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THE THIRSTY TREE

by Lanny and Marilyn Johnson

Around our house there are trees nearly 100 feet high. On the west coast of the United States, giant redwood trees grow as tall as a 30-story building … 360 feet tall. One of the tallest trees ever measured is a Douglas fir that reaches 415 feet above the ground. Trees, like all plants, need water. Some redwood trees use as much as 160 gallons of water a day. That is over 2 bathtubs full of water! Water is heavy and usually does not run uphill. So what does it take to get water up from a tree's roots to the leaves or needles at the top? Are there little workers hauling water to the top in buckets? No. Actually God has created wonderful designs in trees that use some amazing properties of water and sunshine to **push** and **pull** the water to the top.

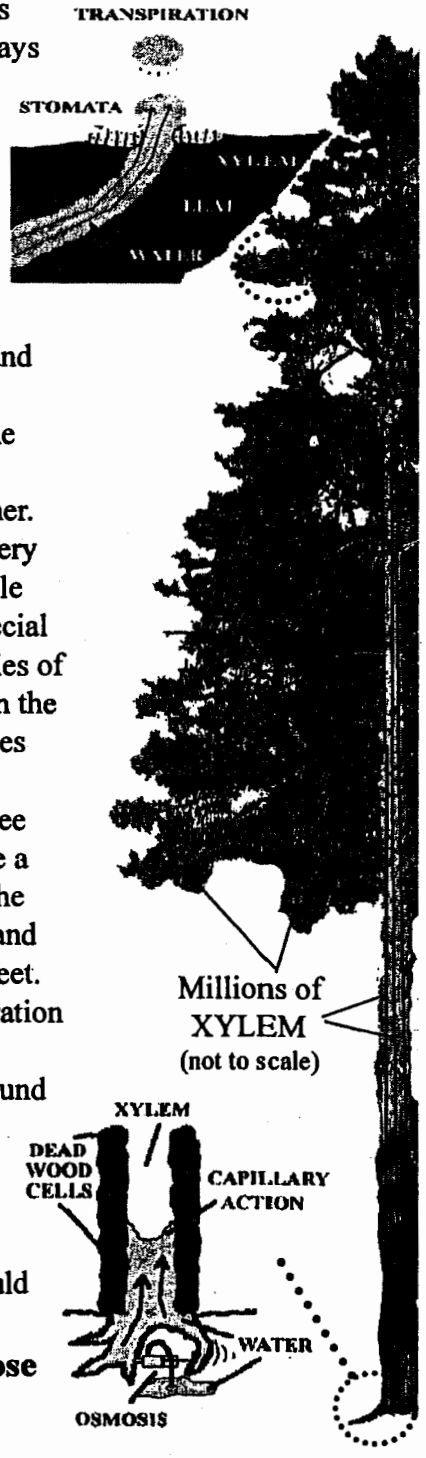
Inside a tree are millions of tiny tubes called ***xylem*** – made up of dead cells that have holes at the ends. These dead cells are joined together to make "pipes" that water can flow through. The xylem tubes stretch out from the roots through the branches and stems to the leaves or needles of the tree. The water in the soil around the tree is at a higher pressure than in the roots of the tree. High pressure always tries to go to a lower pressure - so by a design called ***osmosis***, this higher pressure pushes the water through the outside of the root's cells into the bottom of the xylem tubes. Then an extraordinary thing known as ***capillary action*** takes over. To see capillary action work, dip a corner of a paper towel in water - notice how the water creeps up the fibers in the paper. Water will also climb xylem tubes by the same force. The narrower the tube, the higher water can creep upwards. Osmosis and capillary action work together pushing water partway to the top of the tree, but the real force that pulls water to the top is the evaporation of water and how water behaves.

The small parts (molecules) of water like to hold on to each other. The water in the xylem tubes of a tree sticks together like a long, very thin chain. Pull on the chain of water in one direction, and the whole chain moves in that direction. The pulling power comes from a special design called ***transpiration***. As sunlight strikes the leaves or needles of a tree, the leaves get hot enough for some of the water molecules in the leaf to evaporate (change from a liquid to a gas). As water molecules evaporate, they fly off into the air, sucking or pulling on the water molecules around them. The long chain of water is pulled up the tree just enough to replace the evaporated water. In many ways it is like a person drinking through a straw, with the transpiration supplying the suction at the top. However, if you were to take a very long straw and try to suck water up it, you could only pull the water up about 30 feet. Some scientists have calculated that the suction created by transpiration is strong enough to pull water up to 500 feet above the ground!

In hot, dry climates, where there is not enough water in the ground to replace the evaporated water, the tree could dry up and die. God therefore created many trees with incredible leaf designs that can close off the ends of the xylem tubes (small holes called ***stomata***) so that the loss of water can be slowed down or even stopped.

Without these wonderful designs working together, the tree could not survive. Designs such as these point to an intelligent Creator.

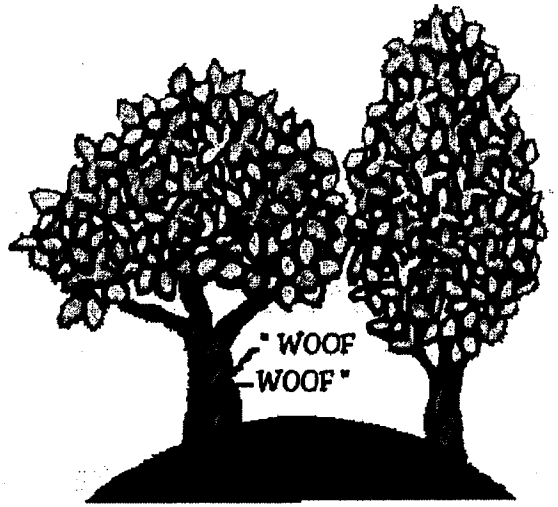
"For all those *things* hath mine hand made, and all those *things* have been, saith the LORD:" Isaiah 66:2.



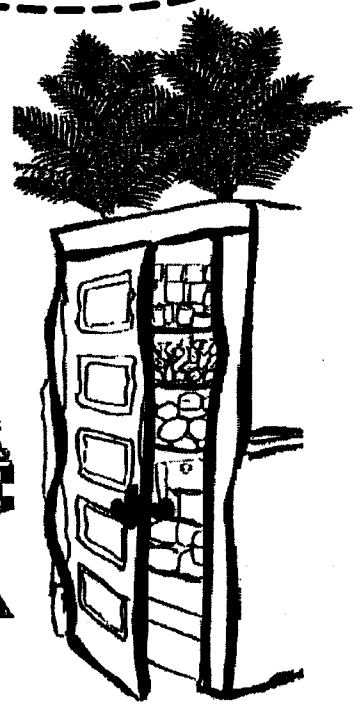
Look for the words in the puzzle from the words in the **WORD LIST** below. The hidden word might be up, down, sideways, slanted, or backwards.

C
T A U
P S P Q X
O V U I Y L K
K L S
Y E L L O
V M P A T A M
W A T E R B O N S
F A B U E Y E Z G B O
L E A V E S I
S T O M A T A S S
E V A P O R A T E U M
S U C T I O N L B D N R N
N E E D L E S X U H E U X E Y
O T S
U U P
P X M

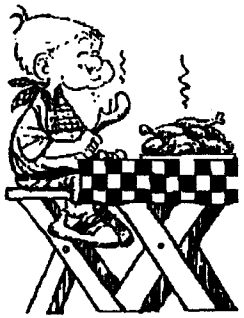
CAPILLARY
DESIGN
EVAPORATE
LEAVES
NEEDLES
OSMOSIS
PRESSURE
PULL
PUSH
STOMATA
SUCTION
TREE
TUBES
WATER

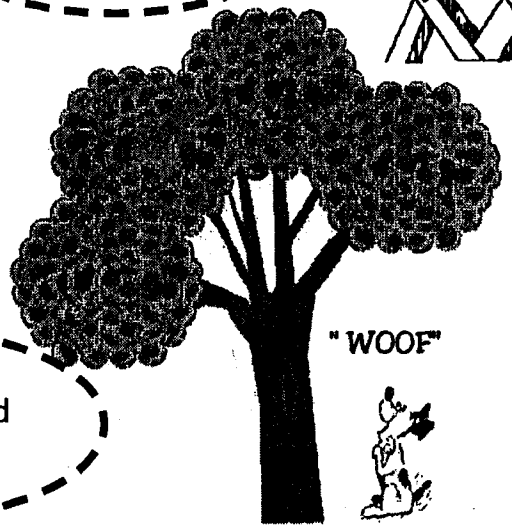


A.
How do you tell a dogwood tree from a redwood tree?



B.
What tree do you like when you're hungry?

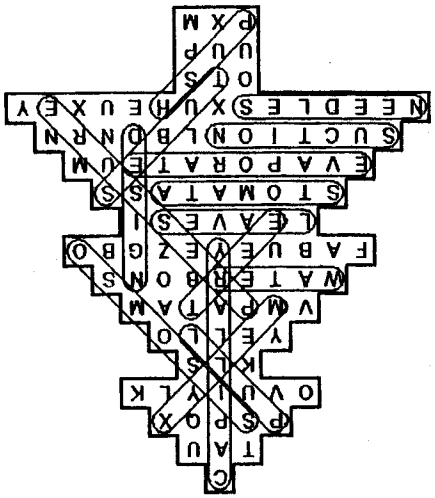




C.
How are dogs and trees alike?

ANSWERS

A. Because of its bark!
B. The 'pan-tree'!
C. One barks and the other has bark.



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