Scientists Now Know How Trees "Sleep"

By Paige Towers • May 18, 2016 at 2:48pm

From a distance, the scene may have looked like a group of friends embarking on a camping trip together. The reality was a bit weirder: in late summer 2013, a group of Austrian, Finnish and Hungarian scientists traversed the Finnish countryside while hauling their bags of research gear, including a RIEGL VZ4000 laser scanner (which strikes a fairly close resemblance to R2D2), all with the purpose of staying up all night to measure the minute movements of a silver birch tree. The purpose of the headscratching setup? To record for the first time ever, the “sleep” motions of trees.

As outlined in a study

, recently published in the journal Frontiers in Plant Science

, the goal of the research team was to measure circadian movements of the branches and foliage of two silver birch trees (After the Finland excursion, the scientists mimicked the night’s events with another silver birch in Austria) through terrestrial laser scanning (TLS), a new, ultraprecise method of 3D surface mapping.

The results clearly showed that the leaves and branches drooped throughout the night.

The measurements of both trees were taken in midSeptember in locations close to the solar equinox in order to guarantee similar lengths of darkness. And they were recorded from sunset to sunrise under nearly congruent outdoor conditions — no wind, no rain, comparable temperatures. The maps of both trees clearly showed that the leaves and branches drooped gradually throughout the night.

Since the changes were so miniscule (maximum droopage on both trees varied from 3.5 cm to 10 cm) they weren't apparent to the naked eye. In the scans below, however, you can see how the differences in the Finnish birch at sunset (black) and at the time of maximum movement, which occurred around 6:40 a.m. (red):

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The “sleep cycles” of the trees were also interesting. Although both showed little movement until about six hours after sunset, the movement increased until 5:30 a.m., with the lowest position reached just an hour or two before sunrise. In the morning, the birches perked up and returned to their original presleep positions with a few hours.

An animation created by the researchers demonstrates the drooping process:

Whether the trees were “awakened” by the rising sun or their own internal rhythms is not yet clear. In fact, the entire subject of tree “sleep” is still murky. Previous studies that tried to determine what tree circadian rhythms proved difficult, as older imagecapturing methods used visible light and interfered with sleep movements.

“Diurnal patterns in plants are well known (e.g. flowers opening and closing over time) and have been studied a lot, but mainly in laboratories,” lead researcher Eetu Puttonen explained to us in an email. But the advent of new technology like TLS makes it more possible.“We can actually take a scanner in woods and monitor a set of trees for a day or two and then move again to another location.”

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11/10/2016 Do Trees Sleep at Night? | Van Winkle's sun or their own internal rhythms is not yet clear.

Such new instruments as the RIEGL VZ4000 may allow scientists to gather more information on tree sleep patterns and extend their scope from, say, a lone birch tree in Austria to an entire apple orchard in France. (Puttonen also mentioned the treefriendlness of TLS, as scientists may no longer have to knock down trees in order to study them.)

Researchers could use them to understand how climate change — including rising temperatures and potential water stress — will affect forests.

“If it is possible to find correlation between the branch movement and temporal change in parameter related to climate change modeling,” Puttonen wrote, “these type of measurement could be used in collecting ontheground truth locally.”