2021 World Wood Day Virtual Symposium & The 3rd

IUFRO Forest Products Culture Colloquium

ABSTRACT BOOKLET

March 21st-22nd(GMT)

2021 World Wood Day Virtual Symposium & The 3rd

IUFRO Forest Products Culture Colloquium

Date: 21-22 March, 2021

Theme

CO2 & Wood: Carbon Capture and Storage in Forests, Wood and Non-Wood Products

The background to this 2021 World Wood Day Symposium in cooperation with the Third IUFRO Forest Products Culture Colloquium is to emphasize the importance that harvested long-lived forest products (wood and non-wood materials) play in mitigating climate change particularly as stored wood-based carbon products that society values. Wood is a natural renewable raw material and is derived from CO2. Carbon is exchanged naturally between terrestrial ecosystems and the atmosphere, whereby wood is formed by photosynthesis of CO2 and water. One cubic meter of wood can correspond to the reduction of the CO2 emission from fossil fuels up to 1.1 tons.

Since the Kyoto Protocol when only forests were the essential carbon sinks for climate change mitigation, wood, and likely non-wood, products are now recognized to have complementary roles. As with forest management and conservation efforts to secure long-lived carbon sinks in forests, various efforts are also

being made to secure the carbon sink effectiveness as well as the fossil fuel substitution effects of harvested wood products in climate change mitigation.

Society needs to cultivate a deep sense of cultural appreciation on the benefits of wood and non-wood products. Various strategies are needed to secure the long-lived carbon storage effectiveness of forest products through research and innovations in forest products technology as well as educational aspects concerning wood and forest culture.

Topics

1. Carbon Capture and Storage in Forests, Wood and Non-Wood Forest Products
2. Wood in Construction and Buildings Including Wood Durability and Protection Needs
3. Building Components, Furniture, Musical Instruments, Artifacts Manufacturing and Design
4. Education on Sustainable Forests, Forest Products Utilization and Wood Culture
5. Challenges for Sustainability in the Forest-Wood Chain
6. Wood Products and Wood Biotechnology (IAWS Special Session)

CATALOGUE

2021 World Wood Day Virtual Symposium Program

Date: 21st-22n March (GMT)

Sunday, 21st March 2021		
TIME	SUBJECT	SPEAKER
08:00-08:30	Introduction to the 8th WWD Symposium Opening Remarks	Dr. Andrew Wong, IWCS Honorary Coordinator for Malaysia and Southeast Asia/Deputy of IUFRO Division 5 Forest Products Dr. Michael Grabner, University of Natural Resources and Life Sciences, Vienna (BOKU) Prof. Yoon Soo Kim, President, International Academy of Wood Science (IAWS) Dr. Pekka Saranpää, Coordinator of IUFRO Division 5 Forest Products Dr. Elisabeth Johann, Coordinator of IUFRO
	Topic 1: Carbon Capture and Storage in Forests, Wood and Non-Wood Forest Products Chair: Dr. Xavier Deglise, French Academy of Agriculture	
08:30-09:05	Keynote- Forest and wood products assets for climate change mitigation : prospects for maximizing their effects	Gerard Deroubaix FCBA
09:05-09:40	Keynote- "Close to Nature Forestry" as a sustainable forest management model with an integrated silvicultural system, that provides timber, carbon storage, biodiversity, and positive ambient effects.	Eckart Senitza Pro Silva
09:40-10:00	Middle Age and modern timber techniques in the restoration of Notre Dame de Paris	Bernard THIBAUT CNRS
10:00-10:15	Coffee Break	
	Topic 3: Building Components, Furniture, Musical Instruments, Artifacts Manufacturing and Design Chair: Dr. Michael Grabner, University of Natural Resources and Life Sciences, Vienna (BOKU)	
10:15-10:50	Keynote- Working Reclaimed Wood: A Guide for Woodworkers, Makers & Designers	Yoav S. Liberman Rudolf Steiner School, NY/Popular Woodworking Magazine
10:50-11:10	Choice of wood in musical instruments: Italian Red Spruce and traditional mandolins	Martino Quintavalla DEIB- Politecnico di Milano
11:10-11:30	1921 - 2021: 100 years of artisanal Alphorn making; an appreciation of Adolf Oberli, the first commercial Alphorn maker in Switzerland	Mike Maurer Klingendes Museum Bern

11:30-11:50	Documentation of the Tired and Scarred Wooden Ifugao Traditional Houses in Kiangan, Ifugao, Philippines	Eulalie D. Dulnuan/ Marissa P. Bulong Ifugao State University
11:50-12:10	Lesser-Known Wood Species & Appropriate Technology: Two Keys to Sustainable Artisan Woodworking	Scott Landis GreenWood
12:10-12:30	Wood Used In Construction Of Indigenous Traditional Houses in Ifugao, Philippines Using The Triangulation Method	Consuelo Dl. Habito UP Open University
12:30-14:30	Lunch	
	Topic 6: Wood Products and Wood Biotechnology (IAWS Special Session) Chair: Prof. Stavros Avramidis, University of British Columbia (UBC) / IAWS Vice President	
14:30-15:05	Keynote - Containing carbon in wood used for coastal defense and marine construction	Philip D. Evans University of British Columbia (UBC)
15:05-15:25	How do trees grow upright?	Lloyd Donaldson Scion
15:25-15:45	Enhancing tree growth and wood production with plant hormones	Roni ALONI School of Plant Sciences and Food Security, Tel Aviv University
15:45-16:05	Recent Progress on The Formaldehyde Emission from Bonded-Wood Products	Byung-Dae PARK Department of Wood Science and Technology, Kyungpook National University
16:05-16:20	Coffee Break	
16:20-16:40	Particleboard: A New Feed Stock from Tropical Rapid Growth and Aggressive Coppicing	Wan Mohd Nazri Wan Abdul Rahman Universiti Teknologi MARA
16:40-17:00	Research of Wood Shape Memory Effect at Low Temperatures	Galina Gorbacheva Bauman Moscow State Technical University, Mytishchi Branch
17:00-17:20	Liquefaction of lignocellulosic biomass and its applications for wood adhesives	Stergios Adamopoulos Swedish University of Agricultural Sciences
17:20-17:40	Valorization of beech wood through the development of innovative and environmentally friendly chemical modification treatments	Mahdi MUBAROK Forest Product Department, Faculty of Forestry and Environment, IPB University
17:40-18:00	Richter K, Windeisen E, Özparpucu M 2021: Interactions of wood extractives and structural wood adhesives and their effects on wood bonding performance	Klaus Richter Technical University of Munich

Monday, 22nd March 2021		
TIME	SUBJECT	SPEAKER
	Topic 2: Wood in Construction and Buildings Including Wood Durability and Protection Needs Chair: Dr. Marie-France Thevenon, CIRAD / Coordinator of IUFRO Research Unit 5.03.00 Wood Protection and Prof. Weijen Wang, The University of Hong Kong	
08:00-08:35	Keynote - Wood Durability and Protection Needs	Mark Thomson Eco Effective Solutions
08:35-09:10	Keynote - Japanese Wood and Carpentry	Mechtild Mertz CNRS
09:10-09:30	An unique, effective, bio-based termiticide microemulsion solutions for aboveground protection of Malaysian native hardwoods against Coptotermes termite threats in buildings and outdoors	Daouïa MESSAOUDI/Andrew WONG ADKALIS - BERKEM Group / Onwood Protection Solutions
09:30-09:50	Climatic value of Thule architectural wood remains from northwestern Alaska (AD 850-1650): a dendroarchaeological approach	Taïeb Juliette University Paris 1 Pantheon-Sorbonne
	Poster	
09:50-10:00	Treatability and dimensional stability of impregnated woods	SARAH AUGUSTINA, SHut., MSi. IPB University
10:00-10:10	Understanding natural durability of three important tropical timber species in Bangladesh against white-rot fungi	Rabeya Sultana Department of Forestry and Environmental Science
10:10-10:25	Coffee Break	
10:25-10:45	Stockmühle revisited – Reconstruction of a historical watermill during the WWD 2019. A WWD-grant report.	Michael Grabner University of Natural Resources and Life Sciences, Vienna (BOKU)
10:45-11:05	Wood Identification: A Tool For Preservation Of Indigenous Architecture Of Traditional Houses In Ifugao, Philippines	ROSALIE C. MENDOZA University of the Philippines
11:05-11:25	Fire resistance of surface charred beech wood	Jakub Dohnal Brno univerzity of technology
11:25-11:45	Structural System of Historical Log Architecture	Wataru Saeki Obayashi Cooperation
	Poster	

11:45-11:55	Theoretical foundation of "Aesthetic wood Culture" model"	Harendra Kumar Dave Edith Cowan University
11:55-12:05	Wood and the cult of Tree in the nomadic space of Kalmyks	Kermen Batyreva, Svetlana Batyreva Kalmyk state university
12:05-14:00	Lunch	
	Topic 4: Education on Sustainable Forests, Forest Products Utilization and Wood Culture Chair: Dr. Elisabeth Johann, Austrian Forest Association / Coordinator of IUFRO Research Unit 9.03.02	
14:00-14:35	Keynote - Wood knowledge for future generation	Andrea Weber, Bed Wood Pedagogy, HTL Mödling
14:35-14:55	Teaching Furniture in a New World: How Wood/Furniture teachers around the world have adapted their teaching as a response to pandemic.	Adam John Manley San Diego State University/Furniture Society
14:55-15:15	Elevating Women Woodland Owners in Forest Stewardship	Leonora Pepper Forest Stewards Guild
15:15-15:35	Effects of Abelmoschus esculentus pod extract on hyperlipidemia in human	Lalit Singh H.N.B.Garhwal university Srinagar (U.K)
15:35-15:55	Incense Culture in the Past, Present and the future	Harendra Kumar Dave Edith Cowan University
15:55-16:10	Coffee Break	
16:10-16:30	Cultural and symbolic importance of Ficus religiosa L. in India	Ronak Yadav/Sangeeta Gupta/Praveen Verma Wood Anatomy Discipline, Forest Botany Division. Forest Research Institute
16:30-16:50	Community Forest Management: A Direct-Market Strategy for a Triple Bottom Line	Mirian Yadira Molina de Cruz Fundación MaderaVerde
	Topic 5: Challenges for Sustainability in the Forest-Wood Chain Chair: Dr. David L. Nicholls, U.S. Forest Service, Pacific Northwest Research Station / Coordinator of IUFRO 5.12.00	
16:50-17:25	Keynote - Connecting the Dots: Building a Sustainable Supply Chain from Forest to Market	Scott Landis GreenWood
17:25-18:00	Keynote - Towards strengthening the role of research and best practice in decision making	Ben Gunneberg Programme for the Endorsement of Forest Certification (PEFC)
18:00-18:20	Synthesis Of Cationized Cellulose From Pine Needles And Application In Paper Making	Tabassum Ansari Forest Research Institute Dehradun India
18:20-18:30	Closing Remark	

Abstract

Carbon Capture and Storage in Forests, Wood and Non-Wood Forest Products

Forest and wood products assets for climate change Mitigation: prospects for maximizing their effects

Gerard Deroubaix
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A**bstract**

Forest and wood products present four assets to help mitigating climate change: carbon capture and carbon storage, making forests one of the largest carbon sink, and material and energy substitution. In managed forests, carbon storage depends of course on long term management. Wood products on the market are also a significant carbon pool, with an entering flux of carbon from forest embedded in new products and an outing flux with end-of-life waste products management. When this stock is growing wood products become a carbon sink.

From the European and French perspectives, forest represent today the largest carbon sink compared to wood products on the market. Nevertheless, in the perspective of a climate change mitigation strategy over the coming decades, it is important to consider the dynamics of these sinks and also the substitution effects of increasing the use of a lower carbon intensity material and energy source than the dominant ones.

In this presentation, the figures, the importance and the drivers of the forest and wood products carbon sinks are considered, taking as example the French situation. The importance of both material and energy substitution effects is also discussed. The prospects for the potential benefits of policies and strategies maximizing these effects are also exemplified on the basis of the French situation. For these policies implementation, methodological choices in environmental accounting tools are important in order to acknowledge the benefit of carbon storage in

long life wood products. Then, the challenges with these strategies for obtaining the best effects of these levers for climate change attenuation are discussed. In a context of strong market competition with other materials, some possible ways of overcoming these challenges are presented.

"Close to Nature Forestry" as a sustainable forest management Model with an integrated silvicultural system, that provides timber, carbon storage, biodiversity, and positive ambient effects.

Eckart Senitza
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Abstract

"Pro Silva" represents a network all over Europe and beyond, with more than 5.500 individual members as one of the larges networks of forest owners, practitioners, scientists, administration staff and consulters to promote "close to nature forestry" as one model for integrated forest management. ProSilva Silviculture is based on a balanced set of principles and various guidelines and a silvicultural toolbox for managing close to nature forest with the role of light and shadow.

Natural processed should be used as much as possible to stimulate forest development that full fills a set of different goals, according to the priorities of forest management targets. Forest management has not to be developed following strict prescriptions, but according to the mentioned principles with respect to the local site conditions, soil, tree species composition, etc. Natural regeneration with a high amplitude of genetic

variations and species is a core feature that must work also in relation to herbivores. Epigenetic effects and a high genetic variety offer far more options in climate change adaptation than mono species plantation can do. Recent scientific results confirm that mixed species forest types with a high structural diversity, multilayer structure have a higher productivity and far increased resilience under turbulent environmental influences. From economic perspective a richer portfolio gives not the maximum output but delivers higher income in changing market and risks by storm, bark beetle and fire. A functioning ecosystem, which a forest should be and treated as, has the ability to buffer und offer many opportunities of interaction of the systems components, even with effects still unknown, as many processes in the soil and also in decomposition of organic matters from wood, needle, leaves, etc.

A richer soil with better humus status, a certain amount of deadwood and also a higher a constant level of growing stock is one important component of carbon storage and sequestration. In addition, all carbon in the wooden products, especially in long lasting construction timber in the booming wood building all over the globe is a massive storage of carbon for 30 years or more. The substitution of fossil based materials and high energy consuming construction elements as concrete and steel, and even the cascadic use of timber as source of energy in the end of the cycle offers further opportunities.

“Close to nature forestry” needs more investment in complex knowhow, in intense dissemination and observations of natural processes and human resources than in big machinery. It offers more flexibility to react on changes in climate conditions and moving targets due to changes of ownership and societal demands.

Middle Age and modern timber techniques in the restoration of Notre Dame de Paris

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Abstract

In April 2019 Notre Dame de Paris was partly destroyed by fire. It was decided to proceed to an identical reconstruction and restoration of damaged parts.

Wood issued from 20th century forests should play an essential role in this process, not only for the respect of the old carpenters, but for its noteworthy performances as material for bending strength and its unique environmentally friendly character.

The first operations were dedicated to restoration of stone arch and stone vaulted ceilings assisted by a total 3D digitized description of the monument. Curved glulam beams, perfectly adjusted to stone parts by computer aided manufacturing, can be seen today as spectacular sub-frame for the stone parts consolidation.

The roof frames of choir, nave and spire were made of oak wood from French forests. Spine was constructed in the 19th century by Viollet-le-Duc using oak timber pieces sawn from big and old trees by “modern” machining practices. Choir and nave were built 800 years ago using Middle-Age oaks and innovating techniques.

One of the basis of these Middle-Age building process was the use of full length (10 – 12 m) oak logs issued from very slender trees of small diameter (25 – 30 cm) and young age (50 – 80 years old). The logs were just slightly squared using a specific axe cutting solution and positioned within the frame in green state. The same techniques were used for most of the Middle-Age cathedrals in Western Europe. They proved to be very efficient

by eight century's experience.

Data from the national forest inventory prove that there are plenty of slender oak trees in the required diameter range, in the current French forest. Literature data prove that slender trees have higher modulus of elasticity and higher strength and that round woods have similar mechanical properties as clear wood specimen, which is higher than sawn timber.

Experimental and modelling studies are in progress in order to understand the rationale behind the Middle-Age timber techniques for further monument restoration or new solutions for the use of oak in building.

Building Components, Furniture, Musical Instruments, Artifacts Manufacturing and Design

Working Reclaimed Wood: A Guide for Woodworkers, Makers & Designers

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Abstract

In this talk, I will lay out what I learned, and experienced vis-a-vis reclaimed wood and its wonderful history, potential, and contribution to our creative sphere. Reclaimed wood has been a life passion for me, the prime medium of my creative career, and the subject of my research which culminated in the book Working Reclaimed Wood: A Guide for Woodworkers, Makers & Designers

Reclaimed wood is intriguing and exciting for many reasons. It is a legacy material that is embedded with environmental importance, historical pedigree, sentimental value, and in many cases sublime beauty. Reclaimed wood is unique, it tells a story and evokes allure. It can often be inexpensive or completely free but at times priceless and rare.

The talk is a celebration of reclaimed wood and the beautiful range of possibilities that exist for its creative use. We will cover ideas for sourcing wood, coverage of safety concerns, technique discussions, helpful case studies, and makers' stories. This talk will help us identify the types of reclaimed wood, ways to rehabilitate them, design according to their individual properties, and finally plan and execute our own reclaimed wood projects. Whether you're interested in sourcing reclaimed wood for environmentally-conscious reasons or tapping into the history or story behind the wood, this talk will walk you through every aspect of using this wonderful material.

Among the topics that I will cover are:

1. Definitions and categories of reclaimed wood
2. How large-scale reclaimed lumber operations work
3. How to find your own reclaimed lumber for free
4. Tips for handling potential safety hazards
5. How to process your reclaimed lumber to get the best results
6. Incredible projects and pieces of art made from reclaimed wood
7. How to reclaim hardware and incorporate it into your builds
8. Tricks for designing with reclaimed lumbe
9. What the future holds for reclaimed materials

Choice of wood in musical instruments: Italian Red Spruce and traditional mandolins

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Abstract

Stringed musical instruments are part of worldwide culture since ancient times. The family of lutes in particular dates back to 3000 B.C. Historic research reveals that these musical instruments had spread all over the world as a consequence of wars, emigration and cultural influence and slowly evolved while moving geographically. Among these, Italian mandolin had a great development and diffusion all over the world.

Mandolins soundboards are traditionally built with red spruce (*picea abies*) because of its excellent acoustical properties. Despite numerous scientific works can be found in the literature that relate wood properties to the acoustics of bowed and plucked instruments such as violin or guitars, not much can be found regarding traditional Italian mandolins.

In our work, we systematically analyzed the wood acoustics performance, applying non destructive methods that allows one to measure the wood properties, developing a figure of merit that considers its anisotropic nature and classify wood for stringed musical instruments according to its acoustic performance. On a parallel track, we characterized several antique and modern mandolins to measure their acoustic response and understand how the sound is related to the particular instrument design and materials. This study was supported by several experiments on wood samples and finished instruments, as well as finite elements simulations that allowed us to understand how the wood properties reflect on the sound.
Our approach highlighted that there is still is room for improvement in terms of musical instrument design and realization, an interesting challenge for the new generation luthiers. In this regard, we realized three test-bench instruments, taking advantage of the knowledge acquired during the study in order to improve or modify the instrument characteristics in terms of sound intensity and timbre

1921 - 2021: 100 years of artisanal Alphorn making; an appreciation of Adolf Oberli, the first commercial Alphorn maker in Switzerland

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Abstract

Prior to 1920 Alphorn making was an individual pastime of the rural population of Switzerland. Rarely would a farmer, carpenter, wood worker et al. manufacture more than a couple of instruments.

In 1921 O. F. Schmalz endeavoured to revive the Alphorn tradition in the Bernese region of Switzerland that was in danger of disappearing. He collected old and broken instruments no longer in use and sent them to Adolf Oberli, a cooper in the Diemtigtal valley to repair and restore. In the same year he ordered 12 new Alphorns paid for by a grant of a wealthy donor. More orders followed with the growing demand for quality instruments.

Adolf Oberli was a self-taught instrument maker. His Alphorns however were of a quality and precision that for the first time enabled Alphorn players to play together with the intonation and accuracy of their instruments being compatible.

Many renowned Alphorn makers learned their craft from Adolf Oberli. Despite many setbacks Adolf Oberli continued as an Alphorn maker for over 40 years into the 1960s. He died in 1972, leaving behind many fine instruments. Some are found in museums (e.g. Bern, Oxford, Edinburgh) while others are still cherished and being used by active Alphorn players.

Documentation of the Tired and Scarred Wooden Ifugao Traditional Houses in Kiangan, Ifugao, Philippines

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Abstract

Ifugao architecture is an indigenous system of wooden construction that is simple and yet complex.

It is reflective of the Ifugao culture, cutting across its social, physical and economic aspects. Modernization has brought in Western influences in the

construction of houses, leading to the proliferation of concrete structures. Without conservation measures put in place, there is danger of the Ifugao architecture losing its original character, as it gets adulterated, modernized and altered. This study will describe the beliefs and rituals related to house construction (eg. site selection and orientation, timing, selection of wood, house warming, etc.). It also made a documentation and inventory of all traditional houses in all the villages of the Municipality of Kiangan, the acknowledged seat of culture in Ifugao, Philippines. Interviews were done with the house owners. In addition, location information of the traditional houses was done and provided to the local planning and development office for inclusion in the town map (using Google maps). A total of 205 structures were surveyed. Lambrecht (1929) identified 321 houses and granaries. The survey revealed that 90% are 70-100 years old. Since the Ifugao houses are wooden, all have experienced damage and most have been renovated. Roofing materials used to be dried grasses but were replaced with galvanized iron sheets for its durability.

Almost 20% are already abandoned. With a complete inventory and mapping of the built heritage of Kiangan, Ifugao, Ifugao leaders and concerned agencies could be more rational and plan for precise projects that will help in the conservation and protection of its built heritage. Protection of the wooden traditional houses allow the people in the present time to profoundly understand and appreciate the way they perform their socio-cultural beliefs, customs and practices, and how essential it is in defining their sense of place and their way of life.

Lesser-Known Wood Species & Appropriate Technology: Two Keys to Sustainable Artisan Woodworking

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Abstract

Since 1993 GreenWood artisans in Honduras and Peru have produced everything from chairs and carved bowls to boats and sawn mahogany guitar stock. In the last three years we installed two innovative bicycle lathes and conducted woodturning workshops in several off-the-grid forest communities in Honduras. One recent trainee has since turned more than 1,000 carving mallets for export to Canada and the US, generating income for his family in a remote village whose main occupations include subsistence agriculture and illegal gold-mining. A second GreenWood-trained furniture maker has joined this production, providing critical income during the last year of the pandemic, when so many normal sales channels have dried up.

This innovative enterprise addresses several key challenges that have undermined efforts to establish a sustainable supply chain for tropical wood products for centuries. The first has to do with our exclusive use of lesser-known wood species for this product, harvested from trees that otherwise have little or no market demand in or beyond Honduras. The tropical rainforest is home to many hundreds of tree species. But the best known and most valuable of those species— mahogany and Spanish cedar in Central America—regenerate naturally in relative low densities, no more than a few trees per hectare in Honduras. When those specimens are removed, legally or otherwise, the remaining forest has little to no value, making it highly susceptible to the agricultural conversion that has taken place in tropical forests around the world. The creation of value-added

wood products made from otherwise unknown and under-utilized timbers creates income for local forest communities and incentives for the protection and management of those forests as forest. A truly sustainable forest is one that is economically more attractive than any other use.
The use of appropriate woodworking tools and technology addresses other common obstacles in the development of viable wood enterprise in the developing world. Considerable donor support has been used to install "first-world" woodworking equipment in "third-world" communities. Such equipment relies upon resources that are in short supply, or entirely absent, in much of tropical America: It is expensive and difficult for individual artisans to purchase, maintain and repair, due to lack of access to capital and the limited availability of replacement parts. It also requires electricity that is unreliable or nonexistent in remote forest communities.
GreenWood's mallet project helps remedy all of these issues, making it an accessible model for wood artisans everywhere.

Wood Used In Construction Of Indigenous Traditional Houses in Ifugao, Philippines Using The Triangulation Method

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Abstract

The Rice Terraces of the Philippine Cordillera mountain range is listed among UNESCO's World Heritage Sites and has been described as "an outstanding example of an evolved, living cultural landscape that can be traced as far back as two millennia ago in the pre-colonial Philippines" (UNESCO 2019). Nestled in these rice terraces is the ubiquitous wooden

traditional house. These structures are completely made of wood and plant materials and are most often found throughout the rice terraces landscape. They typically serve as homes, resting places, or rice granaries for families who cultivated the terraced rice paddies. In recent times, however, the growth of villages and modern influences have led to changes in the way many Ifugao people have built their houses and the way they look. Today, the villages where most Ifugao people live are made up of houses that are built using concrete, commercial timber, nails, galvanized iron roofs, and metal windows. Consequently, the number of traditionally constructed Ifugao houses are now far-outnumbered by 'modern' houses typically seen in other parts of the country. Sadly, the unique traditional house design features of the Ifugao seems to have been relegated to the background.

The research study used the triagulation method in making a definitive identification on the types of wood used in the construction of the traditional house. This was first done by conducting wood species identification of representative components of standing and collapsed traditional houses. The home owner and house builder were also sources of information on the kind of wood that were used in the construction. The construction of the traditional house depends for a large part on the woodlots and forests, which are an inherent part of the rice terraces and where the construction materials are sourced. Lastly, field visits on the woodlots and communal forests surrounding the rice terraces were done to determine whether the tree species were still available for use in construction. This study is part of preservation and conservation efforts to revive the awareness and appreciation for traditional Ifugao house architecture as an inherent part of the rich indigenous culture and ethnic knowledge of the Ifugaos.

Wood Products and Wood Biotechnology

(IAWS Special Session)

Containing carbon in wood used for coastal defense and marine construction

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Abstract

Global warming is causing sea levels to rise and storms to become more energetic resulting in severe coastal erosion in some regions. Erosion of coasts can be mitigated by building sea walls, groynes and revetments. These structures can be built of concrete, stone, metals or wood. Wood has many properties that make it suitable for marine structures including greater resistance to corrosion than steel or reinforced concrete, tolerance of impact loads, high strength-to-weight ratio and ease of machining and repair. In addition, wood has low embodied energy, sequesters carbon, and is a renewable resource. However, wood is less resistant to abrasion than concrete and metals, and most wood species immersed in the sea are rapidly destroyed by marine-boring organisms. Wood's resistance to marine-borers can be enhanced by treating it with biocides, but the chemicals that are fit for this purpose are toxic and subject to regulatory scrutiny, particularly in Europe where no wood preservative is approved for application in sea water. Hence, there is an urgent need to develop more effective and less toxic methods of protecting and containing the carbon in wood used in the sea. One possible route to satisfying this need is to develop new treatments that mimic the protective systems found in wood species such as turpentine (Syncarpia glomulifera) that are naturally resistant to attack by marine borers. Many of these naturally durable woods, including turpentine, contain high levels of silica, but attempts to improve the marine-borer resistance of wood by treating it with silica have yielded disappointing results. Silica-rich species often contain extractives

that could contribute to marine-borer resistance. However, it has not been possible to obtain timbers with high resistance to marine-borers and high silica contents, but low levels of extractives to elucidate the contribution of silica to marine-borer resistance. Furthermore, sapwood of turpentine contains similar levels of silica as heartwood, but lacks the extractives found in heartwood and also its resistance to marine-borers. Hence, it has been suggested that other 'unknown' compounds are responsible for the marine-borer resistance of turpentine. We used synchrotron X-ray fluorescent microscopy and other contemporary analytical techniques to search for these unknown compounds. We observed numerous metal compounds in turpentine heartwood, including several biocidal heavy metals. This presentation focusses on these inorganic components of turpentine wood and discusses whether they are the unknown compounds responsible for the marine borer resistance of turpentine, and possibly other silica-rich marine-borer resistant woods.

How do trees grow upright?

Lloyd Donaldson
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Abstract

This presentation describes the mechanism by which trees maintain vertical growth focusing on compression wood in coniferous trees. Using recent discoveries from genetic manipulation the roles of cell wall structure and composition in the generation of compressive strain on the lower side of leaning stems and branches is illustrated using microscopic and biochemical characterization.

Enhancing tree growth and wood production with plant hormones

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Abstract

The secondary xylem, namely, the wood, in trees is induced and controlled by streams of inductive hormonal signals which shape wood quality and quantity. Auxin is the primary hormonal signal that controls wood formation; it is mainly produced in young leaves, moves downward through the cambium and induces the wood. Cytokinin, from root tips moves upward, promotes cambial cell division activity, and increases the sensitivity of the cambium to the auxin signal. Gibberellin from maturing leaves promotes shoot elongation and induces long fibers and tracheids. Centrifugal movement of ethylene from differentiating-xylem cells outwards to the bark induces the radial vascular rays. In conifer trees, jasmonate-induced defence response, which is mediated by ethylene, induces the traumatic resin ducts. Large traumatic resin cavities that damage the wood in response to wounding and stress can be prevented by lowering the sensitivity to ethylene. Along the tree axis, gradients of decreasing auxin concentrations from leaves to roots induce gradients of increasing cell size. The juvenile wood in trees is induced by young leaves, while the adult wood is produced further away from these leaves. Therefore, to swift the transition from juvenile wood to the high-quality adult wood at the base of the trunk, fast stem elongation of young trees should be promoted. This can be achieved by growing young trees in high densities and by minimizing competition with annuals. Likewise, as root tips provoke juvenile effects in the shoot, fast root growth should be endorsed to minimize their effects. Rapid stem elongation and wood production can also be achieved by manipulating endogenous hormonal concentrations in transgenic trees. Elevating endogenous bioactive gibberellin concentrations in transgenic trees promotes stem elongation, increases fiber and tracheid growth, promotes wood production, and can modify lignin biosynthesis.

Recent Progress on The Formaldehyde Emission from Bonded-Wood Products

Byung-Dae Park
Department of Wood Science and Technology, Kyungpook National University，Korean
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Abstract

As the supply of large diameter logs decreases, bonding small size woods with adhesives is an important way of extending the use of wood products that can replace energy intensive materials with carbon dioxide emission. The formaldehyde emission (FE) from wood products bonded with urea-formaldehyde (UF) resins is a critical and limiting factor of using them. This presentation discusses recent progresses on the FE from wood products bonded with UF resin adhesives that had been used for more than 100 years since their first development in 1884. Low FE was obtained by lowering formaldehyde/urea (F/U) molar ratio of UF resins at the expense of poor adhesion in wood-based panels such as plywood, particleboard, and medium density fiberboard (MDF). Recent progresses show that hydrogen bonds between linear molecules of low molar ratio UF resins forms crystalline domains instead of building three-dimensional network structure, a strength backbone of thermosetting resins. The modification of low molar ratio UF resins with modified nanoclay decreased their crystallinity, and improved the FE and adhesion of wood-based composite products at the same time. This innovation is expected to provide a path of extending the use of wood-based panels in future.

Research of Wood Shape Memory Effect at Low Temperatures

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Abstract

On September 21, 2019, Russia ratified the Paris Agreement. Russia has set a goal to reduce greenhouse gas emissions to the level of 70-75% relatively to the indicators of 1990 including taking into account the absorption capacity of forests. Russia has more than a fifth of the world's forests, holds a leading position in the world in total forest area and the second one in timber stock and has a great potential for carbon sinks in forests and wood products for climate change mitigation. Requirements of multifunctionality, i.e. combination in the material of high physical, mechanical and chemical properties are imposed to modern materials. Wood is the natural multifunctional material with high mechanical properties at the low density, possesses the shape memory effect. Extreme impacts on wood can lead to creation of essentially new structural states. The results of the research of the shape memory effect of wood at low temperatures are presented. The deformative conversions, quantities of wood shape memory effect (Rr and Rf) for specimens of sliced and rotary-cut veneer of pine, beech and birch in temperature intervals from +100 to -71 °C were experimentally investigated. Results of research can be used for the development of new multifunctional biodegradable wood-based materials capable of operating under variable extremal temperature and humidity conditions.

Particleboard: A New Feed Stock from Tropical Rapid Growth and Aggressive Coppicing

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Abstract

In Malaysia, the depleting supply of raw materials for wood composite give a bad impact to mills as their production could be decreased or stopped. This will impact the Malaysian wood-based economy locally and globally. Usage of tree with fast characteristic and small in wood diameter is essential to add source of feedstock to mills. This initiative can reduce the independency of wood source from our virgin forest and safeguard the environment. Wood composite is a material which used by furniture manufacturer and construction industry to support our daily lifestyle. In order to maintain the demand, this study investigates on the mechanical properties of particleboard (density 660 kgm3) made of Leucaena leucocephala, rubberwood and mixed tropical trees by using a different ratio species. Leucaena leucocephala at age of 18 month old, recycle wood from rubber tree and mix tropical wood from sawmill waste were used. Wood species ratio for particleboard are a) 100% Leucaena (L), b) 50% Leucaena and 50% rubberwood (LR) and 50% rubberwood: 50% Mixed Tropical (RMT) with board dimension 3680 mm x 2465 mm x 25 mm were produced. The result shows all species ratio passed minimum requirements of EN standard for commercial used. The performance of Leucaena particleboard is better by despite lower by 4% in resin utilization. The board performance matched the current raw materials (mixed tropical wood:rubberwood).

It is proved that Leucaena wood is suitable for using as raw material in particleboard manufactured. The Leucaena wood performance could be further optimized for the purpose of commercialization.

Research of Wood Shape Memory Effect at Low Temperatures

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Abstract

On September 21, 2019, Russia ratified the Paris Agreement. Russia has set a goal to reduce greenhouse gas emissions to the level of 70-75% relatively to the indicators of 1990 including taking into account the absorption capacity of forests. Russia has more than a fifth of the world's forests, holds a leading position in the world in total forest area and the second one in timber stock and has a great potential for carbon sinks in forests and wood products for climate change mitigation. Requirements of multifunctionality, i.e. combination in the material of high physical, mechanical and chemical properties are imposed to modern materials. Wood is the natural multifunctional material with high mechanical properties at the low density, possesses the shape memory effect. Extreme impacts on wood can lead to creation of essentially new structural states. The results of the research of the shape memory effect of wood at low temperatures are presented. The deformative conversions, quantities of wood shape memory effect (Rr and Rf) for specimens of sliced and rotary-cut veneer of pine, beech and birch in temperature intervals from +100 to -71 °C were experimentally investigated. Results of research can be used for the development of new multifunctional biodegradable wood-based materials capable of operating under variable extremal temperature and humidity conditions.

Liquefaction of lignocellulosic biomass and its applications for wood adhesives

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Abstract

Liquefaction is a useful method of turning whole biomass into liquids, and finds applications in many sectors like polymers and energy. This presentation reviews the different liquefaction technologies and focuses on moderate acid-catalyzed liquefaction (MACL) towards recent advances in the development of sustainable wood adhesives. On the other hand, hydrothermal liquefaction (HTL) produces bio-oils as primary products, and solid residues and gases as by-products. HTL has been researched more than MACL concerning its processes, bio-oil production and its upgrading. HTL has low oil yields and complex products, and thus MACL has been developed with organic solvents at atmospheric pressure and lower temperature than HTL for producing desired chemicals and polymers. MACL depends on the solvent types used such as polyhydric alcohols and phenols. Bio-polyols from alcohol liquefaction as well as phenolated biomass from phenol liquefaction have been used in the production of liquefied biomass-based adhesives. Although promising results have been obtained at laboratory scale, such systems face challenges for industrial uses. Future research should focus on a better understanding of the reaction pathways and optimization of the liquefaction processes. This also includes novel approaches for the production of partially liquefied biomass and its further utilization in manufacturing wood composites. This new liquefaction concept has been demonstrated just recently, and can open up possibilities for using the liquefaction products from abundant biomass sources in combination or without synthetic adhesives. The

developments are in line with the current pressures on the wood panel industry to use healthier and more sustainable adhesives.

Valorization of beech wood through the development of innovative and environmentally friendly chemical modification treatments

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Abstract

European beech (Fagus sylvatica) is one of the most important hardwood species in Europe, being used for many applications, especially for interior destinations. However, its low dimensional stability and poor biological durability are the main drawbacks of this species, limiting its utilization for exterior purposes. Based on these reasons, this study, namely the "VALBEECH" project, organized between France (University of Lorraine) and Germany (Göttingen University) aimed to improve European beech properties through different environmentally friendly wood modification techniques. In general, this research was divided into three parts.
In Part I, the wood modification was performed through a combination between mild chemical modification and thermal treatment. Screening and comparison studies were conducted through impregnation of a low concentration of chemicals as an aqueous additive solution (10% w/w) into the wood, followed with drying (103 or 120°C) and thermal modification (150, 180, 200, or 220°C). Vinylic derivatives of polyglycerol or glycerol, as well as maleic anhydride in a single form, were used as additives. In Part II, up-scaling trials of the best treatments chosen from Part I was demonstrated. A variation on additive concentrations and curing conditions performed under oven heating (OHT) in an open system or under heat pressurized steam (HPS) in a closed system were examined. In Part III, with

a similar polyesterification-based bulk modification performed in Part I & II, the wood modification was based on in-situ polyesterification of sorbitol and citric acid (SorCA). Impregnation of different concentrations of aqueous SorCA solution (10, 20, 30, 55%) followed with drying at 103°C and curing at 140 or 160°C was performed. Various parameter analysis during and after wood modification, such as physical, chemical, mechanical, and biological durability properties, were evaluated. Results from Part I and II disclosed that the wood modified with polyglycerol/glycerol maleate or maleic anhydride in the opened system presented significantly better biological durability, especially during the first and second field test studies for almost every one-year period in Bogor, Indonesia. While, in Part III, the wood modified with SorCA 30% followed with curing condition either at 140 or 160°C was considered as the optimum condition for beech modification. Overall, the biological (white-rot, brown-rot, soft-rot, termites) and certain physical properties greatly increased. In addition, thermogravimetry study evidenced that the modified wood possibly has certain fire-retardant properties. However, certain mechanical properties decreased considerably due to treatments. Nevertheless, this study has provided alternatives for environmentally friendly wood modification treatment.

Richter K, Windeisen E, Özparpucu M 2021: Interactions of wood extractives and structural wood adhesives and their effects on wood bonding performance

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Abstract

For the development of new advanced wood-based materials and composites, adhesive bonding of wood plays a crucial role. However, wood bonding is challenging due to the inherently complex chemical and

structural properties of wood. It is known that in the bonding process, wood extracts can accumulate at the surface and create a chemical boundary layer with different surface permeability, polarity, and wettability as well. Therefore, the quality of wood-adhesive bonds highly depends on the interactions between the wood and adhesives. In our research, to investigate the interactions between the wood adhesives and extractable wood constituents, in-situ FTIR spectroscopy and rheology analysis was performed, which provides simultaneous examination of the progress of chemical reactions and changes in rheological properties by adhesive curing of both pure adhesives and adhesive-extract mixtures. Results show that adhesive curing was affected specifically under the presence of wood extractives in the four structural wood adhesive systems applied. In particular, for the extracts having a high acidity level such as chestnut extract (pH=3.8), the effect on curing was highly significant, eg. for EPI adhesives. For 1c-PUR, however, an influence of specific extracts could not been detected by the proposed in-situ investigation. In summary, fundamental information on the chemical interactions between the extracts and wood adhesives was provided, valuable to support the development of highly durable advanced adhesive bonds with wood.

Wood in Construction and Buildings Including Wood Durability and Protection Needs

Wood Durability and Protection Needs

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Abstract

Modern day living is fixated by low cost and high speed . Interestingly, when life's priorities are understood, everyday value may be realised from natural elements and materials, such as wood .

Future generations may judge us harshly , unless we action the learnings and wisdom of past generations. Natures' cycles are now better understood and the sharing of cultural knowledge ,scientific breakthroughs, and desire for a circular economy, provide great opportunities to address current global concerns.

Wood is a material of endless possibility, when we innovate with cultural wisdom and demonstrate its multi-faceted benefits. Wood is ideal material component for our working and living environments. We now understand that wood has real “health and well-being” qualities and its biophilic benefits continue to be researched and understood.

To gain maximum value from wood, we need to protect it, to realize its true potential as a durable solution for built environments. In our era of structural innovation, mass timber construction is now a realistic option for high rise buildings, incorporating increasingly large spans. Breakthroughs in fire safety science, now offer timber as a commercially viable and environmentally beneficial material, to store carbon and reduce harmful emissions.

Clean air, and ventilation are essential ingredients for healthy forests. We now understand wood buildings also require essential ingredients to deliver healthy and durable environments. The considered use of jointing techniques, correct selection of timber species and adoption of appropriate maintenance programs, all contribute to successful wood construction outcomes.

Using historical examples from across the globe ,important factors in the use, detailing and selection of wood building components will be addressed. Transferring construction knowledge and forest industry wisdom, offer

practical and efficient built solutions meeting modern day standards and expectations.
Design for Deconstruction is one concept, that if understood and applied correctly, will provide innovative circular economy solutions for mass timber construction. Repurposing, recycling, and repairing buildings using timber structures and wood products, offer new employment opportunities for local economies.
This presentation will challenge listeners to reconsider the benefits of the considered and educated use of wood, in all areas of our society. Wood ingredients in light fabrics to structural beams, address durability and protection of the core ingredients, otherwise the true value of wood may be lost or undervalued. Some simple analogies will be provided to ensure the presentation will appeal to a broad variety of listeners, to appreciate why wood is the material, for now and for future generations.

Japanese Wood and Carpentry

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Abstract
Although numerous publications have noted the rich variety of wood species used in the construction of Japan's civil and religious structures, few have focused on the wood itself. This presentation is drawing attention to the wood species used by Japan's carpenters, who so ingeniously exploit the extraordinary diversity of their country's forest resources. This presentation will introduce four carpentry fields in Japan, by showing their wood species selection.
1.A temples and shrine carpenter, the miya-daiku, makes use of large-diameter timber. How do carpenters cope with deficiency of large diameter timber for reconstruction or restoration purposes? This question is a very actual problem with multiple interesting solutions that will be presented here.

2.A carpenter for refined teahouses and residences, the sukiya-daiku, is in charge of rustic and refined teahouses and constructions. He also makes use of very ancient techniques and tools, like the adze (chôna), or the spear-head plane (yariganna), thus bringing out the intrinsic beauty of wood, and even the essence of Japanese aesthetics.
3.A joiner for doors, windows and screens, the tateguya, is also a part of the carpenters' guild. He makes specific use of timber, like especially the sapwood (shirata) of Japanese cedar, called sugi. Sliding doors and folding screens are regarded as artworks that need to fulfill special criteria and careful handling for their preservation.
4.A general carpenter, the daiku, is in charge of folk dwellings like farmhouses, mountain dwellings or townhouses. Wood species are selected depending on regions, building types, structure elements.
In order to get a closer look on the major tree species I also will show the facsimiles of a rare document showing the wood grains of one-hundred tree species. It is a handbook with thinly sliced wood samples glued into it. This guidebook, was prepared by the government of the Meiji period (1868 – 1912) for the 1876 Philadelphia World Exhibition. In that period Japan was aware of its rich forest resources, and wanted to show them to the world. The actual-size facsimiles of some of the handbook's samples furnish an in-depth look at some of the important wood species used in Japanese architectural construction.

An unique, effective, bio-based termiticide microemulsion solutions for aboveground protection of Malaysian native hardwoods against Coptotermes termite threats in buildings and outdoors

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Abstract

The bio-based termiticide solutions presented in this paper are water-based wood preservatives approved for dipping treatment providing 25 years of termite protection for solid wood and wood-based products in Europe and for more than 10 years in Indonesia. These bio-based solutions are patented formulations based on concentrated microemulsions (ME) diluted with water as a dipping treatment, but also for vacuum pressure treatment. Field trials conducted in Malaysia by UNIMAS confirmed the efficacy of such bio-based solutions at three product concentrations on short dip-treated kempas (Koompassia malaccensis) heartwood, a major hardwood species in the Malaysian wood construction market, against the Southeastern Asian subterranean termite Coptotermes curvignathus exposed to aboveground H2 (indoor, non-wetting conditions) hazard class targeting termites compared to CCA-treated kempas and radiata pine (Pinus radiata) sapwood. Prior to the H2 hazard class termite field test exposure, treated wood blocks were conditioned to either a non-leaching volatilization (H2 hazard class weathered wood blocks) or to a leaching followed by volatilization (H3 hazard class weathered blocks) as well as non-leaching/non-volatilization and leaching/non-volatilization reference treatments. After 6 months field exposure, untreated kempas was severely (termite ratings: 0, mean mass loss: 97.4%) or moderately attacked (mean ratings: 7.7, mean mass loss: 17.5%), while none of the leached-volatilized (H3 hazard class) or non-leached-volatilized (H2 hazard class) test blocks treated with those bio-based products at both target retentions were regarded as attacked (mean ratings: 9.7-10, negligible mean mass loss) regardless of biocide retention, leached or non-leached wood, volatilized or non-volatilized wood treatments. Excellent performance also prevailed with the remaining treatment combinations of treated wood. Due to their unique compositions, the bio-based termiticide solutions presented here showed excellent performance against Coptotermes curvignathus with a low biocide retention where conventional agro-insecticides do not work. In conclusion, these solutions are effective for long-term wood protection in buildings and aboveground outdoors against Southeast Asian Coptotermes subterranean termites.

Climatic value of Thule architectural wood remains from northwestern Alaska (AD 850-1650): a dendroarchaeological approach

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Abstract

Northwestern Alaska is a key region for understanding settlement dynamics of the beginning of the second millennium AD in the American Arctic. During the transition from the Medieval Climate Anomaly (MCA) to the Little Ice Age (LIA) (AD 1100-1400), the Thule culture, considered the direct ancestor of today's Inuit, appears along the coasts of northwestern Alaska (Mason et Gerlach 1995; Mason 2017). During the 13th century, Thule groups start settling along rivers in interior Northwest Alaska and colonizing the eastern Arctic to Greenland. The poor resolution of regional environmental proxies used to characterize the MCA-LIA transition is a limit to detailed temporal and spatial analyses of the complex interactions between climate, resources and people (Mason et Gerlach 1995; Nicolle et al. 2018).

Archaeological wood remains are well-preserved in Thule coastal sites of Northwestern Alaska. As early as the 1940's, archaeologist James Louis Giddings understood the potential of architectural wood remains for tree-ring research in Alaska. He built the first millenary chronology (978-1948 AD) in Alaska based on trees and archaeological samples from the Kobuk River Valley (Giddings 1941; 1952). This sequence allowed him to absolute date archaeological sites for the first-time. Along the treeless coast of northwestern Alaska, the main wood resource is driftwood originating from the boreal forests of Interior Alaska. The difficulty of dating driftwood due to its multiple origin and the development in the 1950's of radiocarbon dating led to the near-abandonment of dendroarchaeological research in Alaska.

Since the 1990's, researchers have collected architectural wood from coastal Thule sites covering the last 1000 years. These dendroarchaeological collections together with recent methodological

advances in dendrochronology (e.g. dendro-isotopy, wiggle-matching) allow the development of high-resolution chronologic and climatic sequences for this key period in the development of the Inuit culture. We present results of conventional tree-ring analyses (based on ring-width variations) of 289 spruce disks (Picea glauca [Moench] Voss) from three archaeological sites (Birnirk, Cape Espenberg and Pingusugruk). We cross-dated 67 architectural disks with the Kobuk Master sequence which extends the chronology back to AD 812 and doubles the number of trees contributing to the period between AD 950 - 1250. This enhanced sequence provides new dating opportunities for archaeological features and unique documentation on the MCA-LIA climatic transition. The renewed ring-width sequence also reinforces the documentation for the period between AD 1450-1650, the peak of LIA. Our dendroclimatic approach combines standard ring-width analyses and more innovative isotopic study of wood cellulose (carbon and oxygen) (Fritts 1976; McCarroll and Loader 2004; Daux 2013).

Stockmühle revisited – Reconstruction of a historical watermill during the WWD 2019. A WWD-grant report.

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Abstract

The “Stockmühle”, also known locally as the “Flottermühle”, is the oldest type of a watermill in Austria to grind grain. This special type of watermill with a horizontal waterwheel is nowadays just known in the south-western part of Austria in very steep valleys. The main places are Kals (7 mills), Apriach (8 mills) and Mallnitz (5 mills). According to current knowledge, this type of mill was probably invented in the high mountain regions of Asia Minor. In their present form, they are likely to be about 250 to 300 years old.

During the World Wood Day event in March 2019 in Stuebing the structure of a “Stockmühle” was reconstructed in cooperation of various international handicrafts and craftsmen from the museum.
The original mill was visited to survey the building. A 3D laserscan was performed to get a digital model of the mill and the grinding-machine. The reconstruction was done on basis of the idealised measurements – not following deformations etc.
The main part of work of the WWD Grant project was the precise documentation of the reconstruction of the mill (in whole). Erwin Urdl was leading a team of international specialists - Pierre Cabrolier, Mark Griffith, Joe Thompson, Ola Hjelen, Jaques Vesery, Andy Cheng, Elli Richards, Chung-Sheng Kung, Yuan-Chang Chen, Chien-Wen Lai, Yu-Chi Luo and colleagues from the Austrian Open Air museum in Stuebing - Marcelus Stromer, Hubert Jahnisch, Manfred Liebmann, Karl-Heinz Ulrich, Thomas Beil, Stefan Schweiger.
The building itself was finished within the WWD-event. It was possible to run the mill on March 23rd, 2019 – without grinding grain. Erwin Urdl and colleagues from the museum finished the reconstruction work of the grinding machinery during the summer 2019. The first time grinding grain took place during the Handicrafts day, September 29th 2019. It was the first time setting up a Stockmuehle in Austria since decades.

The final product of the WWD grant is – next to the fully functioning mill – a precise video documentation which can be found at https://www.youtube.com/watch?v=Ow6b6XTIykU&t=245s.

Wood Identification: A Tool For Preservation Of Indigenous Architecture Of Traditional Houses In Ifugao, Philippines

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Abstract

The Ifugao Rice Terraces is one of the inscribed World Heritage Sites of UNESCO, a proud heritage of the Ifugao people who live in the Cordillera Mountains of the Philippines. An integral part of the majestic landscape is the wooden traditional house that dot the expanse of the rice terraces. Its unique structural design is part of the tangible cultural heritage of the Ifugao. The passage of time and modern influences have seen a decline in the number and use of these traditional houses. Moreover, little is known about wood species used in the construction of the traditional house. This study sought to identify different wood species from a sample of traditional houses in the Municipality of Kiangan, Ifugao province. Thirty-two species of mostly indigenous and endemic wood species were identified. The choice of wood species and their use reflected indigenous knowledge on house construction, functionality, their physical attributes, and the availability of these species at the time the houses were built. While premium hardwood species were generally preferred, their dwindling scarcity is likely to have influenced a shift to the use of lesser known wood species, softwoods and exotics. Better knowledge on wood species for traditional Ifugao houses can help the younger generation of indigenous craftsmen. As such, the study seeks to contribute to cultural preservation by enhancing support for protection and cultivation of important wood species as well as promoting preservation of the Ifugao traditional house, a tangible emblem of the Ifugao heritage and landscape.

Fire resistance of surface charred beech wood

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Abstract
One-sided surface charred European beech wood (Fagus sylvatica L.) was studied. The radial and tangential specimens of dimensions 50 × 25 × 350 mm 3 were one-sided surface charred at 200°C, 250°C, 300°C, 350°C and 400°C at various time intervals using contact heating system. Furthermore, specimens of dimensions 42 × 25 × 120 mm 3 were prepared to analyze fire resistance.

Structural System of Historical Log Architecture

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Abstract
Log architecture has been one prototype of traditional timber structures in many regions rich in forest resources. Although timber has been the main structural material in Japan, log architecture has never been common, and the major structural system is of post and beam construction. The authors have been operating on-site investigation on historical log architecture in Japan and East European countries for the past five years. Through the multiple onsite investigation it has been identified that there are similarities as well as many difference amongst these historical log architecture. The most prominent difference is in the shape of the log sections. The sectional shapes of the historical log architecture are round, square, or rectangular. But in Japan log architecture using triangular section (pentagonal or hexagonal section to be precise) logs are found. The logs used in these “triangular log architecture (Azekura in Japanese)” are

stacked on top of each other with the ridge line facing outside and the flat surface to the inside constituting a distinct exterior wall. Many of these “triangular log architecture” are of cultural value. There are 43 “triangular log architecture” in Japan constructed before the mid 19th century, and out of these 37 are designated as cultural properties by the national or local government. The oldest date back to the 8th century, and many of these buildings are used as treasure houses to keep precious objects within temples

Education on Sustainable Forests, Forest Products Utilization and Wood Culture

Wood knowledge for future generation

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Abstract

Austria is a country rich in timber. Almost 50% of its area is covered with forest. Many people work along the value chain of forest-wood-paper. Forest management and wood industry belong to the biggest employers in Austria. Nevertheless, many children know very little about the material wood and how wood can influence our climate. Although, wood industries would be an interesting employer in rural areas, many children do not even think about choosing a profession connected to wood.

In the sense of education of sustainable development, children and teenager should understand wood as a sustainable material. The big challenge of the next generation is mainly seen in the reduction of CO2 emission. Therefore, children have to be trained. It's necessary to bring solutions and applications. In general, wood as material is very well suited to explain principles of climate change and to illustrate ecological aspects in a simple way. Basic knowledge of wood working is worth being a human resource of our future decision makers.

Moreover, hardly any other material is better in teaching solution competence. Wood is easy to get, it is easy to work with and leads to a quick success. After obtaining basic woodworking skills, technical problems can be solved by children and teenagers by themselves. Being able to solve not standardised problems and being creative will be an important ability for a sustainable earth which is worth living. Especially for teenagers this physical working is very important. They get a visible success and can feel their ability.

Not even 100 years ago, it was self-evident to gain first wood working skills

while growing up. Repairing a fence and even building a house was done with a lot of self-effort. Therefore, is was not necessary to teach how to use wood at school. Young family members learned a lot by just doing or by observing their parents. Today, we have a different situation and a lot of knowledge is already lost.

Here the need is given to start teaching programs. In Austria the first steps have been done during the last years. Now the time has come for improvement and development.

Teaching Furniture in a New World: How Wood/Furniture teachers around the world have adapted their teaching as a response to pandemic.

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Abstract

This will be a presentation featuring my own experience and approach to teaching furniture and woodworking remotely and partly in-person during the pandemic. I will then go into some examples of other teachers from around the country, and some outside the US, that are inspiring and creative. So many teachers, at the university, craft school, high school, and all levels, have stepped up to the incredible challenge of teaching hands on skills during a time of social distance and pandemic circumstances. This will be a little survey of some of those adaptations.

Elevating Women Woodland Owners in Forest Stewardship

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Abstract

The long-term sustainability of forest systems—and the myriad benefits they provide—often comes down to the people and communities directly involved in their ongoing management and protection. Promoting buy-in and empowerment among those who can directly impact and steward forestland at an individual scale can be a crucial element in building resilience across much larger landscapes.

In the United States, women woodland owners play a key role in stewarding our private forestlands, yet traditional landowner outreach programs often fall short of engaging this important population. Despite over half of woodland properties listing at least one female owner, women have been shown to be less likely than men to commercially harvest timber, manage for wildlife habitat, participate in cost-share programs, have a conservation easement, obtain green certification, participate in tax abatement programs, or simply get advice about their wooded land.

Forestry, being a traditionally male field, can be an intimidating space for women to break into; many feel they lack the knowledge or confidence to take important steps such as finding a consulting forester or making management decisions on their land. The Women Owning Woodlands (WOW) program seeks to address this gap by providing timely, accessible information and engaging learning opportunities to women landowners. This USDA Forest Service-funded project also supports a national network of professionals who provide women-focused programming. In recent years, WOW leaders in over 20 U.S. states have been making strides building grassroots outreach programs aimed at empowering women to

practice forest stewardship.

In 2020, much of WOW's work at the network level was in supporting WOW leaders in adapting their programs to the pandemic context. When COVID-19 forced WOW leaders across the country to find new ways to reach women woodland owners and keep them engaged, the WOW professionals' network came together to share ideas and offer mutual support. Whether pivoting to adapt existing programs to virtual platforms or safely offering field tours and women's chainsaw safety workshops during the pandemic, WOW practitioners expanded and innovated in their approaches to women-focused stewardship outreach and education.

When asked about their land management goals, women often talk about conserving the land and protecting nature, wildlife habitat, and water. By empowering women woodland owners to manage their land, we can help support their decision-making and ensure the long-term resilience of millions of acres of family forests across the U.S.

Effects of Abelmoschus esculentus pod extract on hyperlipidemia in human

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Abstract

Now-a-days, hyperlipidemia is one of the major problems prevailing among humans, indicating increased blood lipids content like LDL, HDL, VLDL, Cholesterol and serum triglyceride. LDL (Low Density Lipid) is one of the five major groups of lipoproteins, which transport all fat molecules around

the body in extracellular fluid. LDL is not considered good for body as it can causes atherosclerosis, if, oxidized in the wall of artery. HDL (High Density Lipid) is also a lipoprotein, which is considered as good fat as it transports fat from body within water around cells. Serum triglyceride is a type of fat in the blood. High triglyceride in the blood may be responsible for coronary artery disease especially in human females. Moreover, increased lipid content in human blood can raise the risk of many heart diseases, including heart attack. The pharmacological effects of many plants like Abelmoschus esculentus attribute to various constituents like mucilage, tannins, terpenoids, flavonoids and glycosides, present in all plant parts. Report suggests that okra mucilage, okra pectin and okra fibers combat with heart diseases as it binds to cholesterol and bile acids, which carry toxins and dump it in liver (Gemede, 2015).

The present study was carried out to find out the efficacy of Abelmoschus esculentus aqueous extract to reduce Serum Triglyceride, Serum Cholesterol, HDL Cholesterol, VLDL Cholesterol, CHOL/HDL Cholesterol Ratio in the Human blood.

Initially, the blood samples were collected prior to administration of plant extract. Further, blood samples were taken after 7th day, 14th day, 21st day and 28th day of administration of whole plant extract. The blood samples were centrifuged for separating blood serum from the blood. The blood serum of each sample was analyzed for lipid profile by using fully automatic access Robertic biochemistry Analyzer (Response-90) by Diasys Company of Germany.

From the current study it can be concluded that, oral ingestion of pod extract of A. esculentus has potential to reduce lipid content in human blood, including serum triglyceride, serum cholesterol, HDL, VLDL, LDL and CHOL/HDL Cholesterol ratio.

Incense Culture in the Past, Present and the future

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Abstract

Early civilization was developed around natural resources of local forest. They learned to use wood, bark, twigs, extractives, exudates roots, fruits etc. in the row form. They learned the properties of materials by trial and error. Gradual use of the forest products along with the development of science and technology made them to understand properties and used them in more sophisticated forms.

Combustion properties of forest products have been used for warmth as well as smoke produced by smouldering combustion to communicate with ancestor, medicine, cooking and offering to God.

In this way it became part of the culture in the different parts of the world. Incense is a biotic composite material that releases fragrant smoke when it is burned. Incense is made of combustible material like wood powder, natural plant based binders, fragrance, and bamboo thin stick.

Historically incense sticks have been used in religious rituals, celebration, and just for pleasure in home and in the temples. Its long use has generated its economic value, inner value without considering any adverse effect in any condition. Temple in Taiwan

In 2001, researchers in Taiwan found that in badly ventilated temple burning incense smoke is producing cancer causing chemicals in the environment. This sparked more fear in using incense in the temple and home. Thus ritual smoke became pollutant smoke.

This also sparked research interest related to content of incense smoke, environmental effect, and health effect. On another front safety related use of incense in the temple became legal issue.

Academic researchers are also trying to find substitutes of traditionally used binding material, and combustible materials expecting producing non harming smoke.

Manufacturers also started their marketing strategy considering safety like smokeless, pollutant free smoke producing incense in their advertisement.

In the future consumer will consider the safety issue of incense use. Temples will consider ventilation, number of incense sticks used, etc. without harming religious sentiments of the visitors.

The present research paper is based on the literature survey of incense. The present scenario is analysed on the basis of reciprocal model of safety culture (Cooper, 2000). The model considers person, behaviour and the situation.

Reference: Cooper, M. D. "Towards a model of Safety Culture", Safety Science 36 (2000, 111-136).

Cultural and symbolic importance of Ficus religiosa L. in India

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Abstract

Plants are truly a gift by God to humanity. Ficus religiosa L. (or Sacred Fig, Peepal) is one of those plants, which have a social, cultural, ethno-medicinal and religious significance in three major religions viz. Hinduism, Buddhism, and Jainism originated on the Indian subcontinent. Hindu scriptures believe that a sacred tree is regarded as an homage of the trinity- Lord Brahma, Vishnu, and Mahesh. In Buddhism, peoples believe that under this tree, Lord Gautama Buddha has attained enlightenment, hence called "The

Bodhi tree". Various ceremonial practices associated with sacred tree some of them are,
people believe that they gain prosperity and wealth when they light a Diya at the base of the tree on every Saturday. This tree is also known for widowhood (Manglik-dosha Nivaran puja) in which a widowhood girl child married to a Peepal. In South India, there is an important ceremonial practice performed a symbolic marriage with Neem (Azadirachta indica) and Peepal (F. religiosa) tree in which villagers encircle around both the trees to rid themselves of their sins.
Along with its religious importance, the ethno-medicinal importance of the Peepal tree is also very familiar in India. Tribal's and local people of different regions of India use this tree in the three traditional healthcare systems. Every part of this plant has a medicinal value such as its bark is used to cure skin disease, mouth ulcers, and diabetes. Leaves and fruit is used in treatment of diseases like asthma, cough, diarrhea and gastric problems. Stem wood can be used in the treatment of urinary disorders and the problem of the digestive system. Studies conducted on the Peepal tree reveal that the tree releases oxygen in all the time and Isoprene a volatile organic compound, which plays an important role in preserving the ozone layer. Above the aforementioned facts and information, we can conclude that the Ficus religiosa is unique and it has a combined special feature with respect to social, cultural, religious and ethno-medicinal importance. Owing to the above facts, this tree can be seen in the vicinity of almost all major temples and is regularly worshiped and regarded as the tree of life.

Community Forest Management: A Direct-Market Strategy for a Triple Bottom Line

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Abstract

Over the last two decades, the Honduran-based nonprofit Fundación MaderaVerde (FMV) has beencontributing to the livelihoods of rural families in Honduras by promoting self-sufficiency and responsible forest management, increasing their competiveness and creating successful businesses.

FMV's approach to forest management is community based and participatory in nature. It is developed in three separate geographical regions of the North Coast of Honduras. The communities in these three regions have both primary and secondary forests, which are managed through a complementary, integrated process that includes: responsible forest management, training in artisanal production and the marketing of timber and non-timber products.

Since its inception in 2004, FMV has worked closely with GreenWood (its US partner and founding nonprofit) on numerous projects as two independent NGOs. Recognizing that the production and sale of wood products from community forests have provided the primary economic incentives for local forest management and protection, FMV and GreenWood have developed their unique "Green Broker Network." This innovative, market-based approach has trained more than 100 artisans, sawyers and forest producers in communities across the North Coast of Honduras to make and sell high-quality wood products, adding value to forest resources and creating incentives to protect biodiversity. The Green Broker Network also employs a traceability system for legality compliance that enables local partners and international clients to trace the legal chain-of-custody of high-value guitar parts from forest to market. In 2014 our Green Broker Network was recognized with the first-ever Innovation Award in forest finance from the Yale School of Forestry and Environmental Studies and an award from the Vidanta Foundation of Mexico for our contribution to poverty reduction.

The Green Broker Network has generated more than $1.5 million USD in

foreign currency (“divisas”) for the Honduran economy over the last ten years through the sale of high-value wood products, lending tangible support to forest management, community forest enterprise and development. A diversification of products and grades has led to dramatic increases in yield and has paved the way for the introduction of other species, products and markets. Countless millions of dollars have been invested in tropical forest management projects and development schemes over the last several decades. Few of these have been connected to any productive forest enterprise, and fewer still have been accompanied by the effective marketing and sales that are needed to support good forest management.

Challenges for Sustainability in the Forest-Wood Chain

Connecting the Dots: Building a Sustainable Supply Chain from Forest to Market

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Abstract

Teaching artisans in forest communities to make quality wood products is relatively straightforward. Many residents of remote forest communities are resourceful and skilled in the use of hand tools and the production of a range of artisanal wood and nontimber forest products. But identifying or designing products that are well matched to a well-managed forest resource and can be produced efficiently for sale in local, regional or export markets is a much bigger challenge.

Connecting those products to clients and consumers who are prepared to compensate the craftspeople and forest managers for the added values embedded in their products presents marketing obstacles that lie beyond the skills and resources of most community-based forest enterprises.

A reliable and sustainable supply chain for community forest products depends upon a complex matrix of interconnected components, all of which are essential but difficult to maintain. From forest to market, these include:

Legal Rights: Land title, harvest and management rights.

Governance: Implementation of the law, appropriate and timely administration and oversight of management plans and operational harvests.

Inventory & Management: Sufficient forest inventory and support for adaptive forest management, integrating local knowledge and human resources.

Harvest & Transport Capacity: Ability to implement safe and environmentally appropriate harvest and transportation protocols in felling

trees and moving logs or timber from the forest to primary processing facilities.

Primary Processing (including kiln drying, as required): Appropriate tools and technologies for transforming logs into lumber needed for designated products.

Secondary Processing Capacity & Quality Control: Appropriate tools, technologies, expert training and management to manufacture artisan products to market standards.

Marketing & Sales (and export capacity, as required): Ability to solicit clients, establish appropriate pricing and adhere to delivery schedules.

Verification of Legality and Traceability: A transparent, verifiable system for ensuring integrity of the supply chain, from stump to market.

Such a complex process can only be achieved by marshalling an integrated network of resources and skills—natural, financial and human—requiring a well-coordinated and experienced team. In my talk, I will illustrate how GreenWood's experience with three agroforestry community cooperatives, located in the buffer zone of the Río Plátano Biosphere Reserve in Honduras has attempted to implement all of these components—some more successfully than others. There is no "one-size-fits-all" recipe for success, as every situation presents specific circumstances and challenges. But there are basic components that comprise the ingredients of any sustainable supply chain for community forest enterprise.

Towards strengthening the role of research and best practice in decision making

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Abstract

In the past two decades, the sustainable management of forest has increasingly become a public debate as issues of climate change and biodiversity loss have gained in importance. This increased attention has led to a wider recognition of the importance of forests, albeit it has also increased the risk of simplification of complex issues.

One example is the business sector, with more and more companies outside of the "traditional" wood product value chain elaborating and implementing policies that directly impact on forest management. Often, however, these policies are driven by simplified concept such as "deforestation-free".

An increasing challenge for the forest wood supply chain is therefore to strengthen the role of research and best practice in decision making. This concerns specifically the decision making of companies, especially the few dozen companies that drive the majority of the demand of the industrial wood supply globally. The challenge is further amplified by the fact that many of these companies are global consumer goods brands, far outside of the wood supply product value chain and far away from forest management practices and knowledge on the ground.

It is important to support the decision making of these companies through science and research, such as impact studies as well as best practices. Certification is important in this context as it offers a basis for science and research, integrates best practices, and makes a link from the forest to companies, including those outside of the forest sector value chain.

Synthesis Of Cationized Cellulose From Pine Needles And Application In Paper Making

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Abstract

Cellulose, an interesting polymer, is largely abundant on earth. Its modification is also becoming more interesting and useful for many other applications such as in pharmaceuticals, paper industry and many more. Environmental pressure will continue to influence research into new strength chemicals and any new legislation creates opportunities for research groups to produce bio-based products. In this direction the development of cellulosic based derivatives may be dramatically increase the benefits which are desirable in strength of paper. Cellulose based derivatives, especially cationized cellulose, may provide a solution, because these products have the capacity to overcome the heterogeneity of real paper stock. Further, the development of these products from lignocellulosic waste could achieve a reduction of investment and raw material costs with the decline in the demand of competitive and conventional raw materials like cotton fibers and wood pulp for modified cellulosic products. Pinus roxburghii Sarg. needles, is a lignocellulosic biomass in nature and is responsible for the major threat for forest fires in summer season as its leaf surface has a waxy coating over it which makes it highly inflammable. For this purpose we took an initiative for its better utilization and application as strength additive in paper making. This study reveals about extraction of cellulose from pine needles, its cationization and finding its suitability for its application as strength additive in paper making. Chemical analysis of pine needles shows the presence of 47% α-cellulose, 20% hemicellulose, 37% lignin and 70% holocellulose. High holocellulose content showed its suitability as a novel source for cellulose extraction and its chemical modifications. Upto 50% α-cellulose was extracted from the needles and reaction parameters were optimized for the cationization. Application of highly substituted product (degree of substitution ~ 0.53) were evaluated as strength additive for paper making

furnish. An enhancement up to 3.86%, 17%, and 0.8% in tear, tensile and burst index respectively was achieved by the application of cationized pine needle cellulose. The results of the study clearly shows the capability of Cationized pine needle cellulose as a strength additive in paper making.

Poster

Treatability and dimensional stability of impregnated woods

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Abstract

Effect of several impregnating agents on treatability and dimensional stability improvement of three lesser-used wood species grown in North Kalimantan Province, namely nyatoh (Palaquium spp.), sepetir (Sindora spp.), and pisang putih (Mezzettia spp.) has been studied. Impregnation was carried out by vacuum-pressure and then followed by soaking in each impregnant solution in hot condition. Impregnating agents used consist of the conventional phenol formaldehyde (PFK), low molecular weight phenol formaldehyde (LmwPF), polyethylene glycol-1000 (PEG), succinic anhydride (SA), and sodium silicate (SS). Results showed that impregnation applied can significantly improve dimensional stability of wood, except for impregnation with SS. Succinic anhydride and PEG are the best impregnating agent in term of improving wood dimensional stability, but SA can easily wash off from wood. Sodium silicate at 10% concentration is not recommended as impregnating agent. Sepetir wood has greater treatability than other species. The PFK and LmwPF have a different phenomenon on treatability and dimensional stability improvement.

Understanding natural durability of three important tropical timber species in Bangladesh against white-rot fungi

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Abstract

Natural durability is one of the major properties of wood that can provide useful information regarding end–uses and service life, in addition to global carbon and nutrient cycling in the forest ecosystems. A significant numbers of studies on biodegradation of wood particularly from temperate and boreal region have been undertaken, however, but there is a striking knowledge gap in the tropics despite huge diversity of woody species in tropical forests. Thus, it is crucial to understand the natural durability of a wide range of tropical species, capable of providing adequate service life in conditions of different decay hazard against different biological organisms. This study aimed to understand the natural durability of three widely used tropical timber species growing in Bangladesh namely, Dipterocarpus turbinatus, Artocarpus chaplasha, Michelia champaca against three whiterot fungi, such as Phanerochaete chrysosporium, Ceriporiopsis subvermispor and Trametes versicolor. The study revealed that the sapwood was less durable to fungi than heartwood. The heartwood of D. turbinatuswas less durable against P. chrysosporium where the sap wood was less durable against T. versicolor. On the other hand, both the heartwood and the sapwood in A. chapalasha and M. champaca showed substantially greater mass loss against T. versicolor. On the other hand, the durability class of heartwood varied depending on the fungal treatment. The heartwood of D. turbinatus was durable against P. chrysosporium, whereas very durable against C. subvermispora and T. versicolor. Similarly, the heartwood of A. chapalasha and M. champaca was durable under P. chrysosporium and T. versicolor, and very durable against C. subvermispora. Mass loss and extractive content was strongly related in heartwood where the relationship for sapwood was significant except D. turbinatus against C. subvermispora, and A. chapalasha and M. champaca against T. versicolor. Wood density also had a small negative association with mass loss. The natural durability of these species is primarily related to the extractive

content of the species. Such patterns of natural durability explore the potential of these species as a suitable substitute in the wood industry.

Theoretical foundation of “Aesthetic wood Culture” model"

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Abstract

The aim of this research paper is to develop theoretical model of “wood culture” considering past and present use of wood in different culture in different time ad space.

Cultural biography of wood indicates that there is a multiplicity of wood culture depending on space and time. Radaku (2011) rightly said; “wood inspires culture, it does not determine it. This indicates inherent properties of wood.

Early civilisation used wood for basic need like shelter and fire. They used locally available wood using basic tools. Their knowledge of wood was based on experience, and it was part of their local material culture. However, sea trade, silk route trade, colonisation and globalization influenced use of
particular wood species from local use to global use.

As civilisation progressed human aesthetic need was also increased. The role of the senses in the aesthetic experience is well known. Progress in wood science and technology have optimised the desired quality in wood. Different wood species have different inherent properties. Wood has potential to inspire all five senses, smell (sandalwood), taste (oak barrel for wine), touch (feels good), sight (modern artistic wood structure), and

sound (string music instrument). Theses senses have influenced demand, economy, feelings for particular wood species or in general wood. This indicates
Human experience of wood from practical to abstract.
Selection of wood depends on the use of wood i.e. Desired sensory properties,. Workability, size and shape. Some wood species or wood in general are intricately woven in the culture. Tim (2005) introduced the concept of an emotional relationship between the individual or group and the material by which the social and cultural significance of things is sustained. This is how culture affects perception of material which is known as materiality.
The first experience of wood in any early civilization can be like a child, unbiased, intuitive and curious approach to any material. In the present time our experience of wood is based on our prior knowledge of wood properties and uses. The use can be in material religion, cosmetics, architectural construction, pharmaceutical or cosmeceutical, musical instrument to this list we can add many more.
Many models of use of material in different contexts have been proposed, for example role of material in architecture (Badger's thesis).
We can use same model for aesthetic wood culture in general. The model is suggested based on literature survey, and examined using sandalwood case study.
The Medal Relationship the Working Relationship the Perceptual Relationship Perceptual relationship depends on the contexts.

Wood and the cult of Tree in the nomadic space of Kalmyks

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Abstract

Wood was widely used in the household of nomads who left Western Mongolia and settled in the steppes of the Northern Caspian. The traditions determined the use of wood among Russian Kalmyks, who imported wood from the Volga region and the North Caucasus under the conditions of the steppe treelessness. Structural details of the frame of the nomadic dwelling “kibitka”, furniture, dishes, household items, musical instruments were made of wood. Different types of wood were used to create household utensils, but, most often, a maple, a walnut, a poplar. All small-sized utensils of livestock farming were made by carving, turning and chiselling wood.

The items were decorated with carved decor. Thus, wooden ladles "tsatsl" of various sizes and shapes with nine holes were used in the ritual sphere of life. Nomads performed sacrificial drink-offerings with dairy products during the child-bearing, wedding and funeral rites of Kalmyks' life cycle. The decorative design combined images of animals on the handle framed by patterned ornaments of happiness and an L-shaped meander, which personifies perpetual motion. Such items are on the permanent display of the Museum of Traditional Culture named after Zaya-Pandita of the Kalmyk Scientific Center of the Russian Academy of Sciences.

People's respect for wood has ancient origins in the culture of the Kalmyk people. Far beyond the borders of the steppe, the "Lonely Poplar" from Kalmykia is known, which won the third place in the international competition "European Tree of the Year 2020", in which unique old trees from 16 European countries took part. The poplar, growing near the village of Khar Buluk, Tselinny District of the Republic of Kalmykia, represented the Russian Federation in the competition. Before that, it became the winner of “The Russian Tree of the Year” national competition. In an online poll held from 1 to 29 February last year, the Lonely Poplar won 27,411 votes in the European Tree of the Year 2020 competition.

According to the legend, the giant poplar was planted by a Buddhist monk named Bogdokhna Khurlyn Purdash Lam in 1846. He brought poplar seeds from his pilgrimage to Tibet. Purdash-bagshi placed poplar seeds inside his walking stick, which he buried at the highest point of the local hill. Soon a poplar sprout appeared at this place near the village of Khar-Buluk. For more than 150 years, the tree has grown into a real giant. Today its height

is 20 m, diameter is about 1.44 m. And it is included in the National Register of Old-Growing Trees of Russia under No. 390.
The tree is not only a natural monument, but also a sacred object for worship of buddhists. Believers from different parts of Russia and even foreign countries come here to pray. There is a Buddhist sanctuary of stupas on white stone pedestals near the poplar. A sacred Buddhist pole rises among them, symbolizing the initial stay of the seed in it, which gave a life-giving shoot to the tree.
At the foot of the poplar there are healing springs that gave the name to the village of Khar Buluk (Pure Spring). Their water is unique and useful for humans, because it contains alum, acting destructively on all kinds of parasites. Pilgrims come to touch the tree, recharge with its energy, ask for the fulfillment of desires, and also drink healing water. The ancient origins of tree worship are associated with the cosmogony of the Kalmyks, which represents the original principles of the World. The structure of the human universe is formed by the all-embracing foundations of Being - Earth and Heaven, connected by a lonely poplar standing in the middle of a vast steppe space, and inspired by the Sun. The life-giving Sun is symbolized in a red brush on the headdress of Kalmyks (the ethnonym "ulan zalata khalmgud" - children of the Sun). The symbolism of figurative thinking is carried by the ancestral hearth, an analogue of the sun in the living space of nomads. In the exhibition model of the traditional Kalmyk universe, this is emphasized by the vertical axis of the symbolic tree rising from the hearth on the ground through a round chimney to the Eternal Blue Sky of the Mongolian peoples.

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