Learner resource 1 The weirdness of plants

The focus of learning outcome 3.1.3(a) is how large size creates distances between cells and resources that are too large for diffusion, necessitating mass flow transport systems. This is a slightly different angle to the effect of surface area to volume ratio on exchange in section 3.1.1 but the two ideas are brought together on this sheet.

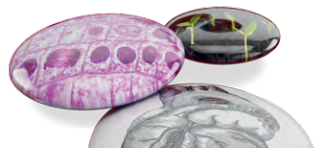
Discussion Points

This list of ideas about plant structure and physiology can be used as a springboard for class discussion. Selected statements could be presented orally or on a PowerPoint. Students could be asked to consider if they are true or false, to find evidence to support some or all of the statements and to vote on whether plants have a 'weird' way of maintaining life.

Task:

After considering these statements students could prepare a written summary, poster, PowerPoint or drama presentation on 'Why it is really WEIRD to be a plant'.

Features like the enormous size of some plants, the low proportion of living to dead tissue in trees, the spanning of two habitats, being stationary and undergoing marked seasonal changes in physiology (in temperate climates) could all be included and hopefully students will come up with more ideas for themselves.



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Activity	True	False
Most of the volume in trees is dead xylem with only a thin cylinder of living tissue around the trunk and woody branches, so surface area to volume ratio doesn't matter.		
Plants grow bigger than animals so must have excellent transport systems.		
The lower metabolic rate of plants compared to animals allows a slower rate of transport.		
Plants have two transport systems but animals only have one.		
A contractile pump, like the heart for faster transport, is impossible in plants because plant cells have walls.		
Plants live in two different habitats at once, the roots in the soil (rich in water and ions, low in gases) and the leaves experiencing the opposite conditions in the air.		
Large surface area to volume ratio of the root hair system is crucial for the uptake of water and minerals (exchange).		
Large surface area to volume ratio of the leaves is crucial for carbon dioxide uptake and oxygen release (exchange).		
The same branching fractal pattern seen in roots below the ground and shoots above the ground to maximise surface area for exchange is seen in the bronchial tree of the lungs and in branching capillary networks.		
The surface area to volume ratio of the aerial plant parts has more effect on water loss (transpiration) than on obtaining raw materials.		
Surface area to volume ratio is important in some xerophytic adaptations.		
Plants make solid food (glucose) and building materials (wood) out of just a liquid (water) and a gas (carbon dioxide) that is present in only 0.04% of the air.		
Plants can't move around so have to manipulate other organisms into moving their gametes and seeds for them.		
Plants in the UK partially self-destruct and then sleep for half the year.