THE AUSTRALIAN NATIONAL UNIVERSITY

ROUGH PIPES HELP DROUGHT SURVIVAL

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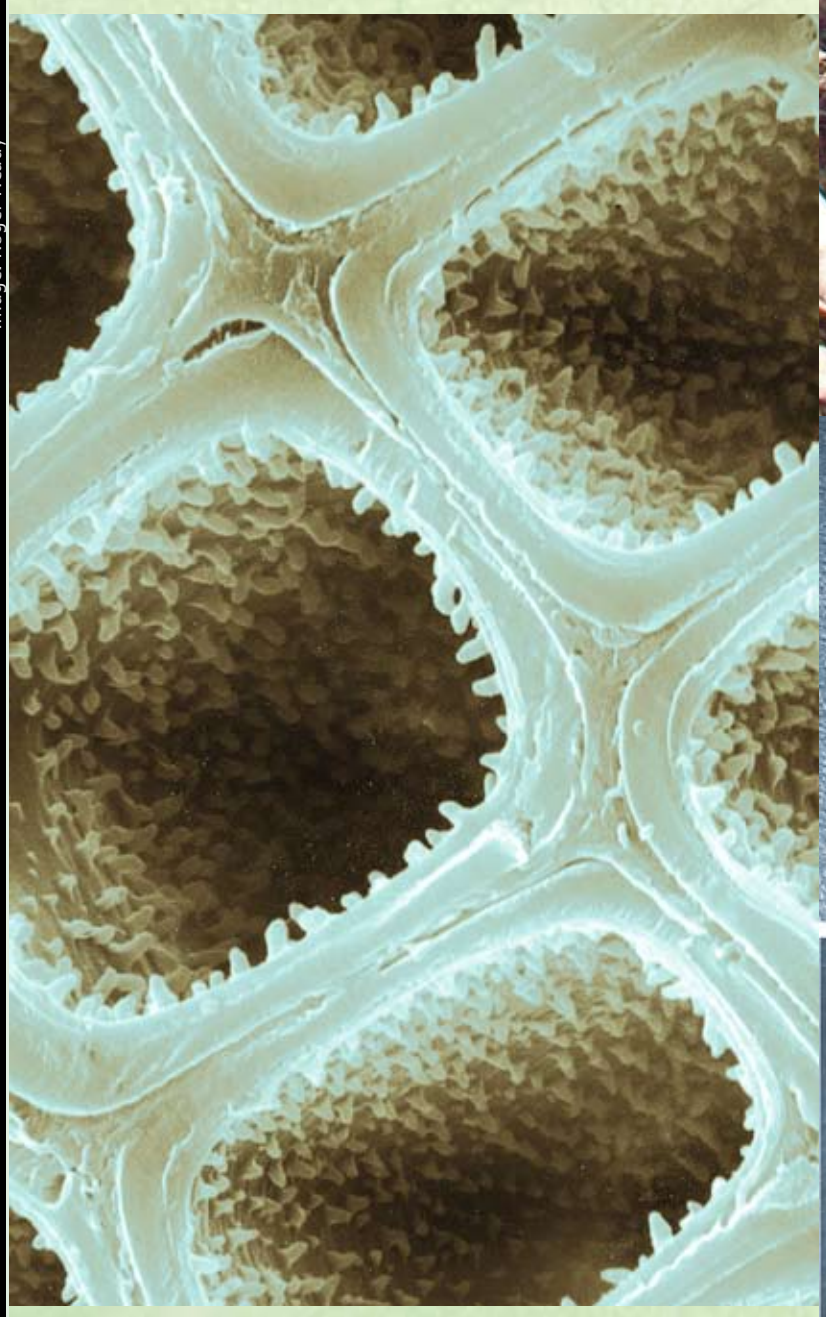
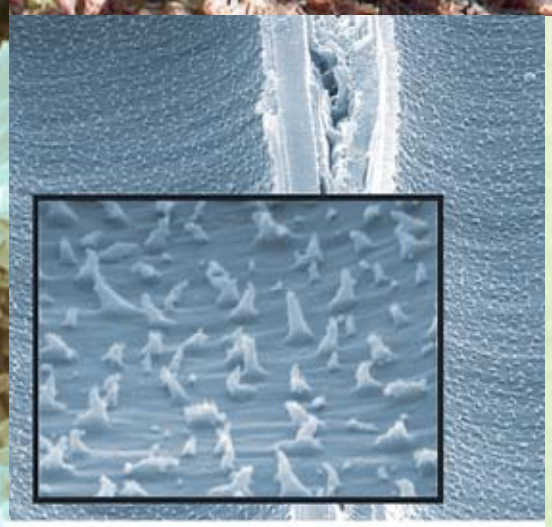
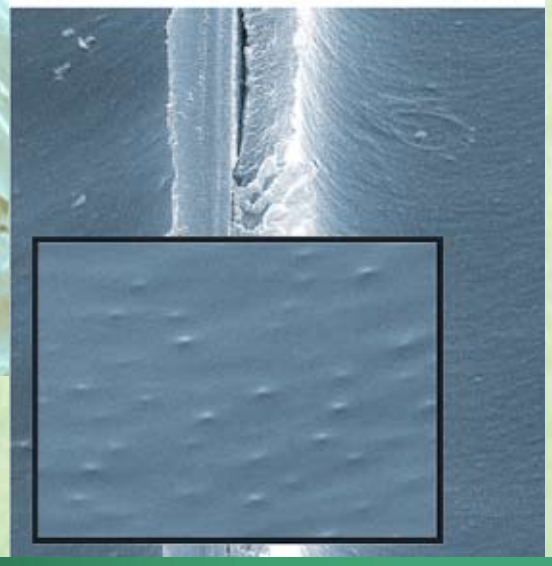
All around us everyday, plants are dealing with the problem of how to get the water from their roots in the ground to leaves which can be many tens of metres up in the air. A human engineer would solve this problem by installing a pump at the roots, because if you try to suck a tall column of water from the top, it simply cavitates, or forms bubbles. However, it turns out that plants pay no heed to this conventional wisdom; they use evaporation from the narrow pores in the leaves to draw long columns of water up through millions of hollow tubes, or xylem conduits, which are formed from dead cells known as tracheids and vessels. The mechanism is brilliant in that it costs the plant no energy to pump large quantities of water, but it suffers from the vulnerability that once a water column is broken by a bubble, the flow stops. Scientists used to believe that once the flow in a xylem conduit was stopped by a cavitation bubble, that particular conduit was lost to the plant forever. However, more recent work suggests that some plants are able to recover from cavitation.

Image: Roger Heady







Many drought resistant plants have curious structures, such as knobs and ridges, on the inner walls of their xylem conduits, whilst those from wetter areas commonly have smooth walls.

New research at The Australian National University may be about to shed light on how some plants are able to pull off this vitally important feat. When looked at under very high magnification, the xylem conduits of plants with good drought tolerance tend to have rough knobbly walls, whilst those with poor drought tolerance have smooth walls. The ANU scientists believe that the rough surface structures, in combination with deposited sap residue, enable the slightly hydrophobic walls to re-wet themselves, and that this in turn enables the cavitated xylem conduit to be refilled.

This research not only promises to aid in solving one of the longest standing mysteries in plant biology, but may also help in developing new and improved crops better suited to dry conditions. And with climate models predicting decreasing rainfall in many areas of Australia, this may have massive economic benefits.