

Life Sciences Outreach Faculty Speaker Series for High School Biology Teachers
How Biologists View Structure and Function
Fall 2018

Station 3 Answer Key:

1. Why not just have one stomata per leaf? Why not just have a cuticle that is permeable to gas diffusion?

If you had one stomata per leaf, you would minimize water loss (which would be great!) but you would also minimize CO₂ uptake, and subsequently the ability of the plant to photosynthesize (which would be bad).

If you had a cuticle that is permeable to gas diffusion, you would maximize CO₂ uptake (which would be great!) but would also maximize water loss, which would not be great because it would result in the dehydration of your leaf.

2. Do you think stomatal density would change as a result of different atmospheric CO₂ concentrations? If so, why?

Yes—as atmospheric CO₂ concentration increases, stomata density decreases. One reason for this is that, when there is more CO₂ in the atmosphere, it is easier for the CO₂ to diffuse into the leaf due to the increase in the concentration gradient. Because it is easier for CO₂ to diffuse in, they do not need to have as many pores to allow CO₂ in (and as a result they can minimize their water loss by having fewer stomata).

3. Does this plot show the same relationship between CO₂ concentration and stomatal density as you predicted?

[Depends on your answer—but if you predicted correctly then yes]

4. Based on the information in Table 1, how far back in time does the data presented in Figure 2 go? What types of plant samples do they use to get this information? Is it all from living plants?

How far back in time: 140,000 years ago

Type of plant samples: *Salix herbacea*, a willow

It is from fossil *Salix herbacea* leaves (black dots). Additionally, there are some herbarium samples (white dots).

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5. Are the stomata on the top (adaxial) or the bottom (abaxial) side of the leaf?
Functionally, why do you think they exhibit this adaxial:abaxial ratio?

For leaves that orient themselves roughly parallel and flat to the ground, it is typical that the leaves have more stomata on their abaxial side. One reason for this is that the plant tries to put all the photosynthetic machinery needed for the light reactions of photosynthesis in the top side of the leaf, and if there were a lot of stomata on the top of the leaf, there would be less room for that photosynthetic machinery.

6. Do they appear open or closed? Why?

They will appear closed because they are indoors and there is not enough light indoors to drive the light reactions of photosynthesis. If they appear open it is likely because there is a cuticle that makes them “appear” open even though they are closed.