San Jacinto River Authority Kids Page

By the time most of us finish grade school, we've heard that "mighty oaks from little acorns grow" -- usually to remind us that even very large things in life can start out very small. On the topic of mighty trees....here's a question that you'll really have to stop and think about. Ready?

When you see a big, tall, heavy, mature tree, do you ever wonder where its *mass* -- its thick trunk, its branches, its canopy of leaves -- came from? Trees are some of the largest organisms on our planet, but they start out as a seed, right? So, where does the wood and bark and limbs -- the tree's substance -- originate?

Many people guess that trees come from the soil, but upon further thought, that answer doesn't actually work. Many trees have massive roots that obviously take something from the soil. Some say that trees even look and feel solid like dirt. But why doesn't the soil around trees recede as the tree grows if that's the source of the large plant's mass?

Puzzled? If it makes you feel any better, scientists have been trying to answer the question about where trees get their mass since the early 1600's. One research project back then lasted over 5 years and involved measuring the amount of soil in a container over the period of time the tree "grew", and comparing it to what the tree itself weighed. The scientist discovered that even though the tree increased in size, it "took" only a very tiny portion of soil content over the years to sustain it.

So what else could contribute to a tree's growth? It's at this point when folks suggest it must be water from rain that is absorbed by the plant. Every living thing needs water to survive, so this must be at least part of the answer, and of course it is! And so is sunlight, right?

Let's introduce the word *photosynthesis*; we learned about that in elementary school, too. Sunlight is the energy that converts CO_2 (carbon-dioxide) from the air into O_2 (oxygen) and some H_2O (water). Plants *breathe in* carbon dioxide and *breathe out* oxygen -- for humans to breathe in and breathe out carbon dioxide that plants need. Very convenient. This *symbiotic* (mutually beneficial) relationship helps keep us alive! But sunlight energy is not "matter".

Back to the "mass" issue. What is the missing ingredient? It surprises almost everyone to discover that 95 percent of a tree actually comes from carbon dioxide. That means that trees are largely made up of air! That is exactly correct, according to **Richard P. Feynman**, who shared the 1965 Nobel Prize in Physics. "People look at a tree and think it comes out of the ground. The substance of a tree is carbon. But if you ask where does the *substance* of the tree come from, you discover trees come out of the air!"

How in the world did those heavy, branchy, giant, hard, bark-covered life forms get their substance from the AIR? Even Feynman said that sounds more like "sorcery than science." But here is the answer. Trees get their mass from air and water. They "eat" the air -- that is done by (literally) chomping down on airborne carbon dioxide. The process uses the sunshine to pull the carbon dioxide atoms apart, getting rid of the oxygen -- which it breathes out or exhales back into the air -- and what is left is the carbon and water -- the ingredients needed to make the substance of the tree. Trees take up water out of the ground -- which got there from the air as rain. So...final answer...trees do indeed get their substance from the air.