

22nd International Nondestructive Testing and Evaluation of Wood Symposium

Detailed Program Schedule | May 24-27, 2022, Quebec City – Canada

Tuesday, May 24, 2022 | Pre-Symposium Technical Workshop Nondestructive Testing and Evaluation of Wood for Cultural Uses

8:30 Coffee and Pre-Symposium registration

9:00 **Welcome Note**

Alexis Achim, Renewable Materials Research Centre, CANADA

Nondestructive Evaluation of Historic Artifacts and Structures

Robert Ross, USDA, Forest Service, USA

This presentation focuses on the condition assessment of historic artifacts and structures. Part one of the presentation will focus on a review of commonly used nondestructive evaluation techniques, and interpretation of results obtained from their use. Part two will provide a review of assessments for a variety of historic materials and structures.



10:00 Coffee Break + Basket Exhibition

10:30 **Black Ash – A Culturally Important Species**



Laurence Boudreault, Renewable Materials Research Centre, CANADA

Selection criteria for basketry / Nondestructive method demonstration / Pounding Demonstration



The implications of species loss are particularly difficult when they hold value for ecological and cultural goods and services. Black ash in QC, for example, is a species of great importance to the Waban-Aki Nation's cultural and spiritual practices, yet is known to be highly impacted by the introduction of an exotic insect (*Agrilus planipennis*). Working through dialogue and understanding with the Waban-Aki Nation, Laurence Boudreault (PhD) will document the properties that give black ash its cultural importance and co-construct potential strategies to maintain cultural activities currently depending on it. Through her research she's co-developing tools and strategies to maintain the weaving activities fundamentally important to the Waban-Aki Nation by ensuring access to quality black ash.

12:00 Lunch

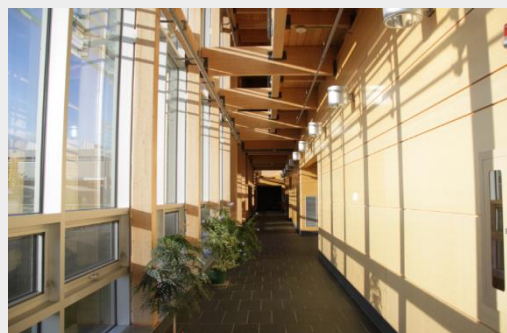
13:30 **Dating Historic Buildings**

Martin Simard, Centre for Northern Studies, CANADA

14:00 **Visit Gene-H.-Kruger Building***

Guide tour by Benoit St-Pierre / Alexandre Morin-Bernard, Renewable Materials Research Centre, CANADA

The Gene-H.-Kruger building is the hub of teaching, innovation, and development of wood sciences at Université Laval. It provides a showcase for the use of engineered wood products in construction, elements of which are featured in the labs, classrooms, meeting venues and administrative buildings that comprise this 8,000 m² complex. [Virtual visit.](#)



15:00 **Visit Université Laval TELUS Stadium**

Guided tour by Simon T. Bellavance, [Cecobois](#) consulting firm in wood construction & Vadim Siegel, Architecture [ABCP](#), CANADA

The TELUS stadium is part of a large-scale project, the regional expansion project of the PEPS sports building at Université Laval. The stadium has a magnificent main frame constructed of glued laminated timber, being an example of sustainable construction. This structural choice avoided the emission of around 1,500 tonnes of CO₂. [See pictures of the TELUS Stadium.](#)

17:00 **Welcome Reception, Renewable Materials Research Centre, Université Laval**

Wednesday, May 25, 2022 | Day 1

8:00 Registration

8:30 Opening Ceremony

Alexis Achim, Renewable Materials Research Centre, Université Laval, CANADA

Robert Beauregard, Executive Vice Rector of Academic and Student Affairs, Université Laval, CANADA

Mohammad-Sadegh Mazloomi, FPInnovations, CANADA

9:00 General session

Moderator: Bruce Allison, USA

In-Forest Wood Quality Assessments – Where Are We with NDT Technologies?

Xiping Wang & Robert J. Ross, USA*

Industrial CT Scanning in Wood Research

José Couceiro, Lars Hansson, Dick Sandberg & Enrico Ursella, Sweden*

Questions and comments

10:00 Coffee/Tea

10:30 Session #1A: Nondestructive Characterization of Wood and Wood-Based Materials

Moderators: Laszlo Bejo (Hungary) and Udo H. Sauter (Germany)

10:30 – 11:45 ID-09: Effects of Microwave Radar Sensor Distance and Material Thickness on Density and Moisture Content Determination, Laszlo Bejo*, Mihaly Jakocs & Ahmed Altaher Omer, Hungary

10:45 – 11:00 ID-17: Comparison between Static Modulus of Elasticity and NonDestructive Testing Moduli of Elasticity in White Spruce and Lodgepole Pine Wood, Cyriac Mvolo*, James D. Stewart & Ahmed Koubaa, Canada

11:00 – 11:15 ID-18: Evaluation of Elastic Constants of Oil Palm Wood Using Ultrasonic Measurement, Katja Fruehwald-Koenig*, Benedikt Faust, Germany

11:15 – 11:30 ID-21: Estimation of the moisture content in wood by combination of Neutron and X-ray imaging, José Couceiro*, Lars Hansson, Dick Sandberg, David Mannes & Peter Niemz, Sweden

11:30 – 11:45 ID-33: Nondestructive Model for Predicting the Mechanical Properties of Wood in Southwest, Nigeria, Lawrence Aguda*, Misirat Bakare & Ige Oluwagbemiga, Nigeria

11:45 – 12:00 ID-36: Comparative Estimation of Acoustic Velocity and Strength Properties of Down Pine Trees Using Near Infrared Spectroscopy, Munkaila Musah*, Javier Hernandez Diaz, Dana Mitchell, Mathew Smidt, Yucheng Peng, Tom Gallagher, Maria S. Peresin & Brian Via, USA

12:00 Lunch

13:30 Session #1B: Nondestructive Characterization of Wood and Wood-Based Materials

13:30 – 13:45 ID-40: Nondestructive Determination of the Within-Ring Wood Dynamic Modulus of Elasticity for Black Spruce and Jack Pine, Wassim Kharrat*, Ahmed Koubaa, Mohamed Khelif & Chedly Bradai, Canada

Session #4: NDE of Sawn Logs for Optimal Utilization

Moderator: Ahmed Koubaa (Canada)

13:45 – 14:00 ID-45: Small-Diameter Logs from Oak for Structural Purposes – Determination of Mechanical Properties by NonDestructive and Destructive Testing, Nicolas Hofmann, Franka Brüchert*, Udo H. Sauter, Kay-Uwe Schober & Beate Hörnel-Metzger, Germany

14:00 – 14:15 ID-11: Distribution of Wetwood in Silver Fir (*Abies alba* MILL.) – A Prerequisite for Nondestructive Testing Mechanical Characterisation of Logs, Franka Brüchert*, Guénaél Klotzbücher, Martin Huber & Udo H. Sauter, Germany

14:15 – 14:30 ID-13: Using X-Ray Computed Tomography (CT) Scanning to Optimize Log Primary Breakdown in Plantation-Grown White Spruce (*Picea glauca* (Moench) Voss), Isabelle Duchesne*, Queju Tong & Patrick Lenz, Canada

14:30 – 14:45 ID-27: Nondestructive Testing of Timber Prior to Sawing Using Finite Element Models Based on X-Ray Computed Tomography Data - A Preliminary Study, Johannes A. J. Huber*, Olof Broman, Johan Oja, Lars Hansson & Mats Ekevad, Sweden

14:45 – 15:00 ID-47: Evaluation of Sawmill Log Scanners with Comparison to Forest Harvester Measurements, Kari Hyll* & Maria Nordström, Sweden

15:00 Coffee/Tea

15:15 Poster session

Moderator: Alexis Achim (Canada)

15:15 – 15:30 ID-64: Approved Method for Efficient Inspection and Documentation of Not Only Historic Timber Structures based on Results Obtained in Hundreds of Successful Projects Since 1988, Frank Rinn*, Germany

15:30 – 15:45 ID-49: Urban Green Spaces and How They Affect Woody Species Diversity and Biomass Carbon Stock in Hawassa, Ethiopia, Abel Woldeyohanis*, Mesele Negash, Yoseph Melka, Ethiopia

Session #6: Condition Assessment of Historic Wood Artifacts & Structures

Moderator: Isabelle Duschene (Canada)

15:45 – 16:00 [ID-35](#): Mechanical Performance and Nondestructive Test of Demolished Timber Collected from a Wooden Building Several Hundred Years Old, [Erina Kojima*](#), [Hideo Kato](#), [Yasutaka Watanabe](#), [Ken Yamamoto](#) & [Ichirou Saitou](#), Japan

16:00 – 16:15 [ID-61](#): Using Dielectric Orthotropy as an Indicator of Internal Decay of Wood Members, [C. Adam Senalik*](#), [James P. Wacker](#), [Benjamin Farber](#) & [Xiping Wang](#), USA

* Presenter

Thursday, May 26, 2022 | Day 2

8:00 Registration

8:30 Session #2A: In-Forest Wood Quality Assessments

Moderators: Xiping Wang (USA) and Franka Brüchert (Germany)

8:30 – 8:45 [ID-01](#): Using Time-of-Flight Acoustic Velocity to Assess the Modulus of Elasticity and Bending Strength Properties of White Spruce from Tree Improvement Experiments, [Iman Rashidi-Jouybari*](#), [Alexis Achim](#), [Patrick Lenz](#), [Jean Beaulieu](#) & [Jean Bousquet](#), Canada

8:45 – 9:00 [ID-34](#): Nondestructive Characterization of Sugar Maple Wood Decay and Modulus of Elasticity by Acoustic Tomography, [Achraf Ammar](#), [Ahmed Koubaa*](#), [Dorra Gassara](#), [Yves Bergeron](#), [Pierre Grondin](#) & [David Voyer](#), Canada

9:00 - 9:15 [ID-15](#): Effect of Partial Harvesting on Growth, Density, and Dynamic Modulus of Elasticity of White Spruce in a Mixed Boreal Forest, [Md Nazrul Islam](#), [Ahmed Koubaa*](#), [Brian Harvey](#) & [Suzanne Brais](#), Canada

9:15 - 9:30 [ID-29](#): Effect of Silvicultural Practices on Basic Wood Density of Sugar Maple in Lake States Region, [Chinmoyee Das](#), [Peng Quan](#), [Xinfeng Xie*](#), [Yvette Dickinson](#), [Xiping Wang](#), [Robert J. Ross](#) & [Christel C. Kern](#), USA

9:30 - 9:45 [ID-31](#): Differentiation of Eucalyptus Clone Seedlings by Nondestructive Tests and Machine Learning Methods, [Rafael Gustavo Mansini Lorensani*](#), [Cinthya Bertoldo Pedroso](#), [Raquel Gonçalves](#) & [Isabela Constantino de Toledo](#), Brazil

9:45 – 10:00 [ID-32](#): Distinction of Eucalyptus Planting Areas Through Data Mining, [Carolina Kravetz*](#), [Cinthya Bertoldo](#), [Rafael Mansini Lorensani](#) & [Fernanda Trislitz Perassolo Guedes](#), Brazil

10:00 Coffee/Tea

10:30 Session #2B: In-Forest Wood Quality Assessments

10:30 – 10:45 [ID-14](#): Dynamic Modulus of Elasticity in *Calophyllum brasiliense* Cambess Trees from Bajo Calima (Colombia), [Julio Bermúdez Escovar*](#), [Roger Hernández](#), [Alexis Achim](#) & [Claudia Cáceres](#), Canada

10:45 – 11:00 [ID-37](#): Field Assessment of Downed Timber Strength Deterioration Rate and Wood Quality Using Acoustic Technologies, [Munkaila Musah*](#), [Javier Hernandez Diaz](#), [Dana Mitchell](#), [Mathew Smidt](#), [Tom Gallagher](#), [Maria S. Peresin](#) & [Brian Via](#), USA

11:00 – 11:15 [ID-60](#): Models for Predicting the Within-Tree Variation of Ultrasonic Velocity and Dynamic Modulus of Elasticity for Plantation Loblolly Pine, [David Auty*](#), [Joseph Dahlen](#), [Thomas L. Eberhardt](#), [Laurence Schimleck](#) & [Nawa Pokhrel](#), USA

11:15 – 11:30 [ID-19](#) Electric Resistance Tomograph: A Nondestructive Testing Approach to Valuation of High-Value Trees of India, [Baragur Divakara*](#), [S. Chaithra](#) & [C Balaji](#), India

* Presenter

11:30 Lunch

Tour and Conference Dinner

13:00 Bus departure from Renewable Materials Research Centre to Saint-Jean-Port-Joli (duration: 1 h 8 min)

14:10 Visit Art Massif Wood Structure

Art Massif designs and manufactures original, superior-quality glued-laminated timber structures. They have an extensive portfolio of commercial, cultural, educational, and historical renewal buildings among others that are true works of art in wood.

16:00 Bus departure from Art Massif to Ras-L'Bock Microbrewery (duration: 6 min)

16:10 Visit Ras-L'Bock Microbrewery – An Art Massif Realization

This two-level building houses a restaurant on the ground floor and a bar upstairs. Facing the mighty St. Lawrence River, the wavy glulam structure echoes the river's waves offshore. On the large outside terraces, guests can enjoy the location's beauty during the warmer months.

17:00 Bus departure from Ras-L'Bock Microbrewery to Laval University or Old-Quebec (duration: 1 h 10 min)

18:10 Free time

19:10 Bus departure from Laval University to Old Quebec (duration: 10 min)

19:30 Banquet at Louis Hébert Restaurant

French cuisine restaurant located on Grande-Allée Est in the heart of Old Quebec

22:00 Bus departure from Old Quebec to Laval University (duration: 10 min)

More details: [Art Massif Wood Structure](#) // [Restaurant Louis Hébert](#)

Friday, May 27, 2022 | Day 3

8:00 Registration

8:30 Mixed session (Online)

Moderator: Alexis Achim (Canada)

8:30 – 8:45 ID-59: Relation of Ultrasonic Wave Velocity and Compression Strength of Artificially Decayed Wood, [Kana Yamashita*](#), [Hirofumi Ido](#), [Yuko Ota](#) & [Toshihiro Yamada](#), Japan

8:45 – 9:00 ID-08: Combining Nondestructive Testing Technology and Digital Twin for Preventive Conservation of Wooden Cultural Relics, [Xueyi Ma](#), [Jian Zhao*](#), [Puxiang Wang](#), [Yuankai Weng](#), [Lihua Fei](#) & [Dong Zhao*](#), China

9:00 – 9:15 ID-42: Influence of Moisture Content on Mechanical Properties and Damage Forms of Ancient Timber Members, [Zhenbo Xin*](#), [Houjiang Zhang](#), [Dongfang Ke](#) & [Yongzhu Yu](#), China

9:15 – 9:30 ID-48: Nondestructive Evaluation of the Concealed Wood Columns in Historic Buildings, [Houjiang Zhang*](#), [Zhenbo Xin](#), [Yongzhu Yu](#), [Dian Zhang](#) & [Hui Wang](#), China

9:30 – 9:45 ID-51: Flexible Machine Strength Grading: Using Acoustic Nondestructive Testing of Green Sawn Timber to Calculate Grading Settings for Individual Batches of Spruce Sawn Timber, [Andreas Weidenhiller*](#) & [Andreas Neumüller](#), Austria

9:45 – 10:00 ID-52: Nondestructive Detection and Three-Dimensional Mapping of the Root System of an Ancient Camphor Tree Based on Ground-Penetrating Radar, [Zhang Xiaowei](#), [Wang Zepeng](#), [Xue Fangxiu](#), [Li Haibin](#), [Li Shuang](#) & [Wen Jian*](#), China

10:00 Coffee/Tea

10:15 10:15 – 10:30 ID-39: Nondestructive Timber Testing as a Tool to Detect Depletion of Carbon Storage in Stem of Aspen, [Linda Čakša](#), [Laura Kēniņa](#), [Nauris Siksna](#), [Kristaps Ozoliņš](#), [Ieva Jaunslaviete](#) & [Āris Jansons*](#), Latvia

10:30 – 10:45 ID-46: Loading Resistance of Silver Birch (*Betula pendula* Roth.) and Eurasian Aspen (*Populus tremula* L.) in Urban and Peri-urban Forests, [Oskars Krišāns](#), [Linda Čakša](#), [Roberts Matisons](#), [Steffen Rus](#), [Didzis Elferts](#), [Andris Seipulis](#) & [Āris Jansons*](#), Latvia

10:45 – 11:00 ID-12: Near-Infrared Spectroscopy Coupled with Chemometric Analysis as a Valuable Nondestructive Tool for Prediction of Carbon Content in Wood Samples, [Iris Beatriz Vega Erramuspe*](#), [Dana Mitchel](#), [Jason Thompson](#), [Thomas Elder](#) & [Brian Via](#), USA

11:00 – 11:15 ID-07: Assessment of Incipient Decay on Wood Using Stress Wave Technique, [Tamara Franca*](#), [Brianna Duquette](#), [Adam Senalik](#) & [Robert Ross](#), USA

Session #3A: NDE for Urban Trees

Moderators: C. Adam Senalik (USA) and Raquel Gonçalves (Brazil)

11:15 – 11:30 ID-23: Tree Risk Assessment: Systemic Approach Involving Nondestructive Techniques and Tree Biomechanics, [Raquel Gonçalves*](#), [Gustavo Garcia](#), [Karen Freitas](#), [Mariana Reis](#), [Stella Palma](#), [Camila Linhares](#) & [Monica Ruy](#), Brazil

11:30 – 11:45 ID-24: Use of Tomographic Images to Support the Inference of Strength Loss in Trunk Using Equations from Literature, [Mariana Nagle dos Reis](#), [Raquel Gonçalves*](#) & [Camila Stephanie Fernandes Linhares](#), Brazil

11:45 – 12:00 ID-25: Influence of the Manner of Obtaining Coordinates of Contour of Irregular Discs in Tomographic Images, [Stella Stopa Assis Palma](#), [Mariana Nagle dos Reis](#) & [Raquel Gonçalves*](#), Brazil

12:00 – 12:15 ID-26: Adjustment of Ultrasonic Tomography Velocity Ranges to Represent the Variations within Tree Trunks Using Confusion Matrix Metrics, [Stella Stopa Assis Palma](#), [Mariana Nagle dos Reis](#) & [Raquel Gonçalves*](#), Brazil

12:15 Lunch

13:15 Session #3B: NDE for Urban Trees

13:15 – 13:30 [ID-62](#): Visual Tree Assessment and Static Integrated Assessment Do Not Allow Breaking Safety Evaluation of Defective Stems of Mature Urban Trees, [Frank Rinn*](#), Germany

13:30 – 13:45 [ID-63](#): Biomechanical and Mathematical Basics of “Allometric Self-Referencing” for Evaluating Breaking Safety of Defective Stems of Mature Urban Trees, [Frank Rinn*](#), Germany

13:45 – 14:00 [ID-38](#): Dynamic Tree Stability: Improved Testing Methodology and Indications of Reliability, [Laszlo Bejo*](#), [Imre Sumegi](#) & [Ferenc Divos](#), Hungary

14:00 – 14:15 [ID-41](#): Comparing the Stability of the Trees in Different Seasonal and Weather Conditions by Using Nondestructive Method, [Ferenc Divos](#), [Laszlo Bejo](#) & [Shadabeh Fathi*](#), Hungary

14:15 – 14:30 [ID-20](#): Identification of Wood Decay and Hollowness in Standing Trees using Electric Resistance Tomograph: A Nondestructive Testing Approach, [Baragur Divakara*](#), [S Chaithra](#) & [C Balaji](#), India

Session #5A: Advanced Grading Technologies for Solid Wood & Engineered Wood Products

Moderator: Xinfeng Xie (USA)

14:30 – 14:45 [ID-03](#): Prediction of Tensile Modulus of Elasticity from Longitudinal and Transverse Natural Frequencies in Hardwood Species, [Gonzalo Moltini*](#), [Gonzalo Cabrera](#) & [Vanessa Baño](#), Spain

14:45 – 15:00 [ID-30](#): Influence of Board Geometry on the Determination of Dynamic Mechanical Properties of Structural Lumber, [Aleš Straže*](#) & [Luka Krajnc](#), Slovenia

15:00 Coffee/Tea

15:15 Session #5B: Advanced Grading Technologies for Solid Wood & Engineered Wood Products

15:15 – 15:30 [ID-43](#): Strength Grading Softwood Structural Lumber with MoE Low Point, [Jon Shanks*](#), [Richard Schaffner](#), [Geoff Boughton](#) & [James Szabadics](#), Australia

15:30 – 15:45 [ID-44](#): Challenges and Opportunities Toward the Use of Northern Hardwood Species in Glued-Laminated Timber in Canada, [Alexandre Morin-Bernard*](#), [Alexis Achim](#) & [Pierre Blanchet](#), Canada

15:45 – 16:00 [ID-54](#): Local Modulus of Elasticity by Constrained Optimization, [Friend K. Bechtel*](#), USA

16:00 – 16:15 [ID-58](#) Using Acoustic Tomography Techniques to Estimate Bending Properties of Cross-Laminated Timber, [Frederico Jose Nistal França*](#), [Christopher Adam Senalik](#), [R. Daniel Seale](#), [Robert J. Ross](#) & [Rubin Shmulsky](#), USA

16:15 Closing Remarks

* Presenter

Saturday, May 28, 2022 – Optional tour

Sightseeing Tour of Old Quebec (Optional Tour)

20 participants maximum

Sightseeing tour of Old Quebec from the perspective of wooden heritage guided by a historian and an architect specializing in heritage



9h00 Visit of the [Dufferin Terrace](#)

Presentation of the history of Quebec City and the historical site of the Terrace by D. Mendel (10 min walk to get to the Ursuline grounds)

9h45 Visit of the [Ursuline Chapel](#) (10 min walk to Holy Trinity)

10h40 Visit of the [Holy Trinity Anglican Cathedral](#) (10 min walk to the *Petit Séminaire de Québec*)

11h30 Interior courtyard of the *Petit Séminaire de Québec*

11h35 Laval University School of Architecture (10 min to get to Augustine’s Monastery)

12h25 Lunch at the Augustine’s Monastery

13h30 Visit of the [Augustine’s Monastery](#)

14h30 Departure by bus to General Hospital

14h45 Visit of the [General Hospital](#)

15h30 End of the visit

Departure by bus to Old Quebec

Heritage and historical tour of Quebec City

Specialists who will lead the tour



Émile Gilbert, architect, obtained his bachelor's degree in architecture from the École d'architecture de l'Université Laval in 1972. Émile Gilbert is one of the contemporary architects responsible for revitalization projects in the central districts of the Quebec capital. His work is rooted in the enhancement of and respect for the heritage sites in which they are located. Émile Gilbert was awarded the Quebec government's Medal of Citizenship in 1991 Biography from the Répertoire du Patrimoine Culturel du Québec.



David Mendel, a historian, studied at York University in Toronto and the Université de Paris-Sorbonne, before moving to Quebec City in 1976. After completing a Master's degree in Art History and undertaking a doctorate at Laval University, he co-founded [Visites Mendel](#) in 1984. He is often called upon at international conferences to give lectures on the history of Quebec City. He has also given many guided tours for dignitaries. A resident of the historic district of Quebec City since 1976, he is very involved in heritage preservation issues. He is the President of the Holy Trinity Cathedral Foundation - the first Anglican cathedral to be built outside the British Isles. He is the author of a series of best-selling guidebooks dedicated to Quebec City and its surrounding regions. After 35 successful years in the tourism industry, David Mendel has decided to take early retirement in 2019, to devote himself to the activities he enjoys most: giving lectures and guided tours of Quebec City and writing books.