TREE POD

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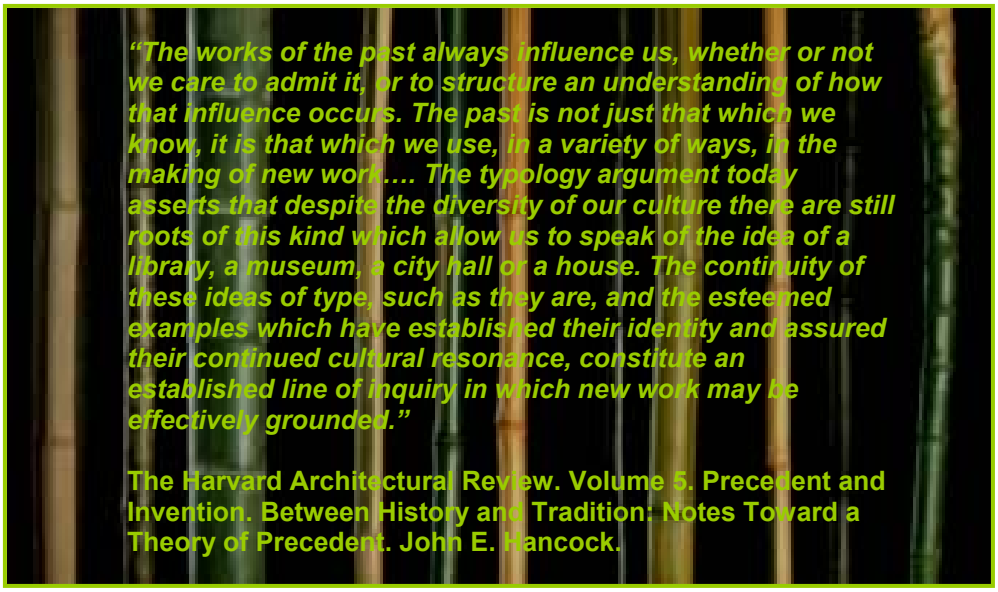

The treehouse and the use of bamboo as an architectural element have dated back to the beginnings of human civilization. While the Bamboo Competition provided a variety building types to pursue, the treehouse seemed to carry a certain unique quality that would complement the use of bamboo. Both the treehouse and bamboo started as elements of necessity, but have now grown to be items of luxury and beauty. The Tree Pod strives to seek the balance between the two functions of practicality and luxury.

The earliest known treehouses were made by primitive hunters in the stone-age, designed to camouflage in the forest and jungle in order to effectively watch and observe their prey in secrecy.[1] The height allowed for an effective range in order to utilize their bow and arrows as well. Furthermore the treehouse provided the hunter with protection from his predators, on a higher plane to which they could not reach. While most civilizations moved from the trees to land as their technology and agricultural practices progressed, some remained in the canopies of the jungles and developed the small shacks in the trees into full houses and communities. One such community can still be witnessed today with Korowai, an indigenous people of Irian Jaya, a tropical island between Australia and the Equator, now under the control of Indonesia.[1] These treehouse usually house a family of eight and usually range from 6-25 metres, but can reach to 50 metres. This choice of altitude is usually the result of a tribal war, or an unruly neighbor, and the need to escape such things. These houses are made of sago leaves and wood, and are designed to be fairly self sufficient from the ground. Water is gathered from the roof, and is abundant in the tropical zone. Waste is disposed through holes in the floor. Born out of necessity, these treehouses are an example of how they can be used effectively as a habitable and functional space. Its cluttered construction and vernacular form is the source of its beauty.


Figure 1.A: A Korowai treehouse

While the tropical tribes continued to flourish in the trees, the rest of human civilization continued on the ground, and the treehouse was forgotten, or at least was rarely used, for centuries. It was only until the Roman Empire that the treehouse began to reemerge and continued to grow as a novelty for the luxurious. It is recorded that the Roman emperor Caligula feasted on a platform in a vast plane tree with 'flooring' of a single plane-tree and the horizontal branches serving as seats. [1] He held a banquet in the tree and the leaves provided partial awning in a dining room spacious enough to hold fifteen guests and the servants. This idea of decadence and luxury in a treehouse continued in the Renaissance, when the famed Medici family competed within their ranks to create the most elegant marble treehouse. In Tudor England, Queen Elizabeth I dined in a house in a massive linden tree. [1]

Figure 1.B: The Tree Pod in a beach setting.

Figure 1.C: ZERI Pavilion at Expo 2000

The Tree Pod is an amalgamation between these two precedents. The base intention was to create a simple treehouse that would provide simple privacy and protection for inhabitants. The design is intended for a beach setting. In this case, the Pod provides privacy away from the activities of the beach. Also, it can be a temporary sleeping area at night that offers a great deal of protection as it elevated and difficult to access when the ladder is retracted. However, the entire structure is still an item of luxury and is intended to be a temporary space to enjoy in privacy, to have a romantic getaway, or to entertain a small group of friends. With the covers down, the pod is a convenient and safe place to change or sleep. Thus, the Tree Pod takes from both the primitive instinctual idea of the treehouse, as well as the novelty and decadence of later examples.

Bamboo's history is also rooted with the idea of practicality. In areas where it is a domestic species, such as China, Japan, India, Colombia, and Mexico, the material is strong, cheap, and renewable, thus an obvious choice for building. However, bamboo has been mostly seen as a low-end building material in terms of architecture, perhaps because of its availability. In China it is mostly used in lower class housing and scaffolding. In Columbia, it is also regarded as a low end material as the higher class would prefer concrete, and well as in India, where stone and wood are regarded as middle to high grade material. [2] But while it is seen as a cheap building material, in many cultures, bamboo also carries a great amount of symbolic meaning. In Chinese culture it represents longevity, while it symbolizes friendship in India. It also represents protection in many Asian cultures. Many Japanese temples are surrounded by bamboo forests to act as a barrier from evil. Vietnamese villages are often protected by bamboo hedges.[3]

Figure 1.D: A modern steel and bolt connection by Shoei Yoh.

Figure 1.E: Wire and steel connection by Renzo Piano

However, many designers are beginning to realize the architectural advantages of bamboo. Bamboo is stronger in compression than pine and stronger in tension than steel. If the cavities of the bamboo are filled with water, bamboo can withstand temperatures up to 40 degrees Celsius while the water boils inside.[4] Bamboo is also light weight compared to other materials in its class. But while bamboo seems to be a better material than steel and wood in strength, the problem is that it is impossible to create connections able to effectively transfer these forces. While most simple bamboo connections consist of simple notching, tied ropes, and tacking, many architects and engineers are developing new connection techniques utilizing steel and mortar to better accommodate for the properties of bamboo. Both architects Shoei Yoh and Renzo Piano have created modern steel connections for their projects, utilizing bolts, metal wire, and mortar filled cavities to resist shear. [5] After being used in larger scale projects such as the ZERI Pavilion at Expo 2000 by , bamboo is being recognized as a structural and architectural element, rather than just a decorative piece. In fact, the species Bambusa Stenostachya is now approved by the International Code Council (ICC) for code approved building construction. [6] Bamboo is also common cosmetic motif in high end design with the growing trend of Asian culture in Western design. Due to its excellent renewability, it is also becoming popular with the rise of sustainable practices and is becoming a popular flooring material.

The Tree Pod is designed to fully display the properties of bamboo and the techniques associated with it. The form of the Tree Pod was actually inspired by another treehouse design, designed by Oisin Clancy and Marc Ackerson of Field Lines Architecture for the 2001 International Treehouse Design Competition, sponsored by Treehouses of Hawaii. [1,7] The finalist design, simply entitled “A Treehouse Is…” consisted of a number of vertical prefabricated wood laminate “spines” that acted as tension members holding the structure together. This design inspired the use of the tension members present in the design. Due to the tensile strength of bamboo, the design emphasizes this property and is essentially a form created out of tension. In theory, the Pod does not require any connections to the ground and hugs the tree utilizing modern custom metal connections. The connections are hinged to allow for a certain

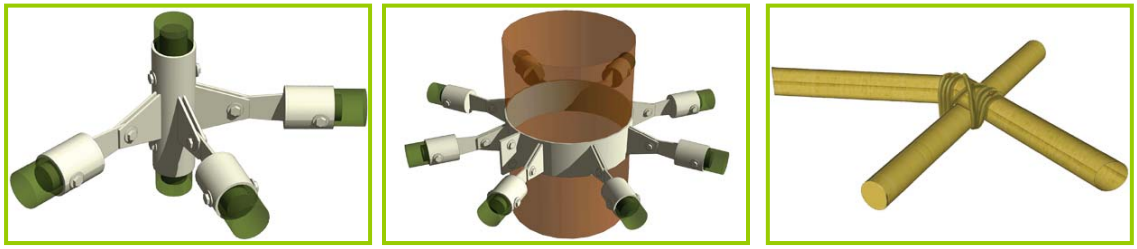

Figure 1.F-H: Various connections utilized in the Tree Pod, including modern prefabricated steel connections and traditional plait ties.

Figure 1.I: A traditional plait tie, using bamboo strips.

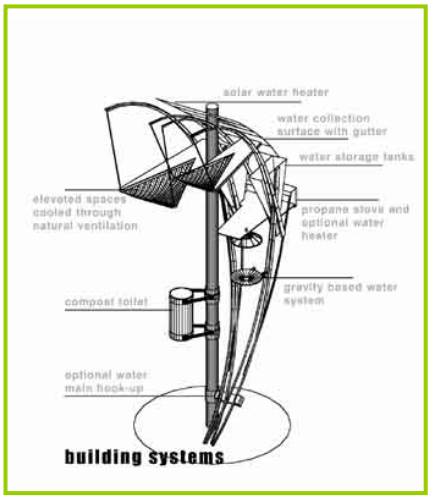

Figure 1.J: "A Treehouse Is…"

Figure 1.J: The Tree Pod

amount of give, rather than forcing a rigid form that my lead to great structural failure. The connections also consist of only three distinct pieces and thus can be easily prefabricated and mass-manufactured. Furthermore, the connections to the tree are metal braces which, if installed properly, will care little to no damage to the tree. While the Pod relies on the tree as its primary support, the Pod also supports the tree itself and reduces swaying due to lateral forces, such as wind. The tree house uses Bambusa Stenostachya (3" diameter poles) and has mortar injected at connections to resist shear and splitting. The bamboo flooring is attached to the frame using traditional tied plait strips usually made of bamboo strips, rattan, or lianas. The plaits are soaked in water before being tied. As the plaits dry, they contract and the connections tighten. The choice of using plait connections along side with high-tech connections is intended to show that both new and traditional techniques are still viable in contemporary architecture. The Tree Pod utilizes bamboo in a fashion that demonstrates bamboo at its full potential and is designed to promote the use of bamboo as a building material, rather than just a veneer or decorative element. However, the design does not try to hide the simple aesthetic of bamboo and leaves it completely exposed. The form of the Pod is a testament to tensile properties of bamboo and is the basis of its design.

The Tree Pod is a treehouse that communicates the basic idea of privacy and protection of its Stone Age predecessors, while also displaying the luxury and comfort of a Roman plane-tree. Its use of bamboo harkens back to simple plait construction, while contrasting with modern high-tech steel connections. It is a balance of the present and past, between practicality and pleasure.

ENDNOTES:

1. Paula Henderson and Andre Mornement, Treehouses (London: France Lincoln Ltd., 2005)
2. "Bamboo as a Building Material," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html
3. "Bamboo", Wikipedia, Available HTTP: http://en.wikipedia.org/wiki/Bamboo
4. "Modern Bamboo Architecture," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html
5. "Mechanical Properties of Bamboo," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html
6. "Bamboo Connections," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html
7. "Bamboo Technologies of Maui earns ICC Certification for Structural Bamboo Poles for Bamboo Living™ Homes," 2006/2007 International Bamboo Building Design Competition, Available HTTP: http://www.bamboocompetition.com/certification.html
8. "Treehouse Competition: Finalists / 2450," Treehouses of Hawaii, Available HTTP: http://www.treehousesofhawaii.com/competition/finalists/pages/2450.htm

BIBLIOGRAPHY:

Paula Henderson and Andre Mornement, Treehouses (London: France Lincoln Ltd., 2005)

"Bamboo as a Building Material," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

"Bamboo", Wikipedia, Available HTTP: http://en.wikipedia.org/wiki/Bamboo

"Modern Bamboo Architecture," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

"Mechanical Properties of Bamboo," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

"Bamboo Connections," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

"Bamboo Technologies of Maui earns ICC Certification for Structural Bamboo Poles for Bamboo Living™ Homes," 2006/2007 International Bamboo Building Design Competition, Available HTTP: http://www.bamboocompetition.com/certification.html

"Treehouse Competition: Finalists / 2450," Treehouses of Hawaii, Available HTTP: http://www.treehousesofhawaii.com/competition/finalists/pages/2450.htm

PICTURE SOURCES:

Figure 1.A:
"Korowai", Wikipedia, Available HTTP: http://en.wikipedia.org/wiki/Korowai

Figure 1.C:
"Bamboo as a Building Material," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

Figure 1.D:
"Bamboo Connections," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

Figure 1.E:
"Bamboo Connections," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

Figure 1.F:
"Bamboo Connections," RWTH-Aachen, Available HTTP: http://bambus.rwth-aachen.de/eng/index.html

Figure 1.F:
"Treehouse Competition: Finalists / 2450," Treehouses of Hawaii, Available HTTP: http://www.treehousesofhawaii.com/competition/finalists/pages/2450.htm