Bill's Rocks and Minerals
Fossil Wood :
Mineral or Fossil? (or both?).

Look in almost any reference book on minerals and you will find a listing for Wood Opal. Although commonly known as Fossil wood, it's preferred title in mineral reference books, for obvious reasons, is Wood Opal or Opalised wood. Wood Opal/Fossil wood is in fact a fossil, but because of it's mineral properties most mineral collectors would include it in their collection, as I do, although it is first and foremost a fossil.

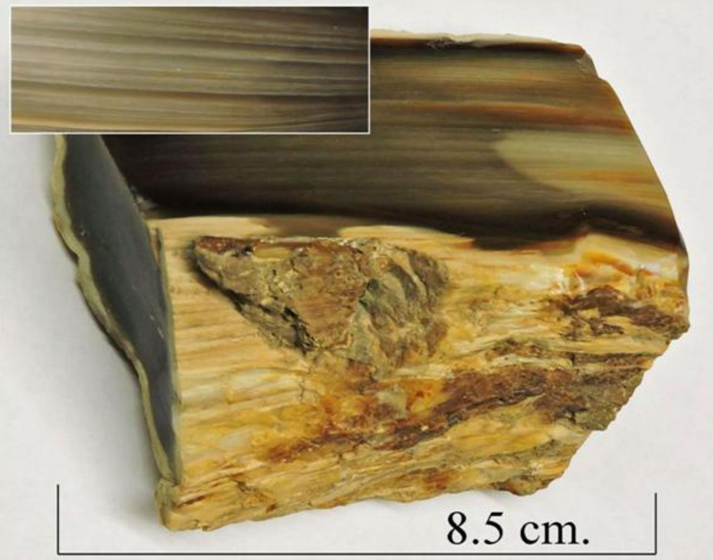
Wood Opal, Opalised wood, and fossil wood are the common names for what in reality should be referred to as petrified wood. Petrification of other organic material is possible, for instance petrified dinosaur bones are not uncommon, but to explore the whole range of petrification in one article is not an option. The agent of petrification is most commonly Silica in the form of Opal or Chalcedony, however, other mediums may also be the agents of petrification, for instance iron oxides, metal sulphides, carbonates, and sulphates. Because the silicates are the most common material, and also because they offer the finest preservation of detail, this article will concentrate on these facts.

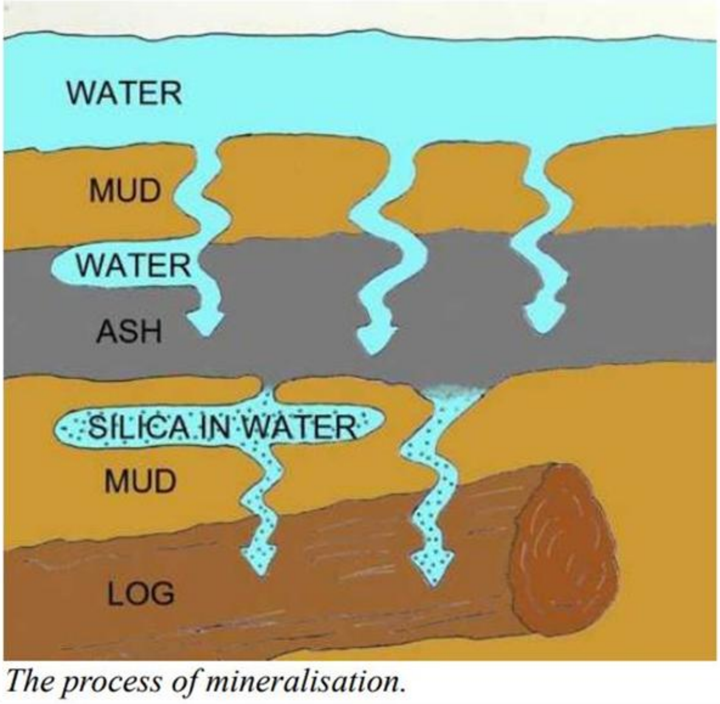
Opal and Chacedony, both silicates, are very similar in appearance to the naked eye, requiring identification in a laboratory. Both are microcrystaline and for this reason theydo not have cleavage planes, and fracture conchoidaly. Opal is hydrated silica and has a water content between 6% and 10%, and is less dense and less hard than Chalcedony, but whichever one is the agent of petrification the process is exactly the same.

The formation of petrified wood can only occur if certan conditions are observed, Very simply the conditions are firstly burial by either ash or mud, secondly a source of silica, and thirdly a good supply of groundwater.

Trees may be buried in mud, possibly as the result of a flash flood or a violent storm. or trees may have been transported by rivers into muddy deltas.Volcanic activity can flatten forests and provide volcanic ash which is a source of Silica, for instance the Mount St. Helens eruption flattened millions of trees, and also deposited in some places ten inches of ash. Historicaly there have been much larger volcanic eruptions than Mount St. Helens, so large that even standing trees have been covered by ash. The largest example of complete forest burial (fossilised in situ ecosystem) is to be found on the Greek island of Lesvos.

Petrified Forest, Arizona. Creative Commons.





The process of mineralisation.

Several episodes of ash and mud deposits eventualy bury the trees at a depth that is suitable for the mineralization process to begin. The depth needed is relatively shallow, because at too great a depth the trees would be crushed preventing mineralization. Two conditions are now fulfilled. The trees are buried, and there is a source of silica in the volcanic ash. The final neccesary condition for mineralization is a plentiful supply of ground water. The groundwater is important for several reasons. It reduces oxygen in the sedeiments therby inhibiting tissue deterioration. A good illustration of this property is found in peat bogs where even human remains are preserved. The groundwater also acts as an agent for the alteration of the ash, stripping silica ions from the ash as it perculates downwards and finaly acting as a medium for the deposition of the silica in the buried trees.

During the initial stages of mineralisation, amorphous silica infills pits connecting cells, and precipitates on cell walls. As mineralisation continues silica replaces cellulose in cell walls. Cellulose that degrades leaves room for the emplacement of silica between and within cell walls. The more resistant lignin that remains in the cell walls continues to act as a guiding framework to preserve structure. Later silica is deposited in cell lumina (the cavity enclosed by the cell walls), and voids created by wood degredation. Trace minerals carried along with the silica, especially iron oxides add colouration to the process, highlighting the original structure of the wood. Initialy the silica is amorphous and unstable, but over a period of time, perhaps thousands of years polymerization and water loss transitions the silica to a more stable state, and it aquires a hardness. The buried trees have now been petrified by the process of permineralization.

Over a period of time geological changes, including uplift and erosion, bring the petrified trees to the surface. At this point it is possible to interpret the initial conditions which started the process, perhaps burial in mud, or burial in ash.

Exposed fossil forests, as in Lesvos or Arizona are littered with fossil trees and logs. Smaller peices which are collected, are usualy cut and polished, and then sold as fossil wood or wood opal. Structural details of the original wood may be perfectly preserved, even down to cell structure, and growth rings are usualy pronounced. Fossil wood can be of great interest to either palaeontologiosts or mineralogists.

Fossil, Mineral, or both?

Bill Bagley, specimens are from my own collection