

The forest as an organic switchboard

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Do trees cry? Yes, when trees are starved of water they certainly suffer and make a noise. Unfortunately, because it is an ultrasonic sound, too high for us to hear, it goes unheard. Now scientists have found a way to understanding these cries for help.

That is not the only time trees make a noise — they do it when they are scared, in pain, cold... A team of French scientists at Grenoble University in France, led by physicist Alexandre Ponomarenko, has separated these sounds and analysed those that they need to know. (After all, if they helped us understand how trees scream when they are being cut, it would be bad for business.) How do trees take in water? Essentially, they drink from a really long straw. Inside tree trunks are bundles of specialised tubes called xylem, which lift liquid to the highest leaves and branches. Because trees are so tall, the liquid in the xylem can be under intense pressure — imagine using a straw to slurp the last few drops from the bottom of your glass: you have to increase the pressure. In drought-stricken trees, this increased pressure can cause the water column to break, allowing dissolved air to form bubbles that block water flow. These events are called cavitation and while trees can withstand some, too many can be deadly. In simple terms, one of the main functions of wood is to transport

water and when a plant or tree is under stress the water transport system stops working. Microphones can pick up the noises that cavitations make. When a tree is getting less water, the noise of the cavitations and the bubbles increases. The sound waves of a tree in water-distress are distinct. This discovery could help scientists figure out when trees are parched and need emergency watering. Imagine a device attached to a tree that could listen for sounds of thirst and then trigger an emergency watering system. Two companies of geologists in Arizona are building a low-cost acoustic detector drawn by the age-old allure of communicating with plants. They hope to be able to decode the language that says “I’m thirsty” to the one that says “I’m cold” to the one that says “Ouch, you’re hurting me”.

Britain’s Royal Botanical Kew Gardens has an exhibit that allows visitors to don headphones and listen to the inner rumblings of a eucalyptus tree, a project funded by the Natural Environment Research Council. Researchers are looking at the differences in sounds between various tree species. By comparing trees that grow in similar conditions, the research can reveal which trees are most efficient at transporting water through their trunks. This is going to be important as the earth grows warmer and droughts increase. A study printed in the magazine *Nature* says that trees in

many places — from tropical rainforests in South America to arid deserts — already “live on the edge”, meaning their cavitation rate is almost as high as they can sustain. Certain species, like pine trees and Douglas firs, can repair the damage, filling the embolisms on a daily or even an hourly basis. Trees considered the most drought-tolerant, such as junipers, are found to be the worst at repairing embolisms. Broad-leaf plants are better at fixing the damage caused by dry pipes. In future, during predicted severe droughts, the plants that have a harder time repairing embolisms are more likely to die. It’s the plants that can repair embolisms that are going to survive. Artist Alex Metcalf has designed a device that can hear the secret sounds of the trees. So what does a tree sound like? When children hear it for the first time, says Metcalf, they tend to think it is thunder, or a motorbike. “But then, as you keep listening, you can pick out this clicking sound. Once you hear it, you can’t ignore it.” The clicking sound is the tree drinking. As water moves up a tree trunk and enters a cell, the air gets displaced, causing a “pop”.

Metcalf’s device is non-invasive as he believes cutting a hole in a tree means you are wounding and infecting it, which changes the sounds. A polished metal cone, based on an old-fashioned ear trumpet but packed with technology that amplifies tiny sounds up to 33 times, then filters out unwanted ambient noise. As the weather changes, so does the sound.

According to biologists Jack Schultz and Ian Baldwin, who have been working on communication between plants since 1983, trees are not inert things that stand around waiting to be eaten, nested in or cut down. “Trees are like slow animals; the only thing they can’t do is run away when attacked.”

Is it not logical that life must have thought processes/intelligence that affect its function, survival and evolution? Scientists who pursue the path of establishing something I have always known — that all beings are the same, whether insects, trees or humans — should be applauded. Studying intelligence at all levels is crucial to our own evolution. And to think that trees are simply a collection of wood that grows, because we need trees and things to burn, is self-destructive. Sound is overwhelming, it’s everywhere. Surely life would have used it to its advantage in all forms to communicate. The forest really does hum with life. Though often too low or too high for human ears to detect, insects and animals signal each other with vibrations. Even trees and plants fizz with the sound of tiny air bubbles bursting in their plumbing. There is evidence that insects and plants “hear” each other’s sounds. Bees buzz at just the right frequency to release pollen from tomatoes and other flowering plants. Bark beetles pick up the air bubble pops inside a plant, a hint that trees are experiencing drought stress. Scientists are now investigating the possibility that root-to-root alerts could transform a forest into an organic switchboard. Considering that entire forests are all interconnected by networks of fungi, may be plants are using fungi the way we use the Internet and send acoustic signals through this Web. I hope I am still alive when we finally discover a way to listen and understand the language of animals and plants. There is no more important discovery.

Source:
<http://www.thestatesman.com/news/supplements/the-forest-as-an-organic-switchboard/65088.html#k0wSWkbvRUU5fzm.99>