

# How the giant sequoia protects itself

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The giant sequoia (*Sequoiadendron giganteum*) has developed effective strategies to protect itself against external influences in its natural environment in the Sierra Nevada. Its bark ensures that the tree survives

wildfires and rock fall almost unscathed. Prof. Dr. Thomas Speck from the Cluster of Excellence Living, Adaptive and Energy-autonomous Materials Systems (livMatS), working with Dr. Georg Bold and Max Langer of the Institute of Biology, have examined the structural properties of its bark in detail for the first time. The University of Freiburg team has shown that the bark fibers form a three-dimensional network with cavities. This network distributes energy acting on the bark across the entire tissue. The results of their study have been published in the *International Journal of Molecular Sciences*.

The outer bark of the sequoia tree contains many fibers, which are organized in fiber bundles. These cross over each other and are also layered on top of each other, creating a three-dimensional netted structure. In between the fiber bundles are air-filled cavities. When a rock strikes the bark, these cavities are compressed. Compressing the hollow spaces and stretching the fiber network has the effect of distributing the energy evenly over the bark and protecting the inside of the tree with the sensitive cambium that forms wood and bark. The bark later returns almost completely to its original state. The cavities also insulate the tree so that it is resistant to the heat generated during wildfires.

Due to this structure, the [bark](#) of the sequoia tree behaves like an open-pored foam similar to the foam used in the construction of cars and houses, for example. On the basis of their findings, the researchers are, among others, to develop with colleagues from the University of Stuttgart a new type of lightweight concrete with bundles of hollow fibers, which could be used to insulate and to better protect buildings against earthquakes, for example.

**More information:** Georg Bold et al. The Protective Role of Bark and Bark Fibers of the Giant Sequoia (*Sequoiadendron giganteum*) during High-Energy Impacts, *International Journal of Molecular Sciences*

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