WOOD STORIES

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The wild forest is a complex and interwoven environment.

Sustainable transition

Wood as a construction material holds unique properties essential for transitioning to a society that develops itself in balance with climatic conditions. Due to wood's capability of carbon sequestration and replacing other building materials with sizeable CO2 emission levels, it has gained attention publicly and inside the building industry in recent years. The development is escalated by engineered wood products becoming more available and economically competitive. The wood industry is well-developed in automation and digital technology for analysing and processing wood, from forestry to the final timber product. It could seem that the path towards a

sustainable building practice is straightforward. However, the production lines of the current wood industry are characterised by a narrow range of both wood species and manufactured timber products. This leads to forests dominated by monoculture and a lack of biodiversity (Bremer and Farley 2010), degrading the forests (Dudley, Jeanrenaud, and Sullivan 2014).

Plantation forest is an effective strategy for growing and harvesting wood resources – but is a threat to biodiversity and natural ecosystems

Timber products for construction are primarily made of pine and spruce, and 90% of the timber used in the Danish building sector is imported, mainly from Sweden, Finland and Germany (T. Nord-Larsen et al. 2020). This is partly due to classification standards that alternative wood species do not match, even though their properties often supersede the standard products. Nearly 40% of the beech felled in Denmark is used as firewood (‘Statistikbanken’ 2020), which disagrees with the EU Biodiversity Strategy for 2030, stating that ‘the use of whole trees…for energy production…should be minimised.’ These facts indicate a need to broaden the range of wood types used in construction.

Furthermore, alternative wood types could lead to new architectural qualities, both technically and aesthetically.

Consequently, adopting wood as a direct replacement for other materials should be approached welcomingly but critically. The material fundamentally differs from the materials it replaces, such as concrete and steel, and displays much more significant variation. There is a risk of losing the architectural potential of the material by overlooking crucial differences in properties of the individual wood types and even each unique piece of wood. The positioning of wood as the primary building material of the near future should rely on an architectural and material understanding that embraces a much more varied, deeper and unfolded story than just the quantification of CO2 emission.

Evoking the stories

While the industries seem to approach wood with an agenda of standardisation and homogenisation, the project Wood Stories seeks to suggest the opposite. A story can be told for each species of wood, each element of a trunk and each induvial log. These stories can point towards architectural anchoring and be a narrative of a spatial or tectonic will and potential. By evoking the virtuality of the individual material properties and positioning these towards tangible duties, it could be possible to explore material possibilities that not only replace the existing methods but instead reveal new ways of approaching architectural and spatial design. Through a series of organically developed experiments and physical investigation, Wood Stories continually seeks to combine the tradition of craft, material knowledge and contemporary digital workflows into architectural fragments.

Today's digital tools offer new methods for grasping certain aspects of the complexity of nature.

Tradition and material

To inform the experimental production, examples from the past and traditional crafts have been researched and studied. The oak-focused wood knowledge of the Vikings and the traditional craft of gondola-making here serves as examples of work that reflects a symbiosis between natural material properties and human-invented tools.

The Viking shipbuilding tradition was deeply anchored in the resources of the forest. By understanding material behaviour and preparing and processing the material accordingly, the Vikings made ships of oak that were strong and lightweight. They dug up the trees with the roots intact instead of cutting them down, and they insisted on cleaving the oak instead of sawing, even after the saw was invented (Andersen 1997, 35–41). The cleaving of wood results in boards with no broken fibres, which preserves maximum strength. Therefore, less wood was needed to construct their boats and buildings.

Furthermore, the Vikings used a radial cleaving technique (Andersen 1997, 88–89) to maintain the final boards' wood rays. The rays are groups of cells extending radially outward from the pith (Hoadley 2000, 8), strengthening the wood in the orthogonal direction to the grains. The Vikings'

ability to fully utilise grain direction and rays in their processing methods is a witness to their technological advancement. The Vikings' building culture also incorporated as-found, natural forms. Crooked branches and logs were selected from the forests based on their curvature and used for the curved sections of ships, along with the bow and stern (Andersen 1997, 106, 113). Later, this technique found a way into other constructions like houses and stables, and it became a widely-known sourcing method in the shipbuilding (Matthew et al. 1831; Vial Du Clairbois 2013). The Viking approach is understood today through combined archaeological research and reconstruction of Viking ships and buildings (see Figure 2) (Andersen 1997; Neersø and Schantz 1986).

Where the Vikings developed their wood culture in an almost nose-to-tail approach, the creation of the classic Venetian gondola evolved in another way, material-wise. While there are many designs and functions of the Venetian gondolas, they all utilise specific material properties that align with the performance of the vessel (Caniato 2007). A gondola is made of eight different wood species – often lime, oak, mahogany, walnut, cherry, fir, larch and elm – and crafted using dozens of specific tools to achieve an optimised form, aesthetic and performance. Gondola crafting is refined craftsmanship, by many, regarded as an art that relies on technological understanding, material experience, and sensitivity. The oar, the rèmo, is made by sandwiching both stiff and elastic wood species. The oarlock, the fórcola, is a complicated piece whose capacity is only achieved if the hardness and grain orientation of the chosen fruit tree wood is exactly matching both the properties of the gondola type and the body build of the gondolier, the human.

Venetian gondola craftsman presenting the art of gondola making

Potential future

Can we be inspired by earlier material cultures when we develop our future sustainable buildings? And can the material be used as a starting point for the design process? Wood Stories seeks to demonstrate and discuss the potential of utilising material properties as functional and aesthetic consequences in a contemporary architectural design context. The project is based on the idea that increased attention and adaption of material capacities and properties can embrace a modern concept of craftsmanship while fostering a wood-building culture that is more inclusive and sustainable than today's standardised industry. By looking at unwanted, alternative and leftover wood and wood species Wood Stories tries to establish artefacts and experiments that form an architectural discussion around them. The methods incorporate knowledge from traditional craftsmanship together with computational control in a search to bridge today’s design workflows and a comprehensive perspective on nature. By suggesting building fragments that propose alternative wood tectonics and new architectural potentials, the often-unknown properties of specific wood species come to life. Discarded crooked oak is, for instance, used in roof construction where the natural shapes of the logs inform the design of the typology. Another series of artefacts proposes using beech wood instead of steel in joints, which allows both more sustainable construction and a radically different expression. In another piece, technics for bending and laminating wood while maintaining natural fibre composition suggest alternative glulam tectonic with a much closer dialogue to the material.

Examples of beech wood utilised in construction joints.

Wood Stories is a selection of a long and unfinished investigation that evaluates itself through the making of pieces and artefact that expresses themselves as they immediately appear but also contain both individual deep and complex narratives and a shared aim at discovering and rediscovering a sustainable relation to the forest, the tree, and the wood in future architecture.

Larger architectural fragment constructed of discarded, crooked oak. The natural curvatures of the wood inform the design.

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