The effect of the post-industrial rise in CO_2 on physiological traits of *Equisetum*

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Equisetum and rising CO_2 levels

- Since the onset of the industrial revolution, atmospheric CO_2 levels have risen from c. 280 ppm to 420 ppm[1].
- *Equisetum* first evolved under high atmospheric CO_2 levels (fig. 1) and might still carry the evolutionary traits optimized under this environment.
- The impact of rising CO_2 levels has been measured in angiosperm and gymnosperm species[2,3,4], but rarely in ancient plant lineages like *Equisetum*[5].
- **We hypothesize that this evolutionary background may provide a relative competitive advantage under future elevated CO_2.**
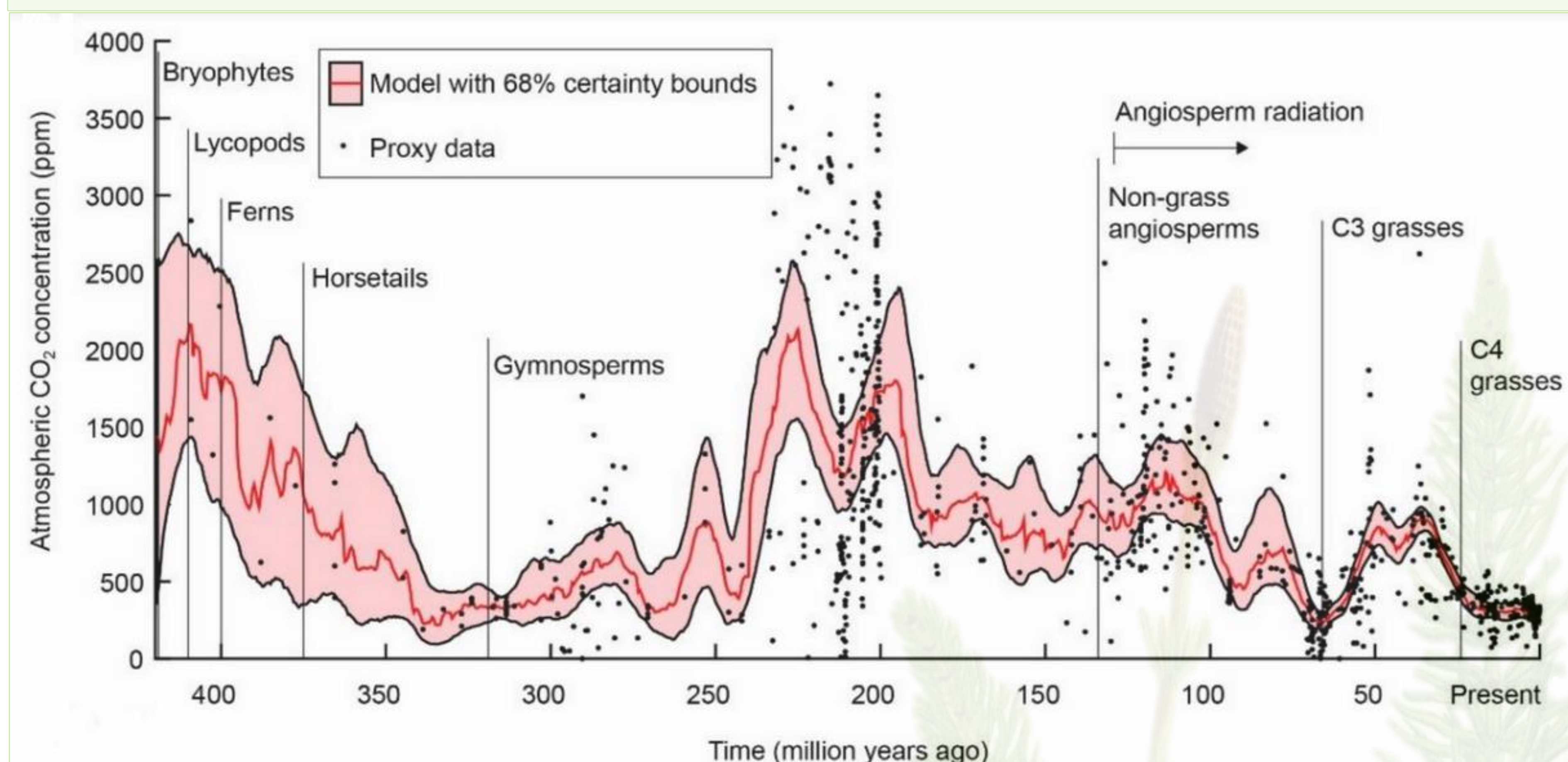 - We analyse this evolutionary baggage through cuticle analysis (fig. 3).

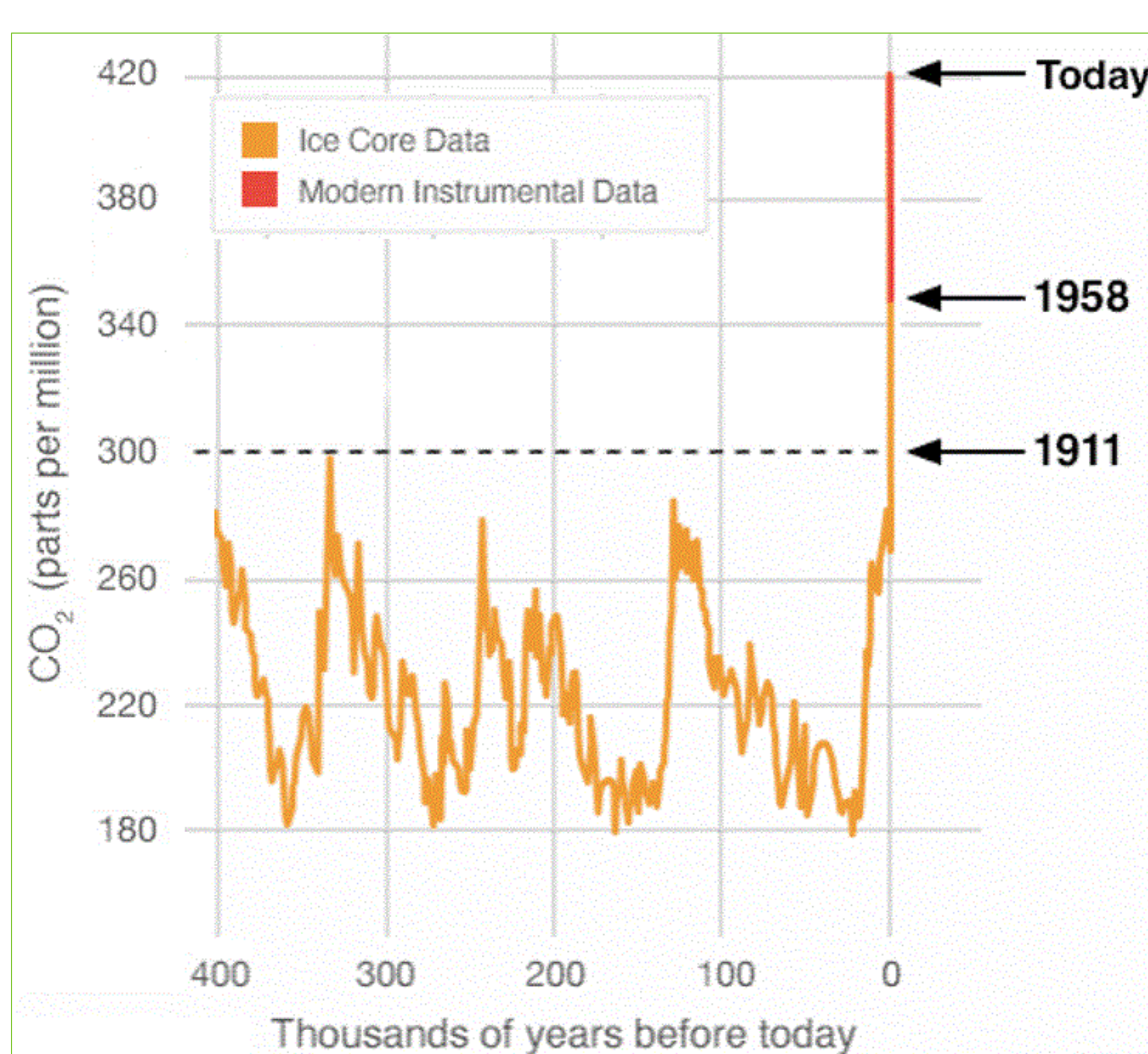**Figure 1.** Atmospheric CO_2-levels of c. 400 million years ago to present. Adapted from Foster et al. 2017[6]

Figure 2. Atmospheric CO_2-levels of c. 400.000 years BP to present. Adapted from: https://climate.nasa.gov/vital-signs/carbon-dioxide/

Up next!

- **More analyses**: photosynthetic biochemistry (δ13C), leaf nitrogen content, & silica content (phytoliths)
- **Past – present – future**: fossil (high CO_2) & herbarium samples (low CO_2) - present-day samples - samples grown under future CO_2 levels (elevated CO_2)
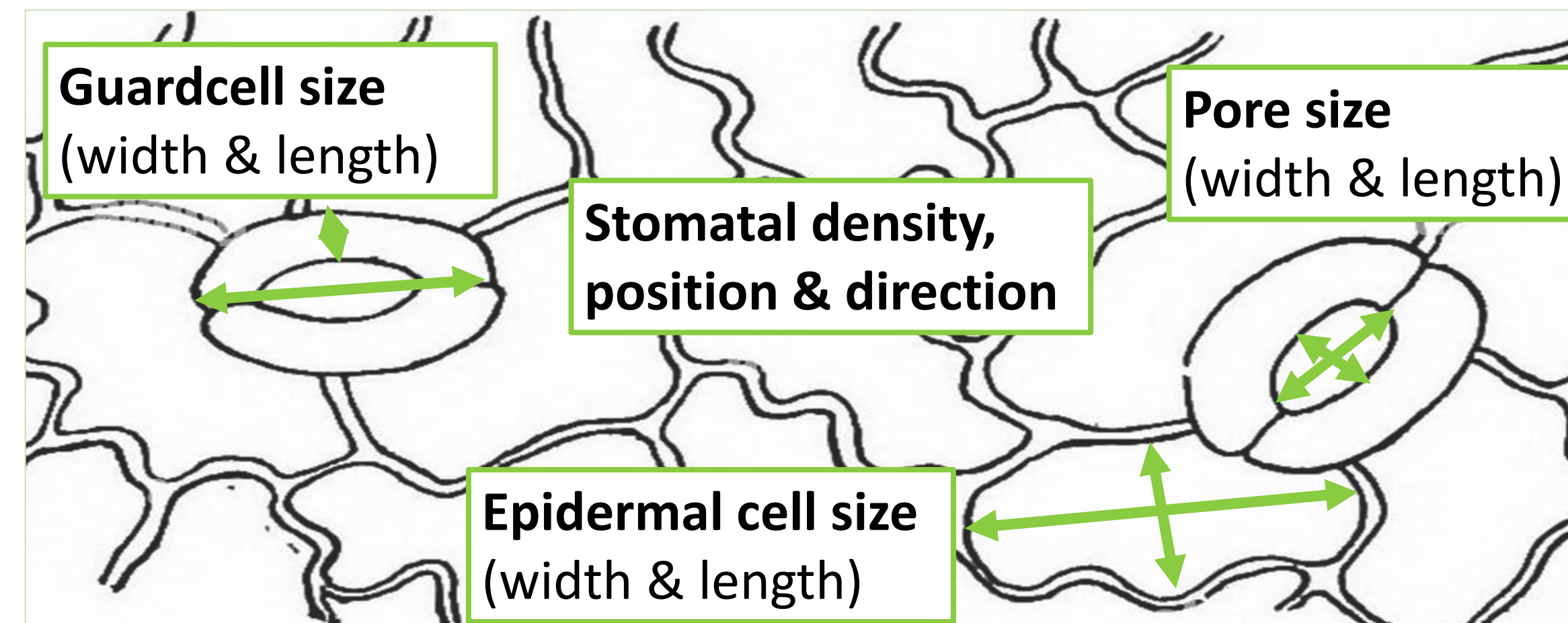
Cuticle analysis

Figure 3. Cuticle analysis is based on a series of measurements on the stomata and epidermal cells and can identify evolutionary traits in plant species.
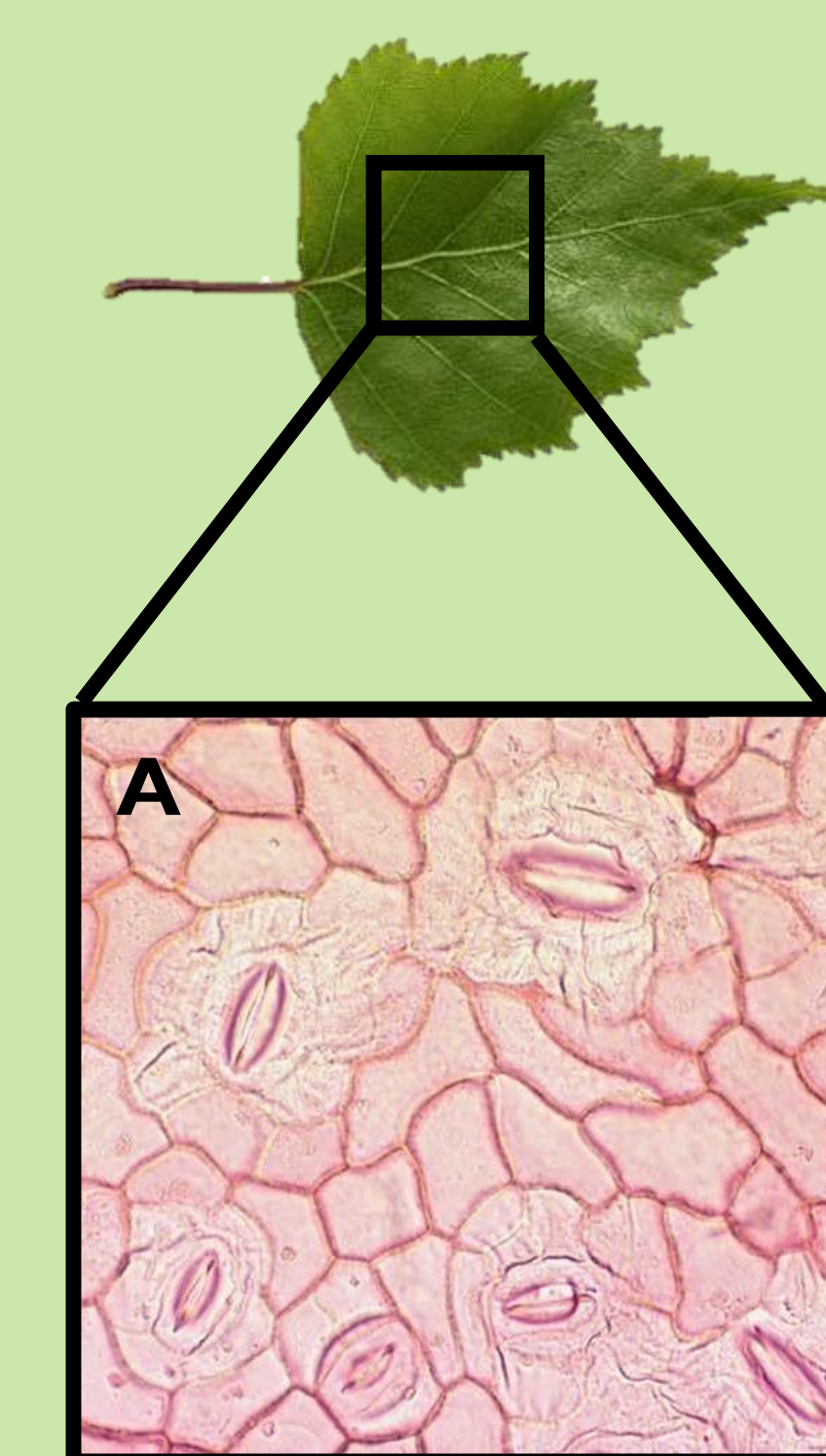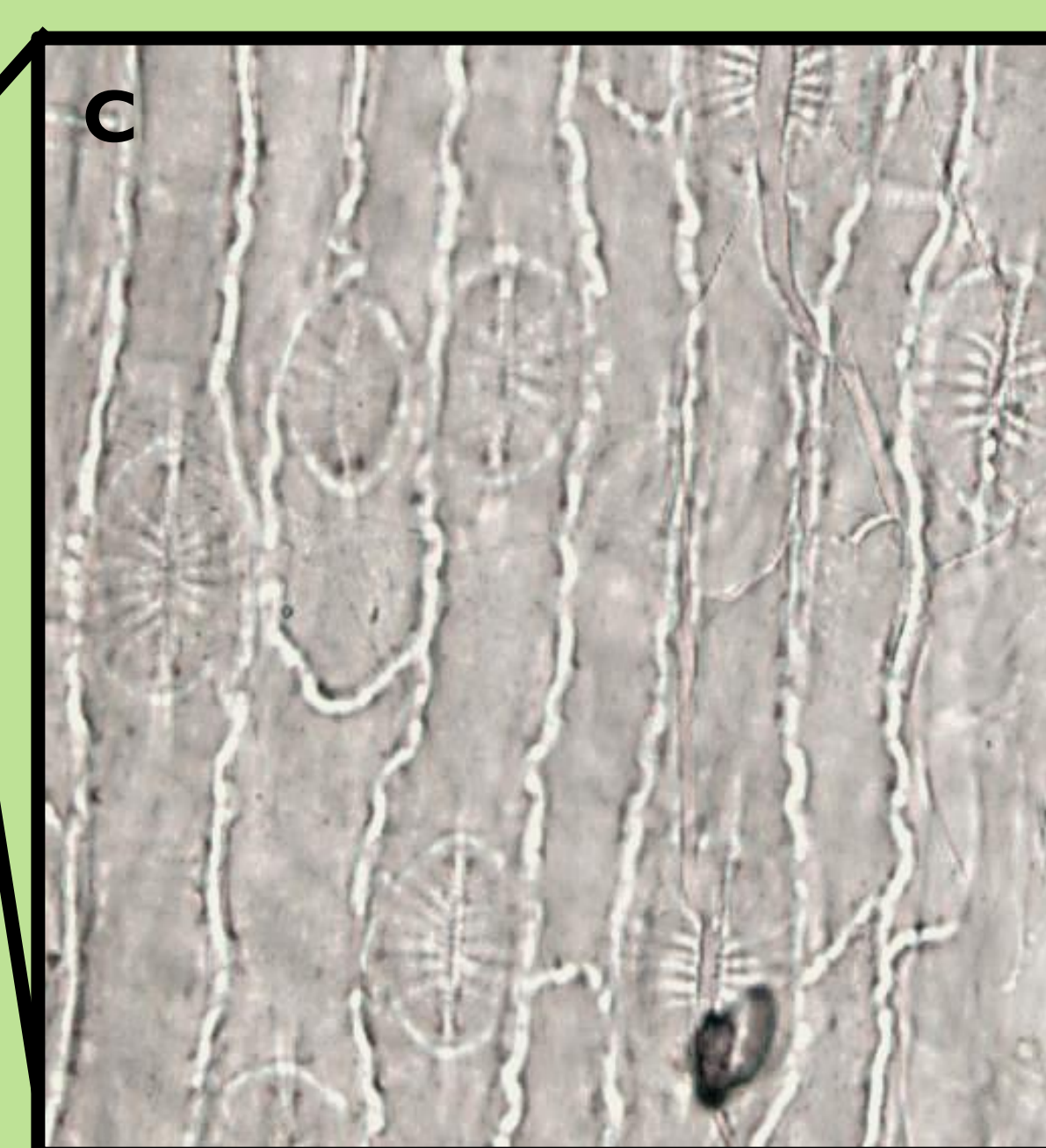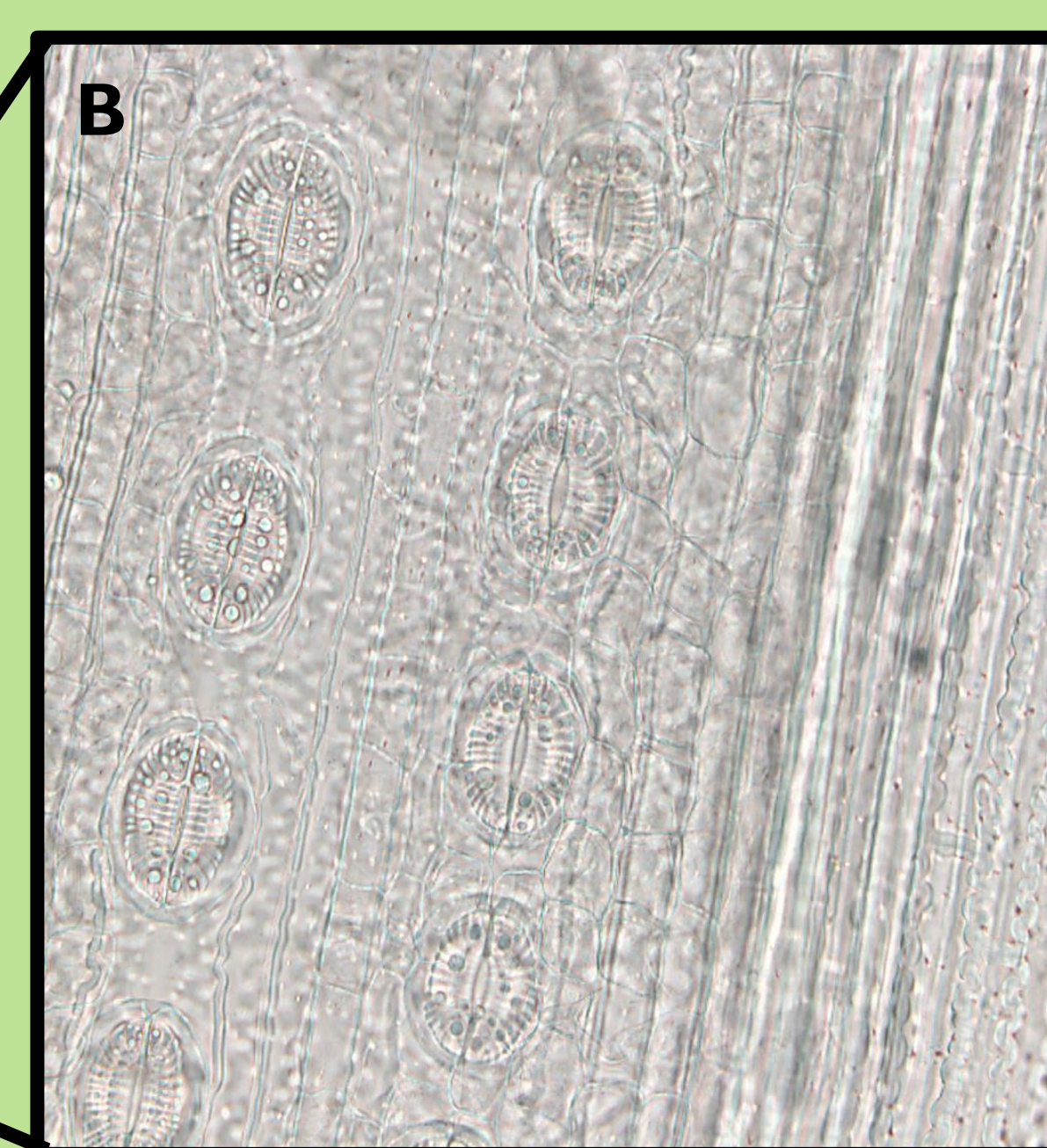
Angiosperm cuticle

Figure 4A-C. Cuticles of *Equisetum* (4B-C) have a vastly different pattern and morphology than cuticles of angiosperms (4A).

Equisetum cuticle

References

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6. Foster et al. (2017). Future climate forcing potentially without precedent in the last 420 million years. Nature Communications, 8.