

Cactus Identification using Morphology

- growth and shape patterns as a means of plant i.d. (can also use geographic distribution, plant taxonomy)
- the characteristic appearance or form of a plant includes color, leaves, spines, shape
- habit of growth - the manner in which the plant grows as it matures

Anatomy on the other hand refers to the internal organization and structure of the plant

A word about plant identification: approach from different angles

1. Study the form of the plant in question and its characteristics-have to examine plant very closely
2. Read descriptions of plant types and patterns of growth of known specimen representatives
3. Study plant taxonomy and organization of plant classification: family, subfamily, genera, species, etc.
4. Look at pictures of same – start to recognize patterns
5. Make an educated guess
6. Validate your guess with other known examples, searching online and here at club
7. Recognize that id. is inexact science – more of an art – and remember that even the same plant can look different due to variations in growth conditions.
8. Other factors can provide clues but only talking about morphology in this talk
 - a. If cactus is flowering, bud, flower appearance can provide clues
 - b. geographic habitat information – in habitat, a wide distribution encourages greater variation such that it can become difficult to tell where to draw the line where one species becomes an entirely different one.
 - c. Cactaceae is divided into 4 subfamilies:
 - i. Pereskioideae: leaf cactus – has persistent petiolate leaves that perform photosynthesis
 - ii. Opuntiodideae – characterized by presence of glochids, habitat most wide ranging geographic range
 - iii. Cactoideae - over 1,000 species, shows extremes of morphology diversity. extremely succulent, spheric, barrel-shaped to columnar or snakelike stems
 - iv. Maihuenioideae - these are low growing mat or cushion-forming plants.
9. Read the general descriptions for each and then identify characteristics and their genera and progressively refine search to species level and deeper
10. Keep in mind the role geographical habitat plays in affecting growth which can make the same cactus species from different regions look like entirely different from each other
11. Keep in mind that many hybrids (cultivars) are difficult to identify due to lack of information or documentation

Most important first question to answer:

Is it even a cactus?

First, figure out if it is a cactus and not another spiny plant.

Spine formation provides answer. A cactus is the only succulent with the following structures which give rise to spines.

1. **Tubercules:** warty projection or mound on ribs or flat surface of stem.
 - Single tubercule not always round or smooth-can be faceted.
 - Contains areole from which arise spines.
 - Sometimes these merge into vertical ridges or ribs.
 - Arrangement of tubercules varies by genera and species – i.e. Mammillaria are very symmetrical with each tubercule a fixed number of degrees from the last tubercule forming spiral pattern
2. **Areoles:** Meristemic tissue (actively dividing cells) - Give rise to flowers, branches, spines, roots. The growth point

Once it is a confirmed cactus – Examine typical cactus features

Narrows to a few possible genera. Descriptions below represent mature growth habit of representative cactus. In addition to Tubercules and Areoles listed above:

1. **Spines:** Modified leaves

- Grow from areole in various numbers, formations, colors, shapes, sizes, hardness (diagram).
Because they arise from areole and not from the stem directly, they can more efficiently cover the surface of a cactus as they can be in greater size and numbers.
Not easily detachable from areole.
Can be long, short, hooked, multicolored, hair-like, needle-like
- Glochids: smaller, detachable bristles, [glochids](#) (barbed and easily detachable) grow on members of the subfamily [Opuntioideae](#) thereby a good indicator to narrow identification to subfamily

2. **Cephalium:** Apical and Lateral

A flower-bearing, woolly and densely bristled outgrowth at the top of the stem of some cacti (apical cephalium), such as Melocactus and Discocactus, or side (lateral) of ceroid (columnar) cactus on which the flowers and fruit appear. Apical cephalium will only begin growing after a cactus has reached maturity, at which time the plant quits growing and producing photosynthetic cells.

3. **Stem:** In most species the leafless, spiny stem is the characteristic feature of the majority of cacti – adapted to store water.

- Stems can expand using rib adaptations, can be fluted, smooth, tuberculed, green, bluish, brownish green, visibly waxy.
- Large range of stem shapes
- Can be segmented or not with round or flattened segments such as cladodes (or pads) in Opuntia

4. **Leaves:** most cacti do not have visible leaves with some exceptions: Pereskia, Opuntia which have young leaves that drop off, small genus Maihuenia. Only Pereskia leaves are true leaves for photosynthesis

5. **Flowers:** all cactus flowers are complete containing petals, sepals, pistils, stamen.

- Range in color from white, yellow to orange, red to magenta.
- Very helpful in identification but cacti don't flower reliably for all growers.
- Species also vary in point where flowers emerge from stem – some flower in a ring
- Excepting Pereskia, each flower comes from separate areole

6. **Pleats or Ribs:** in columnar stems, supportive and adaptive structure to accommodate weight and shape as water is absorbed and accompanied by supportive circular skeleton of inter-connected, woody ribs.

- The number of ribs inside the plant correspond to the number of pleats on the outside of the plant.
- As the cactus grows, the ribs will occasionally fork and the corresponding pleat will also fork at the same place
- Tubercules can merge to form rib ridge as in Uebelmannia pectinifera, Astrophytum ornatum
- Expansion of ribs increases volume of water stem can hold
- Different genera can be n -sided