

# Biomimicry Design

Pine Group



winter 2011

The problem :

Rainy regions are always in needs of shelters with fast actions especially in public places such as parks and open spaces .

The Goal :

designing a shelter inspired by nature (pine tree ) that has a fairly fast reaction to the weather changes and also it could be capable to be installed in public spaces with a optimum production and consumption and saving energy.

Researchers during their researches on pine tree wood concluded that the fibrous tissue of pine wood has a great feature in response to relative humidity. Because of the high capacity to absorb and retain water ( moisture ) in the wood and also its significant feature of transformation in a short time , that is completely reversible . base on these features a preliminary model is presented .the component consist of two critical parts : a load bearing substructures ,and 2 moisture sensitive veneer composite elements .

This structure is our basic design plan in this project and the shelter coefficiented according to the length and thickness of pine wood ( stands designed )

What was important in the design plan was ,how to inspire by the nature in order to ease people community( movement ) on a rainy day , and the design more compatibility with the environment around .this project is intended as a shelter for a rainy day , that is responsive to both social attitudes and climate treatments.

The use of pine wood with the features above-mentioned and the ability of this material to react quickly in moisture shows this material is an appropriate option in this project to built a shelter . One of the most important problems (most challenging parts of ) with biomimicrical designing is designing with energy approaches .

Therefore the plan to built a shelter with pine wood material , because of removing (omitting) the energy of shelter transformation for each rainy time and also capability to collect the rainwater from the lower half of the shelter structure and save it for other uses , could be an appropriate response to existing conditions .

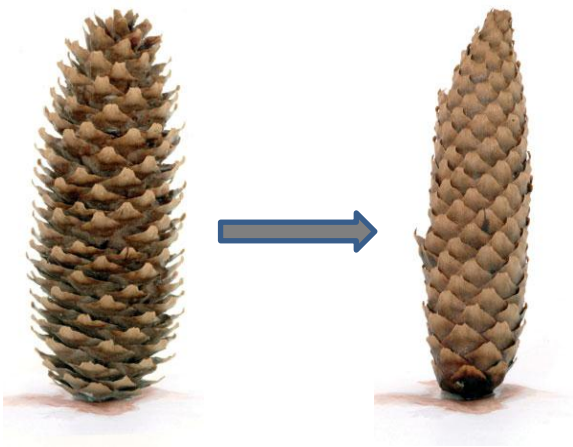
In addition to the above, the plan due to the use of pine wood that is found in abundance in this region and also due to the ease of installation is economically affordable.

The form of these structures together creates a warm and pleasant atmosphere .

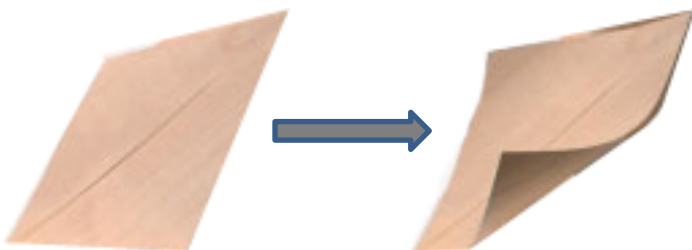
# Responsive Surface Structures : Instrumentalising Moisture-Content Activated Dimensional Changes of Timber Components



Scanning electron micrograph of wood from a Siberian pine tree (*Pinus sibirica*) showing the internal differentiation of wood

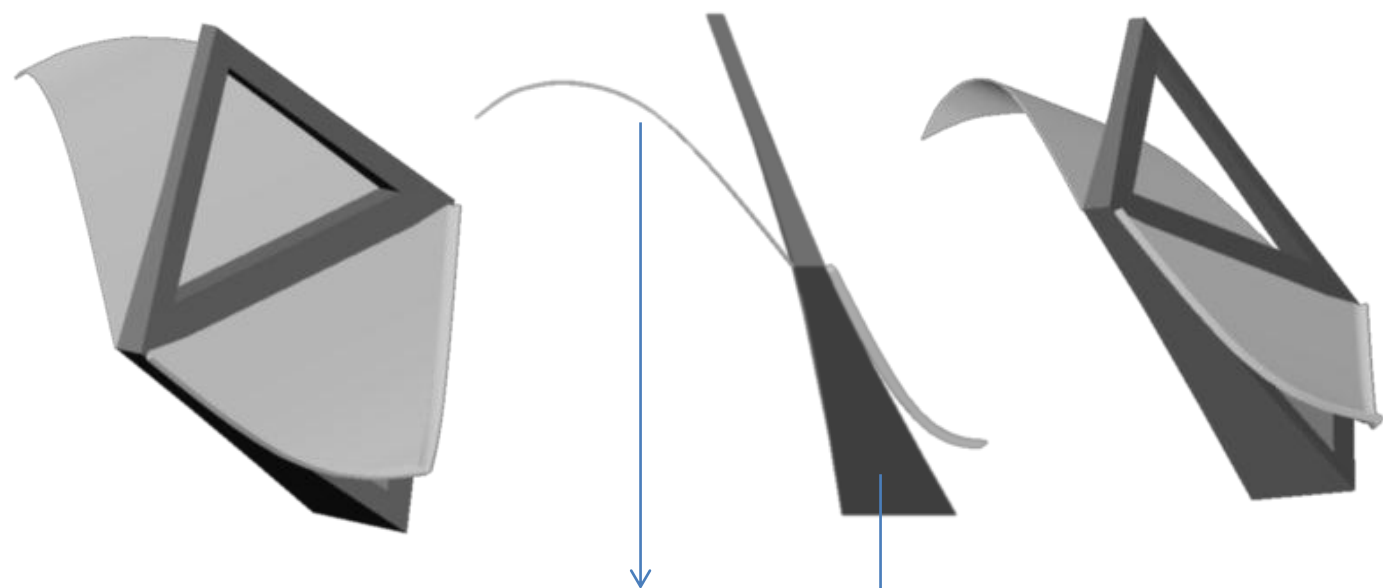


The reaction of pine cone to relative humidity



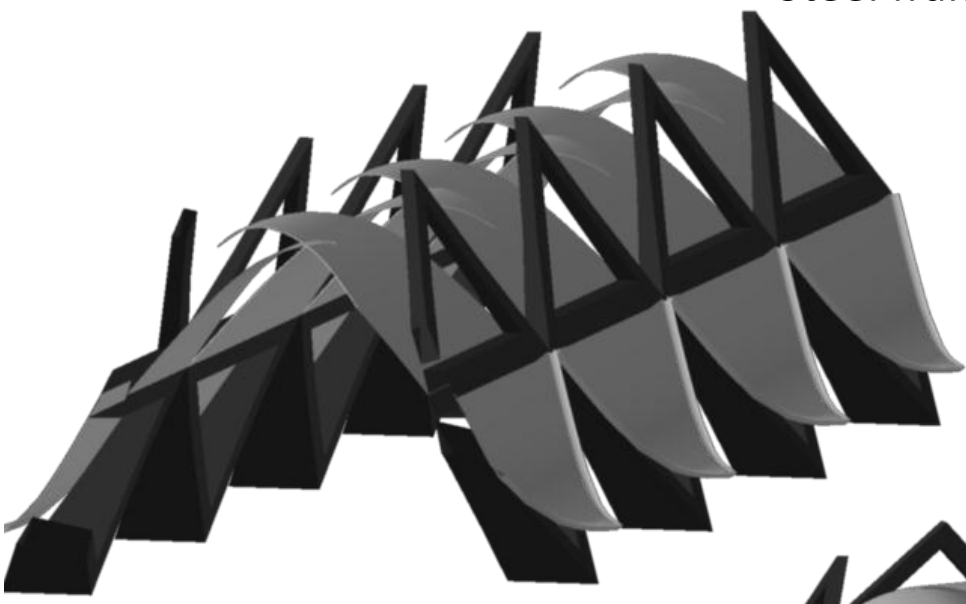
The reaction of pine wood to relative humidity

1- After finding pine wood feature, we need too have a structure to hold the wooden sheets

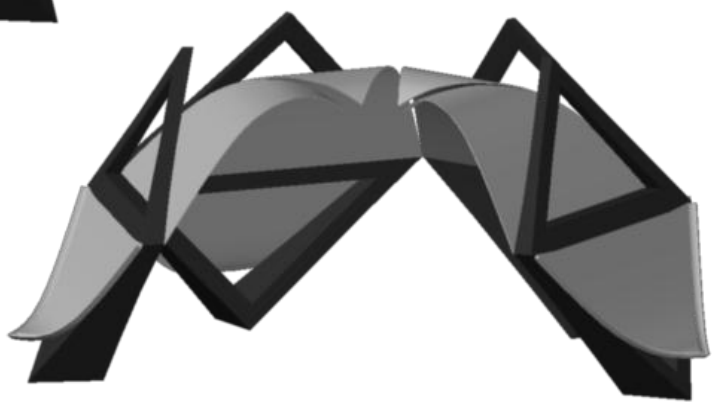


Wooden sheet

Steel frame

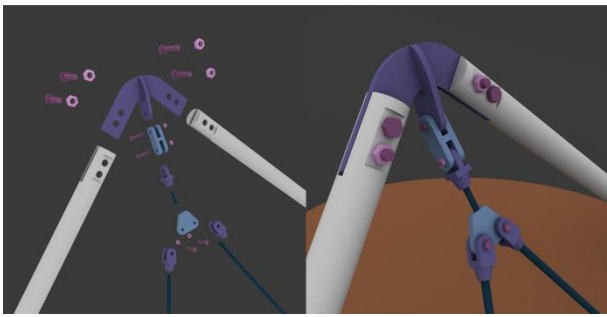


Form 1

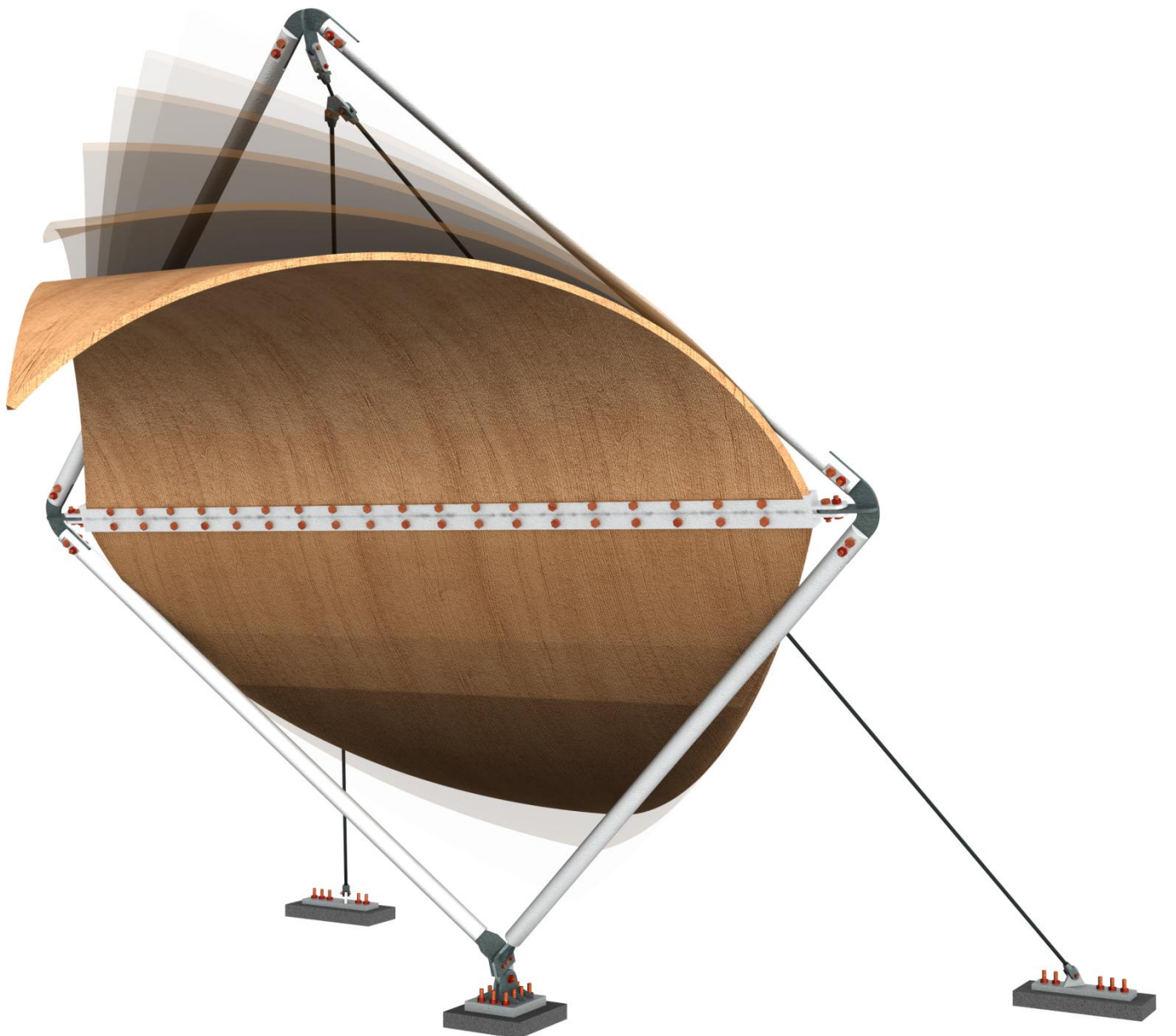
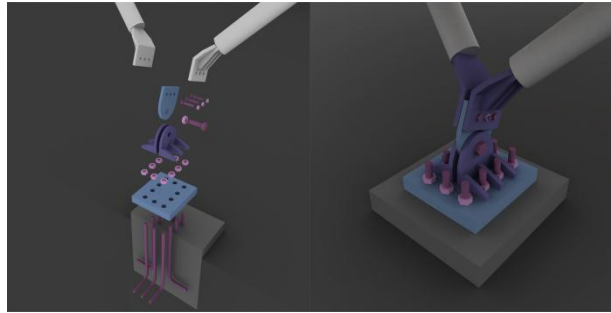
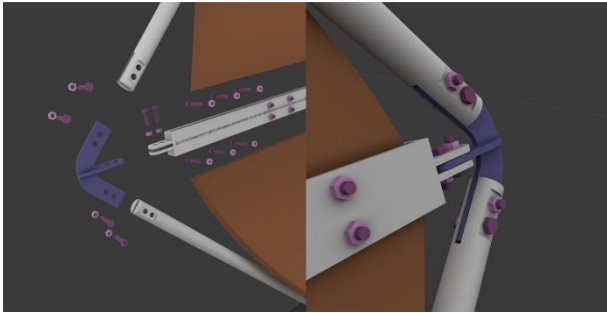
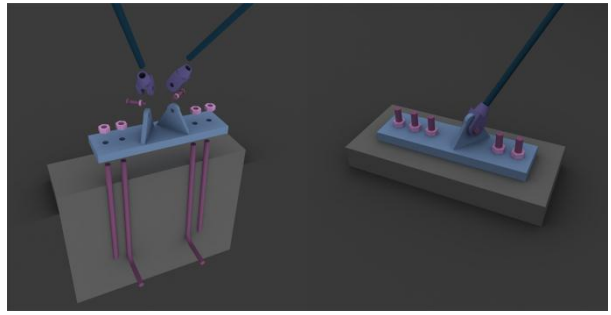


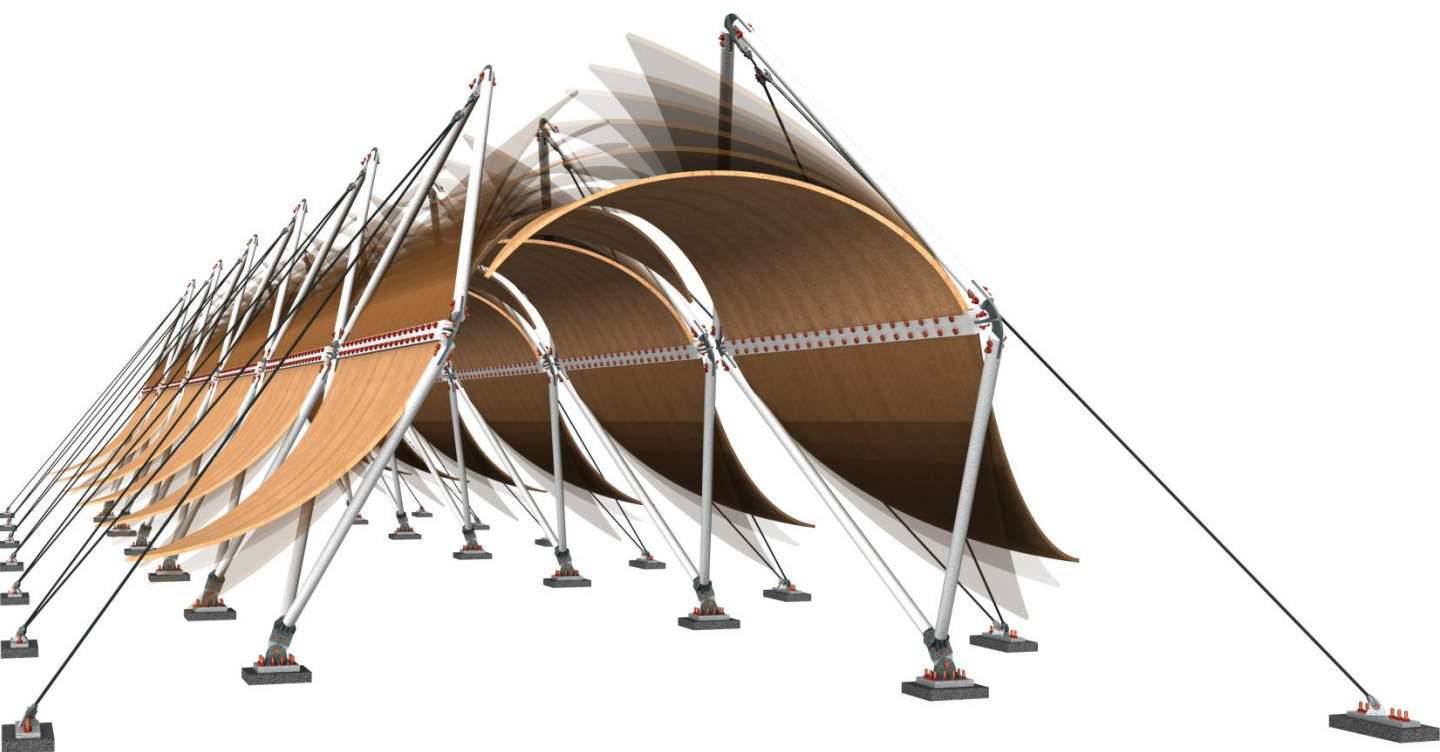
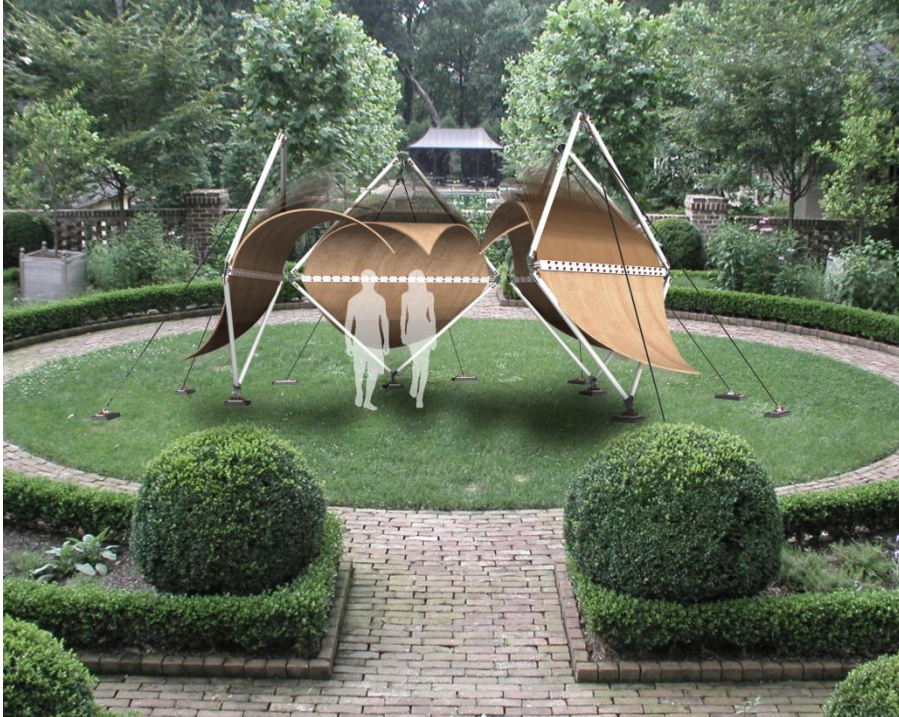
Form 2





2





# Life's Principles

Be resource (material and energy) efficient

Using sheets of pine wood that is totally reversible to nature and also changing sheets position

Adapt to changing conditions

By Environmental changes, sheets  
Automatically and without using outer  
Energy become close or open

Integrate development with growth

By using the main module as a prototype, we  
Can have an integrate and also a nested component