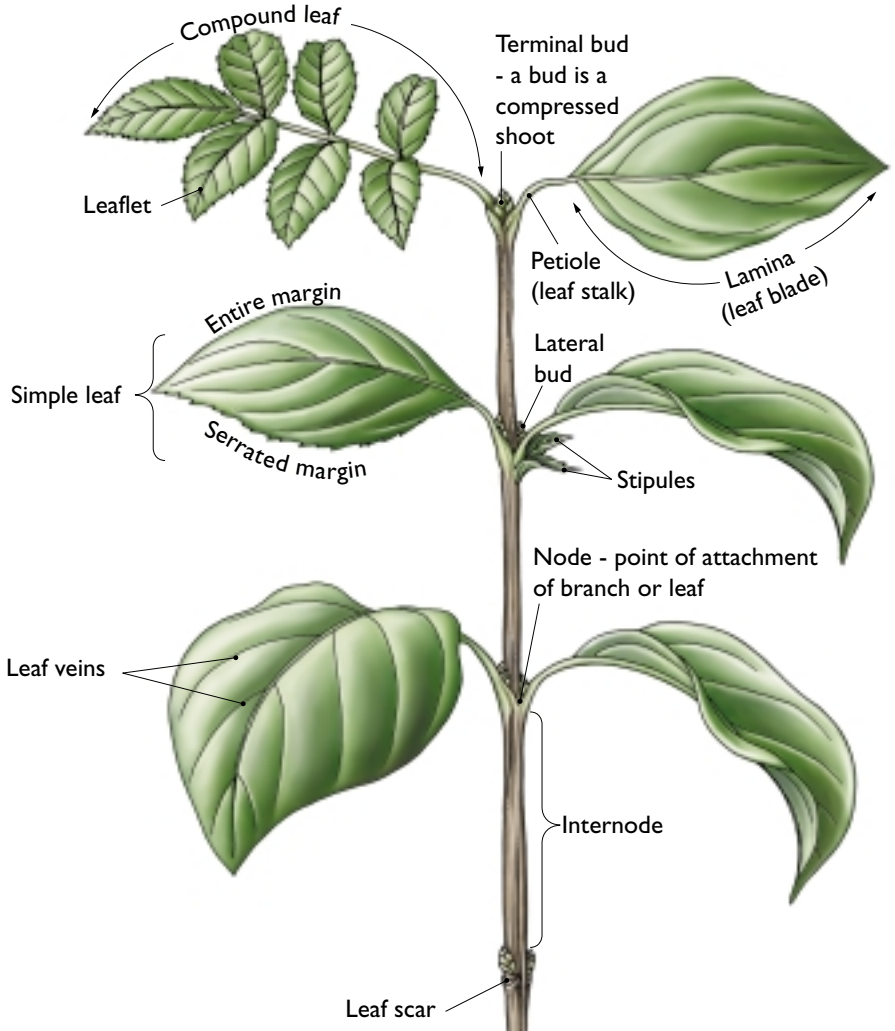
STRUCTURE

FUNCTION

Leaves

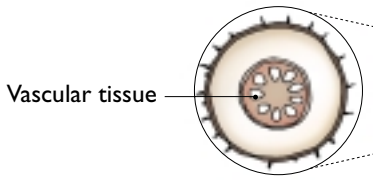
Leaves come in a huge variety of shapes and sizes.

Many characters are used in classification and identification.



Leaves are a plant's **food factory.** They are the main site of photosynthesis, where sugars are made from water and carbon dioxide, using sunlight energy.

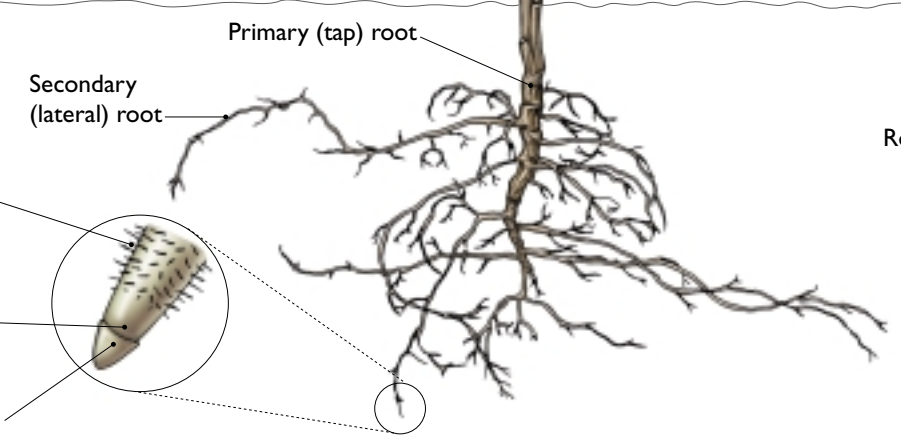
Stems



Stems **support** the leaves, flowers and fruit.

Stems **transport** water, minerals and sugars to leaves and roots.

Roots



Roots provide **anchorage** in the soil.

Roots allow **absorption** of water and nutrients.

Roots allow **transport** of water and nutrients.

Adaptations of leaves, stems and roots

Leaves are the main site of photosynthesis – the production of carbohydrates using energy from sunlight. Photosynthetic leaves are usually thin, have a large surface area, and are arranged and angled on the plant for maximum light absorption. However, they can be adapted for other purposes including food and water storage, support and defence.

Food storage
Bulb
Onion (*Allium cepa*)

A very short stem axis with thick fleshy scale leaves.

Defence / water loss
Spine
Opuntia marnierana

Each leaf has become a woody and non-photosynthetic spine. The small surface area of the spine reduces water loss and protects the plant from herbivores.

Attraction
Floral bracts
Bougainvillea glabra

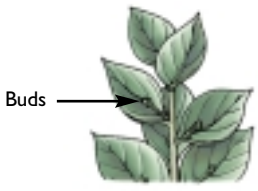
Leaves play the role of petals in attracting pollinators.

Carnivorous
Venus fly trap (*Dionaea muscipula*)

Leaves are modified to form an insect trap.

Stems tend to be above ground, erect and self-supporting. They usually end in a bud and bear leaves, lateral buds and reproductive organs. Lateral branches arise in the axils of leaves (the angle between leaf and stem). There are many variations on 'normal' stems. They may be underground, prostrate, or serve as storage, reproductive or support organs.

Photosynthetic
Phylloclade or cladode
Butcher's broom (*Ruscus aculeatus*)

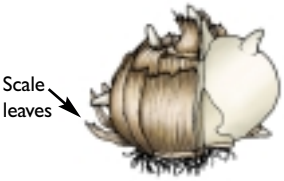


Stem structure that looks and acts as a leaf.

Storage
Rhizome
Ginger (*Zingiber officinale*)

Underground stem that grows horizontally below soil surface. Generally thick, fleshy or woody.

Storage
Corm
Crocus (*Crocus* species)



A short, swollen (vertical) stem of several nodes and internodes. Develops at or below ground.

Climbing/support
Tendril
Grape vine (*Vitis* species)

Deciding whether a tendril is a modified stem or leaf can be difficult. Its position and presence/absence of reduced scale leaves give clues.

Roots tend to grow downwards, away from light and towards water. As a general rule, they bear neither leaves nor buds. Their primary roles are anchorage, absorption and transport. However, roots have adapted to fulfil a variety of other functions including storage, support and aeration.

Absorption
Aerial roots
Epiphytic orchid (*Oncidium* species)

Epiphytic plants grow on other trees using them for support. Their aerial roots rarely reach the soil so absorb water from rain or mist.

Aeration
Pneumatophores
Mangrove (*Sonneratia* species)

Air-breathing roots have internal air spaces connecting with the submerged roots.

Attachment
Ivy (*Hedera helix*)

Adventitious attachment roots grow from aerial stems, on the side in contact with a surface.

Support
Prop roots
Maize (*Zea mays*)

Aerial roots grow down from the stem into the soil.

Illustrations: Debbie Maizels

Further information

Bell A. D. & Bryan A. (1993) *Plant Form: an Illustrated Guide to Flowering Plant Morphology*. Oxford University Press, Oxford.

Leaf Shapes and Arrangements
http://theseedsite.co.uk/leafshapes.html

Plants have leaves in many different shapes - the thicker the book you refer to, the more leaf shapes they seem to find, but here are some of the basic ones.

Sword-shaped
(ensiformis)
Long, thin, pointed

Lance-shaped
(lanceolata)
Long, wider in the middle

Ovate
(ovata)
Oval, with a tapering point

Elliptic
(elliptica)
Oval, with a short point

Round
(rotundifolia)
Circular
.

Cordate
(cordata)
Heart-shaped
.

Oblanceolate
(oblanceolata)
Top wider than bottom

Spathulate
(spathulata)
Spoon-shaped

Rhomboid
(rhomboidalis)
Diamond-shaped

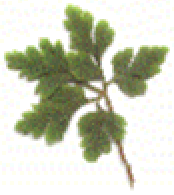
Lobed
(lobata)
With several points

Spear-shaped
(hastata)
Pointed, with barbs

Pinnatisect
(pinnatifida)
Cut, but not to the midrib

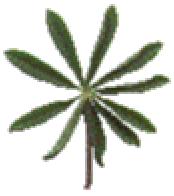
Pinnate
(pinnata)
2 rows of leaflets

Bipinnate
(bipinnata)
Each leaflet also pinnate



Tripinnate
(tripinnata)
Each leaflet divided into 3

Trifoliate
(trifoliata)
Divided into 3 leaflets



Palmate
(palmata)
Divided into many lobes

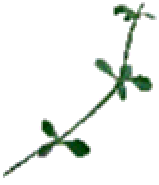
Digitate
(digitata)
Divided into 5 lobes

Opposite
(oppositifolia)
Leaves opposite one another

Alternate
(alternifolia)
Arranged alternately

Perfoliate
(perfoliata)
Stem through the leaves

Peltate
(peltata)
Rounded, stem underneath



Whorled
.
In circles round the stem

Rosette
.
Leaves in close rings

Leaf Margins

http://www.fnr.purdue.edu/extension/kp/lm.html

Revolute

Entire

Repand

Sinuate

Serrate

Dentate

Doubly Serrate

Doubly Crenate

Lobed

Parted