BPSC 031 "Spring Wildflowers"
Lab 7. Fabaceae (the Pea Family) and Cactaceae (the Cactus Family)

I. Fabaceae (Pea Family)

Plants ranging in size from herbs, to shrubs, to large trees with alternate, usually compound leaves with stipules (sometimes modified into glands or spines). The most distinctive trait of the family is the fruit, which is always a legume (a one-carpeled seed pod) with parietal placentation and one single row of large seeds. The roots of most plants in the family develop nodules that harbor nitrogen-fixing bacteria (*Rhizobium*). The flowers have three distinctly different forms, according to the subfamily, and the seeds are often laced with poisons (lectins and saponins) as defense mechanisms against predators. The family is classified according to its flower type into three subfamilies: (a) **Faboideae** (pea subfamily), (b) **Cesalpinoideae** (palo-verde subfamily), and (c) **Mimosoideae** (the mesquite subfamily). Each subfamily has a unique and distinctive floral pattern that makes them easily recognizable when flowering.

Key to the subfamilies of the Fabaceae

A. Flowers actinomorphic, in dense clusters, with reduced, inconspicuous petals and showy stamens, leaves bipinnate …… **Mimosoideae**
A'. Flowers zygomorphic, perianth conspicuous …….. **B**

B. Flowers with open petals exposing the androecium and pistil …….. **Caesalpinoideae**
B'. Flowers strongly zygomorphic, papilionoid. Lower petals forming a closed keel that encloses the stamens and the pistil …….. **Faboideae**

II. Cactaceae (Cactus Family)

Cacti are plants with leafless, succulent, fleshy green photosynthetic stems studded with clusters of spines arranged in rows or in spirals along the stem. They have showy, multi-petaled flowers with numerous stamens and an inferior ovary. Flowers display numerous spirally-arranged sepals that grade into numerous petals, together with numerous separate stamens and a single pistil with an inferior ovary and many fingerlike stigma lobes. The fruits are berries, often very fleshy and sweet, commonly bright red or yellow when ripe. Because the ovary is inferior, the fruits, like the stems, are covered with areoles (clusters of spines).

Take randomly one of the plants in the lab and, using the above descriptions and keys, try to identify the family and subfamily to which that species belongs. Then, according to the family you have identified, develop the following activities.

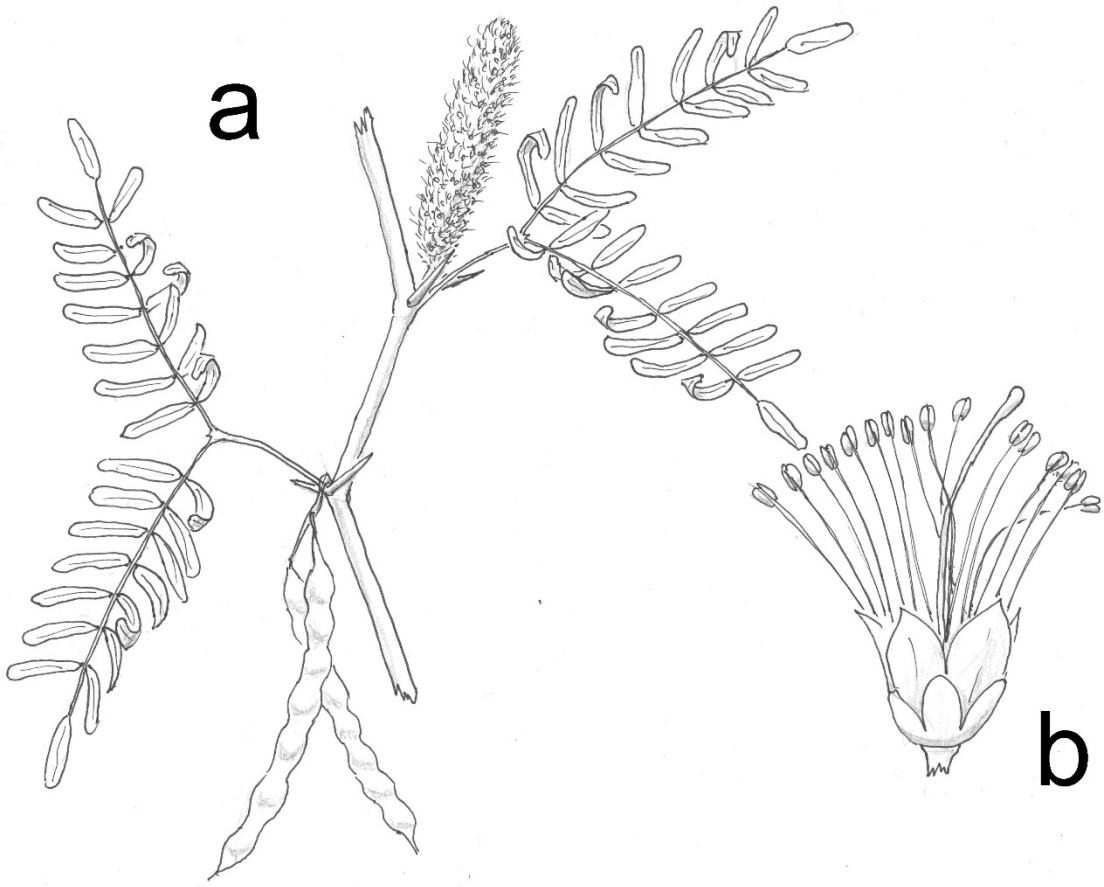
1. **Fabaceae (Pea Family)**

a. With care, dissect the flower and observe the flower parts. Is the flower action or zygomorphic? If zygomorphic, does it have a papilionoid morphology?
b. Look at a developed or developing legume. Dissect the legume and observe the seeds. Describe the placentation type.
c. Look in detail at the leaves and the stem. Can you see any stipules present at the base of the petiole? Is the leaf entire or composite?

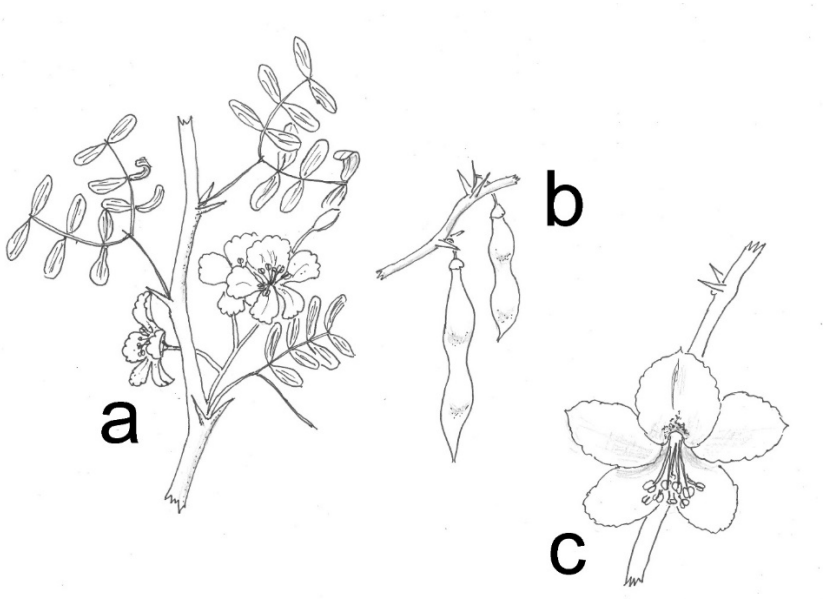
d. Make a sketch of the most distinctive traits you have observed in this species.

2. **Cactaceae (Cactus Family)**

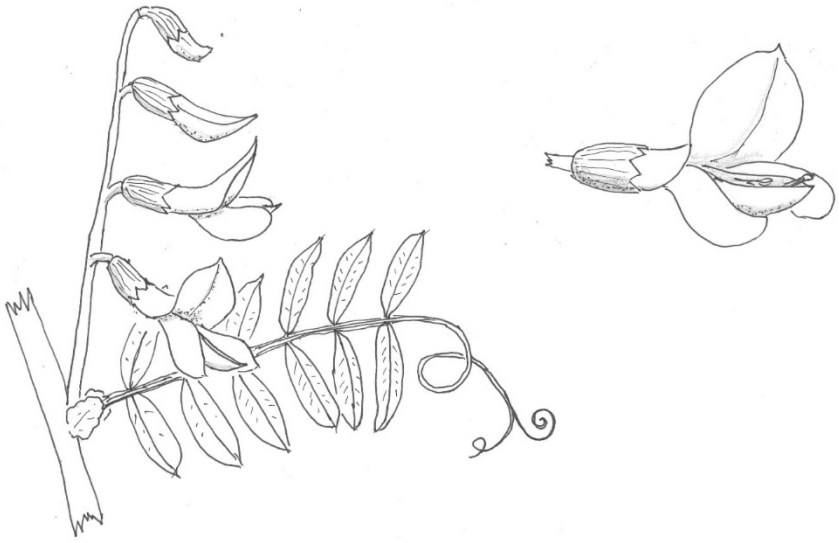
a. Look in detail at the flowers. Can you distinguish sepals from petals? Cut the ovary and describe the ovules. Is the ovary superior or inferior?
b. Look at the succulent stem and identify the areoles. What is the arrangement of the areoles around the stem, is it helicoidal, like in the prickly pears, or along longitudinal ribs, like in the saguaro?
c. If your plant is a prickly pear (*Opuntia*), observe the flat stem. Look in detail at the spines in the areoles. Can you see the two types of spines, large spines and microscopic spines called **glochids**?
d. Make a sketch of the most distinctive traits you have observed in this plant.



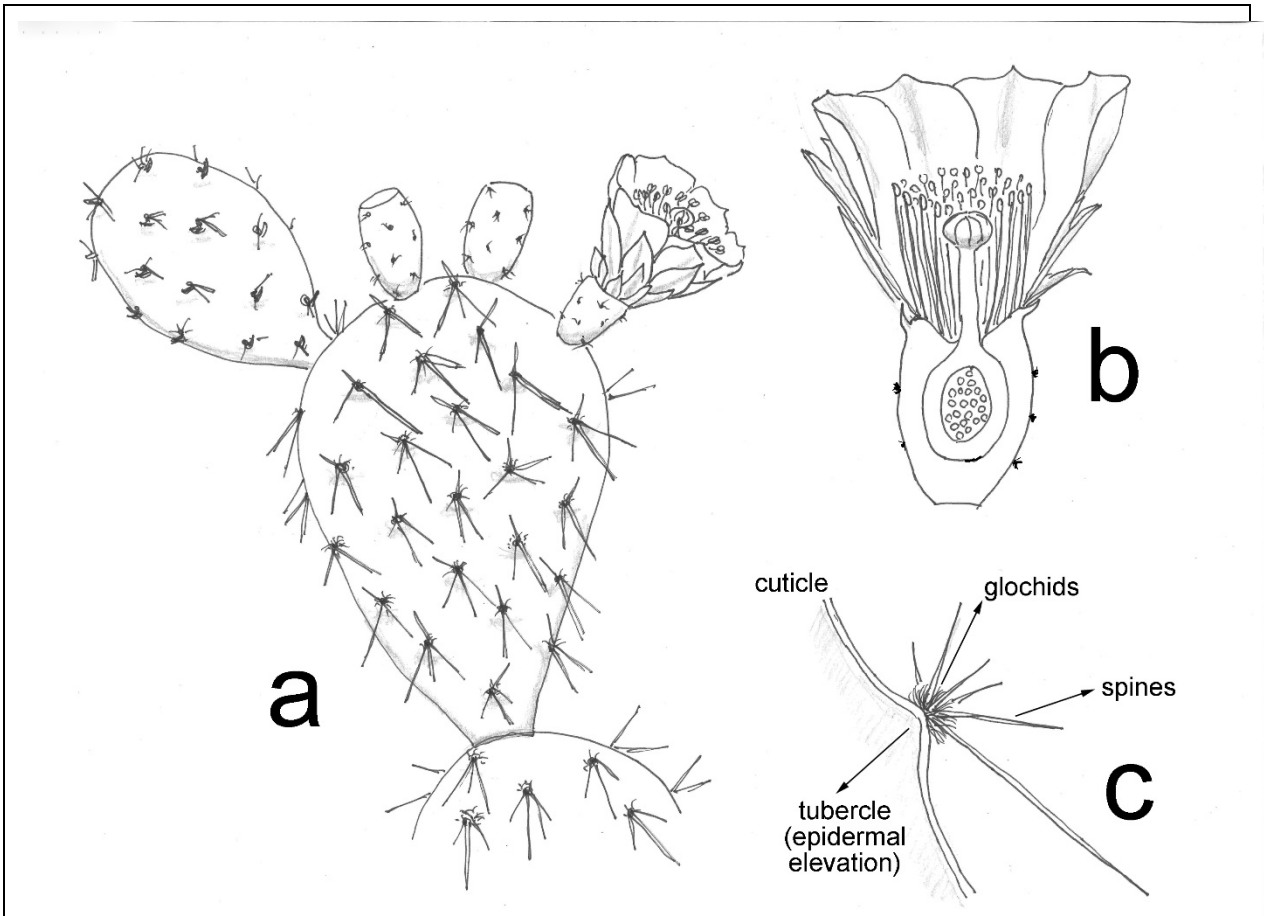
Mimosoids at a glance: (a) Compound, often bi-pinnate leaves with small actinomorphic flowers arranged in dense clusters. (b) Individual flowers have many long, colorful stamens that function as pollinator attractants as well as pollen providers (mesquite, *Prosopis glandulosa*).



Cesalpinoids at a glance: (a) Compound or sometimes bi-pinnate leaves and open, zygomorphic flowers with exposed androecium (10 stamens) and gynoecium; (b) fruit a legume, and (c) the flower has five petals: the upper banner petal is commonly larger and colorful, the lateral wind petals guide insects to the center of the flower, and the two lower keel petals form the landing surface for arriving pollinators (paloverde, *Parkinsonia florida*).



Papilionoids at a glance: Compound, palmate, or trifoliate leaves and open, zygomorphic flowers with anthers and a single pistil enclosed within a keel formed by the two lower petals. The flower has five petals: an upper, showy banner, two lateral wing petals, and two lower petals fused into a single keel that opens when pollinators land on it (San Diego pea, *Lathyrus vestitus*).



The Cactaceae at a glance: (a) Green, succulent stems with leaves transformed into spines and arranged in spine-clusters (areoles). (b) Flower with multiple tepals transitioning from outer leaf-like bracts on to large showy petals; multiple stamens surrounding a columnar style that opens radially into multiple stigmas. Ovary inferior, containing many seeds surrounded by sweet fleshy arils. (c) Areoles, formed by highly transformed axillary buds with leaves transformed into spines, develop on elevated tubercles (coastal prickly pear, *Opuntia littoralis*).