

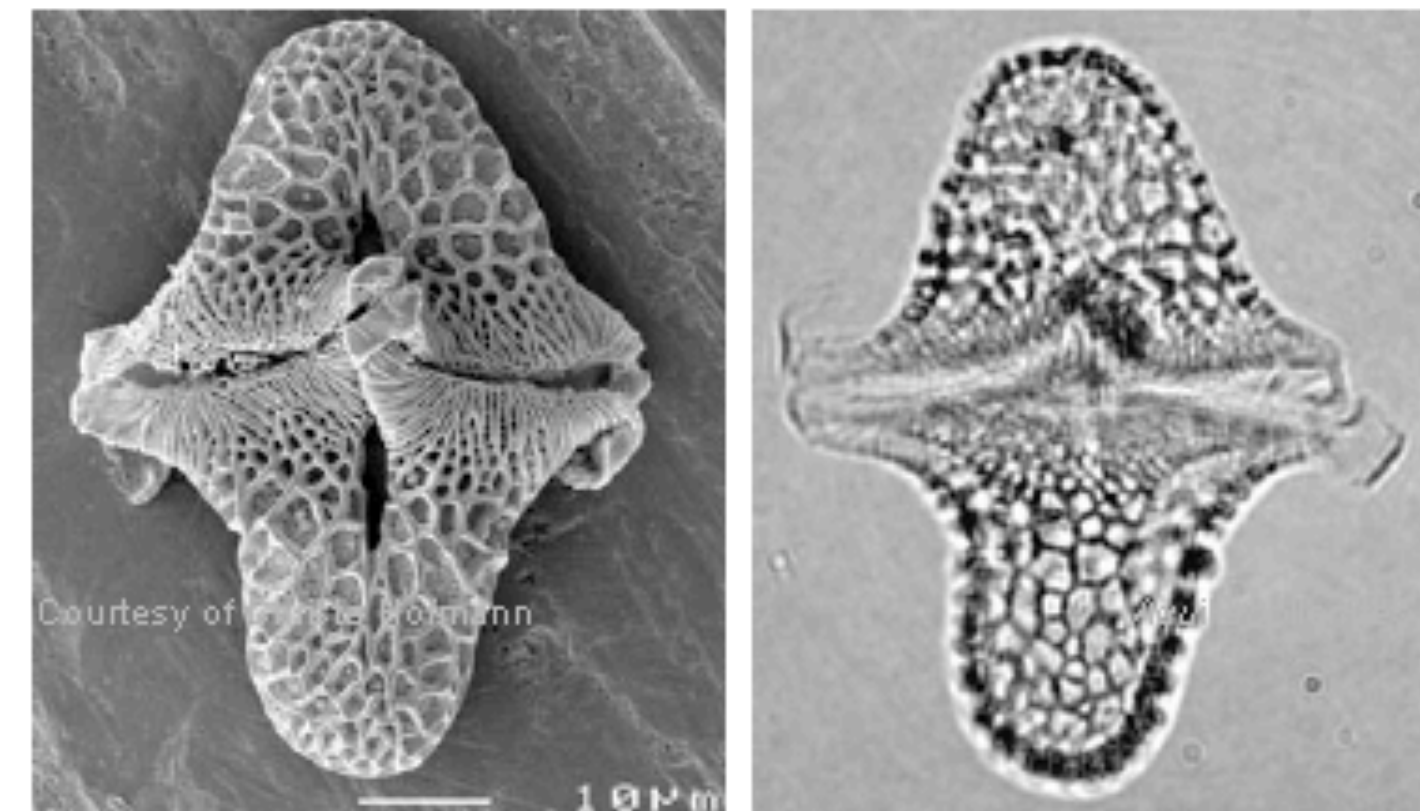
Plant Palaeoclimate Proxies

Palaeoclimate proxies may be divided into two types:

- 1) those based on the environmental tolerances of assumed living relatives (nearest living relative approaches) and
- 2) those that are based on aspects of plant architecture constrained by environmental conditions (physiognomic approaches).

Each have specific advantages and disadvantages.

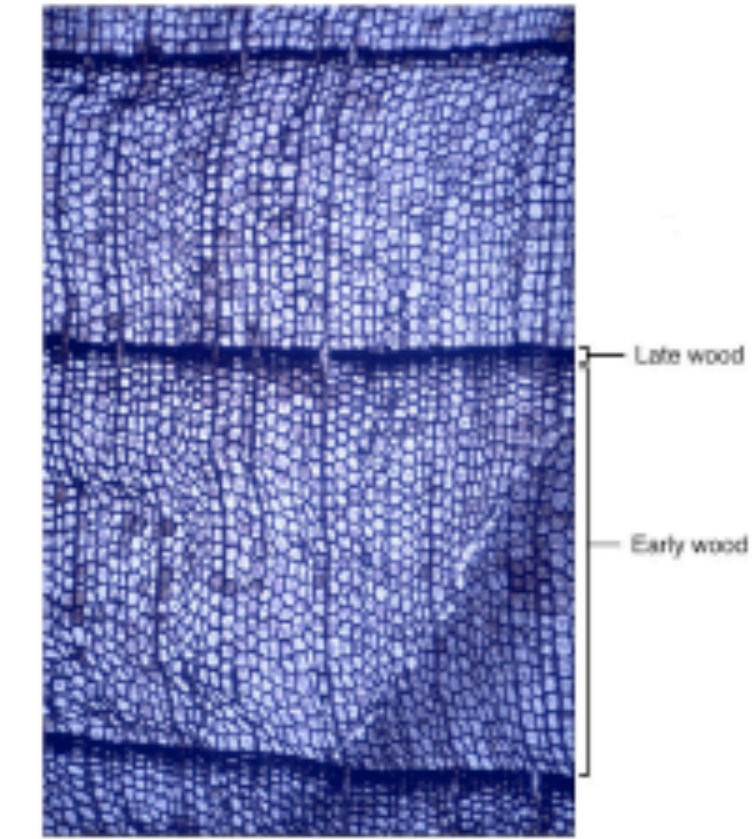
Nearest living relative techniques (NLR) can be applied to all plant organs assignable to modern taxa but are most useful for those plant organs lacking known morphological adaptations to the physical environment (e.g. seeds and pollen). However they are restricted to timescales where evolutionary change at the species level is unlikely. In most cases <1-5Ma, although techniques that involve protocols for examining populations (e.g. Co-existence Analysis and Overlapping Distribution Analysis) can be extended further back in time.



Plant Palaeoclimate Proxies

Physiognomic - Climatic signals encoded in plant architecture as a developmental and growth response to the environment, honed by selection to maximise functional efficiency. Examples - wood anatomy, leaf architecture and stomatal analysis.

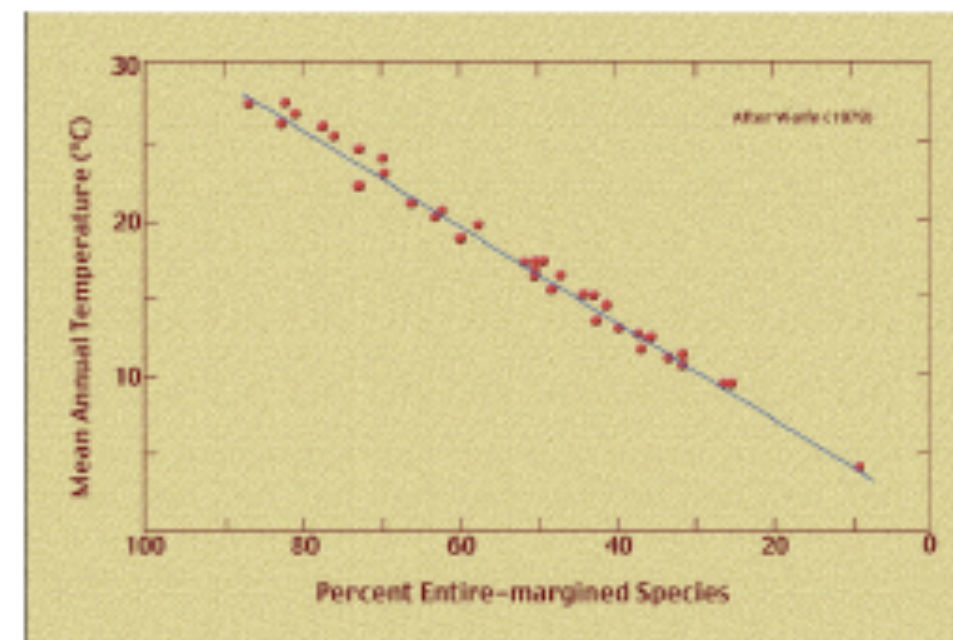
These techniques have the advantage of being useful over long timescales that encompass previous greenhouse climates, but are restricted to comparatively rare leaf and wood assemblages.



Wood records almost daily variations in growth conditions but is difficult to quantify unambiguously in terms of climate variables.



Stomatal analysis can yield estimates of ppCO_2 and, in ideal circumstances, estimates of elevation.



Univariate Techniques - Leaf Margin Analysis - return a single variable e.g. mean annual temperature.

Multivariate techniques (e.g. CLAMP) return an array of quantified environmental variables.

