

This activity is very useful in helping students understand the significance of a trend in observation. It is very unlikely that all stomata will respond the same way. How many open or closed stomata are necessary to see a pattern? Your students could record the numbers of stomata that are open or closed to find a percentage for comparison.

Some factors will increase success in student observations:

- Be sure to use clear or transparent adhesive tape. DO NOT USE magic, disappearing, or cloudy tape. Clear packing tape or very inexpensive clear adhesive tape works.
- If two or more conditions are being compared, students should put all samples on one slide. It is much easier to compare the samples by moving the slide around than by switching slides and refocusing.
- Be sure that the leaves or any plant parts that are experimented with are dry.
- Have students interested in the opening and closing of stomata work with leaves that are still or very recently connected to plants. Once a leaf is picked, it may change quickly.
- DO NOT take a stomata print of a very valuable leaf. The process of taking the print damages the leaf.

### **Possible Directions**

While it is important for students to develop their own questions, be ready to point them in a direction. Projects to explore include:

- View stomata on one type of plant at different times of the day to determine when stomata open and close.
- Compare leaves from different parts of one plant to view density or action of stomata on leaves in the sun or shade.
- Compare stomata density of the upper and lower surfaces of leaves.
- Choose a plant such as dandelion that has stomata on both upper and lower plant surfaces to determine the difference in density. Explore other nonwaxy leaves to find other upper surface stomata.
- Look for stomata in ferns and possibly moss. Compare the density in these plants. (Most moss do have stomata, but they are hard to see.)
- Determine the effects of desiccation or changes in water potential on leaves with open stomata. (Dandelions are a good choice for this.) Try soaking leaves in 1 M sucrose solutions or just leave them in the air after picking them.
- Compare stomata density and location on different types of vegetables such as lettuce, cabbage, green onions, asparagus, broccoli, etc.

- Compare the arrangement or density of stomata on monocots and eudicots.
- Compare the arrangement or density of stomata on conifers and angiosperms.
- Compare the arrangement or density of stomata on plants that are sun tolerant and those that are not sun tolerant.
- Compare the size of stomata on different types of plants.
- Compare the action of stomata on plants kept under different wavelengths of light.
- Compare the density or arrangement of stomata on c3, c4, and CAM plants.

### Expectations

Students should be able to articulate a finding with their experiment. Their data collection should include multiple trials, an obvious pattern, and a reasonable conclusion. While most students need to have an answer, it may not be possible to see differences with their experimental conditions. It is acceptable to state that no difference was observed.

Students should record their results in a data table that makes sense for their observations. Help them understand that one data table would not work for all observations. With all students doing different experiments, it would be very meaningful to have a “stomata seminar” for them to share their results with their classmates.

### References

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