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BIOL 305L Spring 2020
Laboratory Seven
Flowering and reproduction

Introduction

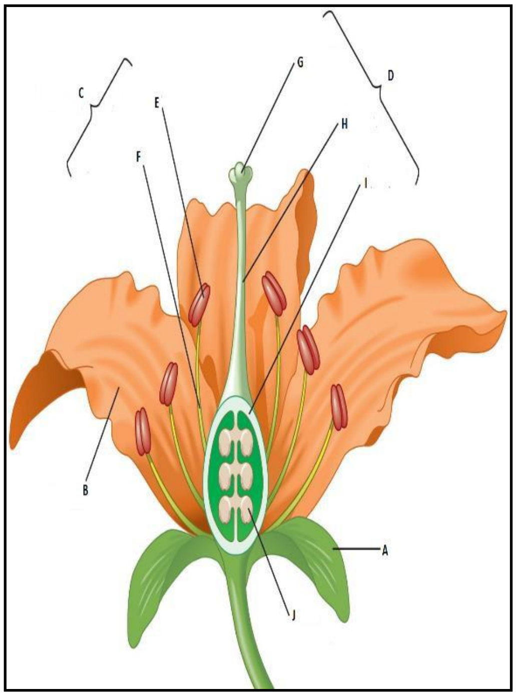
Flowers are not simple structures, and the diversity of flower shape, color, and fragrance suggests that angiosperms have evolved a variety of ways to reproduce (Heidemann, 1985). For many angiosperms, the differences in flower anatomy are related to how the plants are pollinated. However different they may look, most flowers do contain specific structures that assist in transfer of reproduction agents, structural support and attraction of pollinators (Elzinga, *et al.*, 2008; Heidemann, 1985).

The crucial step in sexual reproduction of angiosperms is pollination, the transfer of pollen from anther to stigma. This is the part of the reproductive process that the plant does not control itself. Instead, some other agent must transfer the pollen to the stigma. In some cases, gravity or wind may allow pollen to move from anther to stigma (Elzinga, *et al.*, 2008; Heidemann, 1985). These mechanisms are strictly mechanical, and may result in pollination of the same flower that produced the pollen. To avoid this self-fertilization, many plants rely on other agents, or use wind differently, to help insure cross fertilization with other flowers (Raguso, 2008). Pollination alone does not guarantee that fertilization will occur. Many factors interact to predict whether a pollination event will result in successful fertilization (union of sperm and egg). From the perspective of a plant, the most efficient pollinating animals are the ones most likely to visit another flower of the same species (Elzinga, *et al.*, 2008).

Potential pollinators differ in how they detect flowers. Some have good eyesight. Larger flowers that have colors animals can detect would be more recognizable. Other pollinators rely on odor. For these visitors, plants are more recognizable if they have distinctive odors. Finally, pollinators differ in what time of day they are active. Flowers will be more detectable to visitors if they are open at the appropriate time of day. What is most surprising is the diversity of mechanisms that plants have evolved to become detectable to, reward, and support visits by animal pollinators.

In this Lab you will understand the general structure of a flower and determine how flower structures have adapted to be pollinated by animals to prevent self-fertilization. In addition, you will investigate the genetics behind flower development.

Identify the structures of a typical flower from this diagram, and describe the function of each structure



A:

B:

C:

D:

E:

F:

G:

H:

I:

J:

Flowers have evolved over generations to accentuate the traits their most effective pollinator prefers. Explain what these are for the listed pollinators. **<u>Cite at least two primary literature articles for each example</u>**.

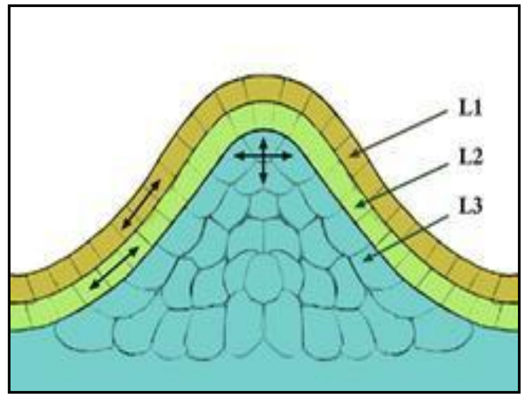
<u>Bees:</u>

<u>Butterflies:</u>

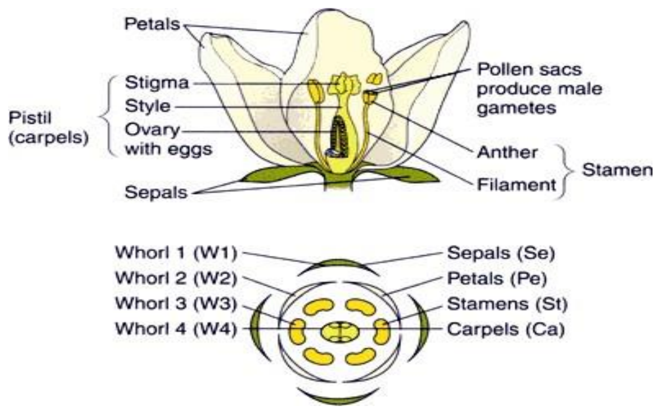
Birds: (pick a specific one)

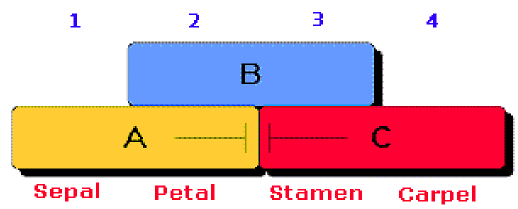
Bats:

FULLY explain the meristems (HINT: look at the layers) AND how genetic control of the AGAMOUS (AG) gene induces floral meristems development.



Explain the ABC model of flower development to include how these genes interact with each other



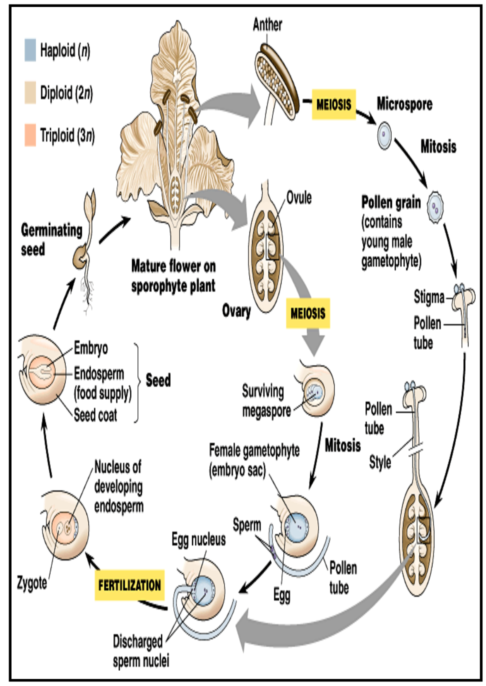


All angiosperms are heterosporous, that is they produce microspores that form male (Stamen) gametophytes and megaspores that form female (Carpel) gametophytes. Fully explain the form and function of both.

<u>Stamen:</u>

<u>Carpel:</u>

The life cycle of an angiosperm begins with the formation of a mature flower on a sporophyte plant and culminates in a germinating seed. FULLY explain ALL the developmental stages involved.



References

Elzinga, C., S. M. Lawrence, L. M. Leege, M. K. Heidemann and D. O. Straney. (2008). *Biological Sciences 110 Laboratory Manual*. 13th edition. pp. 161-177. Hayden-McNeil Publishing, Inc. Plymouth, Michigan.

Heidemann, M.K. (1985). Chapter 35. In: Exercises in biological science. pp. 215–220. Wadsworth Publishing Company. Belmont. California.

Raguso, R. A. (2008). The "invisible hand" of floral chemistry. *Science*. **321:** 1163-1164.