HOW THINGS BECOME PETRIFIED

Petrified Logs, Photo Courtesy of Jonathan Zander

Petrifaction (also known as petrification) is a type of fossilization which leaves living organisms preserved as a type of stone. In order for this to happen, a specific set of circumstances has to be present when the organisms cease to live.

When any living thing dies and begins to decay, an oxygen rich environment is usually present. This environment is full of microorganisms, insects and fungi that begin to colonize and break down the organic matter into unrecognizable material. The stuff left over, like cellulose and lignin for trees, or bones and cartilage for animals, is further broken down and has its chemical composition changed by other microorganisms. The end result of this process is the carbon rich organic goodness that award winning gardeners everywhere use as fertilizer.

When an organism dies in an environment that lacks oxygen, for instance if it was covered by ash from a volcano, it is deprived of an environment that is conducive to normal decay. This leads to the organism remaining mostly intact for long periods of time, which in turn encourages the very slow degradation process that allows for the wonder that is petrifaction.

Ground water rich in minerals will start to impregnate all of the pores and cellular spaces inside the organic material. These minerals will crystallize and settle into the shapes of the cells and other structures that are slowly breaking down. When the last remnants of organic material finally changes their chemical composition, all that is left is the stone-like fossil of the original living organism, created by the crystallization of the minerals present. Not all of the organic material is lost, however. Although most petrified plants are rock-like in weight and density, about 1%-15% of the material is still organic.

Wood is one of the most common types of things to become petrified. In fact, there are several known petrified forests throughout the world, including petrified forests in 11 of the 50 states in the U.S. and 19 other countries worldwide. The structure of these petrified fossils depends on the minerals present in the ground water that penetrated the wood. The most common are silica based, as silicate minerals make up about 90 percent of the Earth’s crust and therefore are the most prevalent in groundwater. Some common silica minerals involved in petrifaction include: quartz, calcite, pyrite, siderite (iron carbonate), and apatite (calcium phosphate).

The process of petrifying wood ultimately takes millions of years. For instance, the petrified forest in Arizona is believed to have been created by trees that grew over 225 million years ago. Geologists say that the trees fell in a rain forest almost 100 miles away. Streams containing sediment and volcanic silica ash carried the logs downstream and quickly covered them. The process of petrifaction then began its slow magic. After millions of years, the tectonic uplift that formed the Rocky Mountains, combined with erosion, uncovered these wonders of evolutions wizardry. Currently there is about 100 feet of uncovered petrified trees populating this forest. Every year rainwater exposes additional petrified trees.

A way to quickly petrify wood has been discovered by Dr. Yongsoon Shin and his colleagues from the Department of Energy, at the Pacific Northwest National Laboratory. Using their method, they can petrify wood in a matter of days. The process starts by taking wood and soaking it in a bath of acid for about a day. Next, it gets soaked in a tub filled with a silica solution. Once air-dried, they bake the wood in argon gas at temperatures of up to 1,400 centigrade for 2 hours. When cooled, the process yields perfectly petrified wood (silicon carbide). It is thought the large surface area created by the vast number of pours in plant material will yield new types of ceramics that will help in filtering processes similar to those that filter out pollutants from different types of gases.

The rare set of circumstances that allow living things to become stone are special indeed. Whether your wood takes millions of years to become hard, or you prefer just several days of manual manipulation, petrifaction is one process that surely excites geologists everywhere!

Bonus Facts:

- Petrified wood weighs between 160-200 pounds per cubic foot. It's also a very hard material, rating between 7 and 8 on the Moh's Hardness Scale. For reference, talc rates a 1 and diamonds are a 10.

- Petrified material is only one type of fossil. There are several different types known. No matter the process that yields a fossil, all require two things: an environment that lacks oxygen and the presence of a hard part of the organism.

- Petrified matter can be many different types of colors depending on the minerals involved. This is why no petrified material is exactly alike. Iron will yield reds and yellows. Blues and greens will come from manganese and copper. Crystals like quartz will give the fossil a glittery appearance.

- The Petrified Forest National Park in Arizona was first created as a National Monument by Theodore Roosevelt in 1906. It wasn't until 1962 that it was designated as a National Park. There are over 800 archeological and historic sites within the park, and it's the only national park that contains a segment of the historic Route 66.

- Ancient Pueblo Native Americans, the peoples the inhabited the land where the current Petrified Forest sits, used petrified wood to build their homes. One of them, known as Agate House, still stands today. It is thought that it was built from 1100 to 1150 A.D.

- It is illegal to remove any petrified wood from the National Park. Despite this, it is known that tons of it is removed annually. Conveniently enough, you can purchase it from rock shops that are near the park. But don't accuse the shop owners of thievery, they collect it from private land outside the park borders. Or so they would have us believe! Wake up Sheeple! 
- The second largest petrified tree specimen is in Amphoe Ban Tak, Thailand. It's 65.6 feet long and 6.5 feet in diameter. The largest petrified tree is on display at the Geronimo Trading Post in Arizona. The tree itself is in several sections and is reported to weigh nearly 80 tons.

- The largest field of petrified wood is located in the Puyango Petrified Forest. Encompassing approximately 2658 hectacres. It's found south of the city of Loja in Ecuador. Don't think, however, that it's just south. This petrified forest is actually very remote and although Loja is the nearest city, it's still about a 4 hour drive away.

References:

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