

# The Flawless Wonder of Engineering: The woody structure that makes trees solid

**How do trees resist strong winds and stand for hundreds of years?**

**What are the features of the structure that makes trees solid?**

**How do the roots, body and leaves of the tree make it solid?**

Trees, which are one of the most important research fields of the science world, act as an inspiration to scientists on many issues and the details in their creation are still being discovered. One of the most striking features of trees which capture the scientists' attention the most is their bark, which are a wonder of engineering. The bark, which forms a major part of the tree, is still not entirely understood despite advanced technology and intensive research used. This structure, which gives strength and an aesthetic appearance to trees, not only helps carry all of the leaves and branches but also protects the tree from climate conditions like wind and storms and helps trees stand for hundreds of years. What brings such solidity to the bark of trees is the arrangement of their cells and their structural characteristics.



## **The Cells in the Bark of Trees Are Arranged to Provide Solidity**

More than 90% of wood cells are composed of thin tubes that stick on one another very tightly and move along the trunk with branches. This helps water to be carried to the leaves and at the same time provides solidity for the tree. As it is known, trees generally resist against external forces such as winds. This resistance generally comes out as the tree bends in the face of wind. However, no matter which direction the tree bends, it moves parallel to the cells and lines of the wood. As the concave part of the long and thin cell particles arranged parallel to one another resist the pressure like a column, the convex part elongates like a rope and ensures that tree stands solid in the face of winds by making the tree flexible against outside effects. Moreover, tube-like structures are more solid compared to uniform structures. Engineers can increase the solidity of structures by using these structural characteristics, which are a manifestation of the superior intelligence of Allah, the Lord of worlds, for several designs.

## **Lines of Cells Interlocked Increases Solidity**

There are circles interlocked with one another inside the tree trunk, in order to increase the solidity of the cells arranged parallel to one another and to prevent the wood from cracking. These ensure that the wood stands together with parallel cells, because if there were an impact on the cells parallel to the wood, the circles would show resistance in the opposite direction of the outside effect. These layers form 80% of the total thickness of the cell membrane, and this is the part that pulls the actual weight. When there is an impact, it splits from the cells surrounding it and collapses inside and absorbs the energy of the impact. In this way, even though dents form a

long crack along the fibers, the woody structure remains intact. So even if there is a crack, it has the strength to carry a certain amount of weight. This structure of wood prevents it from being crushed under its own weight.

This provides a special structure that makes the tree solid and flexible. There is a superior intelligence, which grants trees all of their characteristics, and places these systems in areas so small that they can only be defined with measurements like one in one hundredth and even one thousandth of a millimeter. The owner of this intelligence is Allah, Who is the ruler of all worlds and controls all things. This is revealed in the verse:

**“Everyone in the heavens and earth belongs to Him. All are submissive to Him.” (Surat ar-Rum, 26)**

### **The Structure of the Cell Membrane Provides Strength and Solidity for the Tree**



Every detail in the tree’s creation – the thinness of the layers, their density, number and order of veins, the substances inside- is created specially to ensure solidity. The cell membrane is also created from a durable substance that increases the wood’s mechanical features. This is composed of tiny cellulose fibrils. These make the bark more solid and prevents it from breaking up. This structure makes the wood even more solid than fiberglass. Therefore, boats made of wood are more resistant to strong tides than fiberglass ones .

### **Tree Trunk is Completely Composed of a Wood-like Structure**

The general appearance of trees is one of branches and leaves coming out of a single trunk. Allah created the trunk as a single thick column in order to prevent it being bent down. Thanks to this superior creation, the tree can carry all the leaves and branches that put weight on it. Moreover, the trunk needs to be single and thick in order to resist the movement of bending that occurs due to strong winds. This is because a single, thick trunk is much more solid and resistant than many thin trunks.

Our Lord gave the tree solidity with the shape of the trunk. The part of the trunk that is closest to the ground is larger. In this way, the part of the tree that is more resistant to outside effects becomes more solid with the thickening of the solid woody material.

### **Allah is the One Who Creates the Tree’s Bark and Grants Inimitable Characteristics to It**

One of the basic chemical substances that form the tree’s structure is “lignocellulose.” This matter is composed of a mixture of “lignin” and “cellulose” that makes the wood solid. When the chemical structure of trees is studied, it is seen that it is composed of 50% cellulose, 25% hemicellulose and 25% lignin. When the chemical formulas of these substances are examined, three chemical elements come across in their formation. Hydrogen, oxygen and carbon,

Hydrogen, oxygen and carbon elements are the building blocks of millions of substances in nature. However, these three elements come together and form the "lignocellulose" in plant's structure as a miracle of Allah. Even though scientists have these materials, they cannot artificially produce this special substance in the plant's structure. Even though they can easily obtain these elements commonly found in nature and there is a tree sample in front of them, scientists cannot form even a piece of wood by artificial means. However, all of the trees that we see around us combine the oxygen and carbon in the air, water and sunlight, and have prepared this composition for millions of years since they came into existence. The details in the bark of the tree remind us of the superior qualities of the tree's creation as Allah reveals in Surah al-Waqi'a. It is revealed in one verse as such:

**"Have you thought about the fire that you light? Is it you who make the trees that fuel it grow or are We the Grower? We have made it to be a reminder and a comfort for travellers in the wild. So glorify the name of your Lord, the Magnificent!" (Surah al-Waqi'a, 71-74)**

This characteristic, which our Lord created inside the bark of trees, could not yet been formed by any scientific study. This material is delicate enough to carry its leaves, strong enough to prevent trees being crushed under their own weight, breaking or being uprooted against strong winds, light enough to prevent the tree from being crushed under its own weight and solid enough to prevent it from coming apart in the face of any outside effect. This characteristic of wood is a result of our Lord's superior intelligence, which manifests on the arrangement of cells and microscopic features of cell membranes.

No material designed by men could have the characteristics of solidity, strength, delicacy and lightness that wood possesses at the same time. Brick and glass break under pressure, steel and concrete are solid but very heavy. Wood is a true wonder of creation when compared to these materials. The fact that even a single cell that forms the tree cannot be replicated via artificial means, that man is helpless in the face of the creation of trees despite all his means, the tree's characteristics which would fill volumes of books, their incredible features that inspire scientists all display the superior knowledge and intelligence of the creation of the tree. This knowledge and intelligence that manifests on the tree belong to Almighty Allah, Who creates all things and controls everything.

## **The Tree's Root, Branch and Leaf System Increases Their Solidity**

### **Characteristics of Roots**

Trees communicate about strong winds and storms to their trunks and root systems. Our Lord created the root systems of trees in a way that will fix the tree into the land very strongly. As it is known, a big part of the tree's root systems is made up of the main root. This fixes the trees into the soil just like stakes that fix a tent into the ground. The side roots coming out of the main root act as ropes that fix the tent and prevent the main root from being twisted.

As trees age, the main roots begin to lose their importance. However, our Lord's superior intelligence manifests here. Subsidiary roots begin to grow to make the tree stronger. Subsidiary roots become taller and thicker and causes the root to branch out and form a net. As these roots would not be adequate to fix the tree in place on their own, the thin roots that grow out of subsidiary roots ensure that the tree holds into the soil more strongly.

## **The Effect of Branches and Leaves That Decreases the Friction Force of the Air**

Since the branches and leaves of the tree are much thinner, they decrease the aerodynamic friction force and makes it easier for the tree to hold onto the ground. However, thanks to this feature of creation, the effect of strong winds on a five-meter tall pine tree are decreased by one third. Palm trees can endure even the strongest winds thanks to this characteristic. Trees that drop their leaves decrease the wind's effect by bending more against strong winter storms. And trees that do not drop their leaves decrease the force of friction with leaves pressing against branches. As it has been seen, Allah created perfect systems for trees to hold onto the ground firmly. Allah, He Who protects all living beings and Who has superior power is the Creator of all things.



**“Have they not looked at the heaven above them; how We structured it and adorned it and it has no rifts? And the earth; We spread it out and cast therein firmly set mountains and made grow therein something of every beautiful kind. Giving insight and a reminder for every servant who turns to Allah.” (Surah Qaf, 6-8)**

<https://www.harunyahya.info/en/articles/the-flawless-wonder-of-engineering-the-woody-structure-that-makes-trees-solid-61421>