

Academy Board

Chair: S. Wang (2021)

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K. Čufar (2024)

G. Daniel (2022)

G. Du (2024)

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L. Schimleck (2024)

T. Shupe (2020)

K. Takabe (2020)

A. Teischinger (2022)

End of terms: 1 June

Please send correspondence by email to the editor,

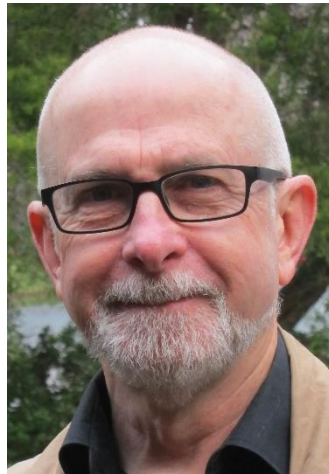
Lloyd Donaldson:

lloyd.donaldson@scionresearch.com

[com](http://www.iaws-web.org/)

<http://www.iaws-web.org/>

Message from the President



Our 2019 Plenary meeting in Stübing, Austria, was held in partnership with the International Wood Culture Society (IWCS) as part of the 7th World Wood Day activities at the Austrian Open-Air Museum. The IWCS was admitted to the IAWS as an Affiliate Member in 2017, allowing great opportunities to further the integration of science and culture. The theme was 'CHANGE' to highlight our need to change direction for a sustainable future. This was a great opportunity for IAWS Fellows to communicate scientific principles in the context of wood culture and to reach a much greater and more diverse audience than is possible at our usual scientific meetings.

Fellow Alfred Teischinger delivered the Academy Lecture at this meeting and Fellow Gerd Wegener received the IAWS Distinguished Service Award. At our technical session in Stübing, we were also treated to the announcement of the awarding of the 2019 Marcus Wallenberg Prize to Fellow Gerhard Schickhofer, who will be presented the Prize at the Grand Hotel, in Stockholm, October 7. Detailed information is included in this Bulletin and on the MWP website.

The results of the 2019 IAWS PhD Award, judged by the Academy Board, have been announced.

First Place: Dr. Jinze Dou, Dissertation title "Fractionation of willow bark for combined production of extracts and fiber bundles", Graduated from Aalto University.

Second Place: Dr. Qiliang Fu, Dissertation title "Wood Nanotechnologies for Transparency, Fire Retardancy and Liquid Separation", Graduated from KTH Royal Institute of Technology, Sweden.

With a Fellows election round in progress, it is extremely important to read the comments of Fellow Pieter Baas in this Bulletin regarding imbalances in the IAWS Fellowship. This is an unprecedented opportunity to increase the diversity of the Academy with many well-qualified candidates. Thanks to the work of the Scouting Committee led by Pieter Baas, and to the other Fellows who took the time to nominate. Please start thinking about nominations for election to the Academy and bear in mind the fact that we are a long way behind our goal of balanced representation in our Fellowship.

I remind Fellows to submit Fellowship nominations to me and nominations for the 2019 PhD award to our Chair, Siqun Wang (please let your colleagues know that PhD Award nominations can also be made by non-Fellows).

We celebrate the life of Fellow Bob Kennedy, who was elected in 1971 and served as President of the IAWS 1987-1990. He was an Academy Lecturer in 1995. An obituary by John Innes is included in this Bulletin.

The Executive Committee will meet again in Moscow as part of the celebration of the 100th anniversary of the Bauman Moscow State Technical University/Mytishchi Branch (December 2-5).

Thanks to my Fellows on the Executive Committee, Yoon-Soo Kim, Howard Rosen, Lloyd Donaldson and Uwe Schmitt, as well as Board Chair Siqun Wang and the Board for their dedication and support.

Robert Evans.

Distinguished Service Award to Fellow Gerd Wegener

The IAWS Distinguished Service Award is made in recognition of an individual who has contributed distinguished service to any aspect of the broad field of wood science. Such service may have been made in any relevant research, educational, or leadership area that furthers the objectives of the Academy.

Professor Wegener has been a Fellow of the IAWS since 1988.

During Professor Wegener's long and illustrious career, he has contributed much to wood science as a teacher, scientist and leader. He has had a major world-wide impact on the development of wood as a sustainable material in the construction industry and for many other uses.

He held professorships at two of the most prestigious universities in the world – the Ludwig-Maximilians-University in Munich and the Technical University of Munich from 1993 to 2010 and was Editor in Chief of the European Journal of Wood and Wood Products and of the official IAWS journal Wood Science and Technology for almost two decades (until 2013). In addition, Professor Wegener has served on numerous advisory committees and boards concerned with academic and industrial excellence.

Professor Wegener's many honours include the extremely prestigious Cross of the Order of Merit of the Federal Republic of Germany for outstanding commitment to the Bavarian Wood and Forest Industry, and the Schweighofer Main Prize for 'outstanding performance for the European Forest Based Sector over an extended period of time'. In 2016, at our Academy's 50th Anniversary Meeting in Paris, Fellow Wegener delivered the Academy Lecture, which is our highest honour.

His excellent international reputation is also symbolised by Honorary Doctorates from the Technical University in Zvolen, Slovakia, and the St Petersburg State Forest Technical Academy in Russia.

During the World Wood Day Symposium at the Austrian Open-Air Museum, Stübing, it was my great privilege to present to him our Distinguished Service Award on behalf of the Academy.

Robert Evans

Academy Lectureship awarded to Fellow Alfred Teischinger

The highest honour that the International Academy of Wood Science can bestow is our Academy Lectureship. It honours distinguished achievements in the science of wood, which in turn encourages high standards of research and publication. Since the Academy Lectures are presented in different parts of the world and in connection with meetings of related professional organizations, the philosophy and activities of IAWS are widely communicated.

At the 2019 Plenary Meeting of the IAWS in Stübing/Graz, Austria, the Academy Lecture was delivered by Professor Alfred Teischinger (coincidentally a native of the region of Graz).

Fellow Teischinger, University of Natural Resources and Life Science in Vienna, was elected as a Fellow in 2013 and is an elected IAWS Board Member. He is the recipient of many distinguished awards including the 2009 Dr. Wolfgang Houska Prize, the 2007 Austrian State Best Book Award and the 2006 Stern Award. He has organised at least thirty meetings including our memorable IAWS plenary meeting in Vienna and Sopron, 2014. His extensive contributions to wood science, education and inspired leadership make him an ideal ambassador for the IAWS.

Professor Teischinger demonstrated his excellent communication skills during his fascinating comprehensive history of wood technology. A summary is on the IAWS website (www.iaws-web.org) and in this Bulletin.

Robert Evans

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Treasurers report - 2019

TREASURER'S REPORT

Following is the audited Treasurer's Report for the calendar year 2018, dated January 29, 2019. The dues have been broken down into categories and the E is for "extra" year's payment. The net change for 2018 was - \$313. At the end of 2018, 105 of the 118 (89%) Active and Retired fellows and 24 out of 26 of the Affiliate Members were current in their dues. Our CD's and mutual fund totals \$98,901 and have been invested in less secure and longer-term investments to obtain higher rates of return. Our difference between 2018 and 2017 was slightly negative this year because of a 6% drop in the value of our mutual fund, a result of a decrease in the US Stock Market, and because of higher meeting costs.

So far in May of 2019, we have approximately \$41,700 in Capital One Bank and \$4,450 in our PayPal account. Added to our \$108,000 in savings, we have a total of approximately \$148,600 in assets. So far, 19 of our 26 Affiliate Members have paid 2019 dues and 57% of our Active and Retired members have paid this year. We continually need funds to support our website, the PhD Thesis/Dissertation Award, the Distinguished Service Award, and technical conferences. Our finances continue to be on a sound footing.

IAWS Expenses and Revenues--Calendar Year 2018

Revenues (E – extra years paid by a member)

Retired dues (27 + 5E)	642.36
Active dues (69 +4E)	3,650.00
Lifetime dues (6)	3,651.98
Affiliate member dues (22)	4,367.00
Donations (1)	100.00
Total	\$12,411.34

I have examined the books of the IAWS Treasury Account for 2018 and have found all the details in satisfactory order.
Frank C. Beall

Frank C. Beall, Fellow, IAWS
Professor Emeritus, UC Berkeley
Date 1/29/2019

Expenses

Supplies	10.00
Web Site Revision/Managing	1187.88
Awards	1,000.00
Meetings	8,984.06
Wire fees Capital One	295.00
PayPal Fees	367.48
Total	11,844.42

Income = \$12,411 - \$11,844 = \$567

Capital One Account

Beginning balance January 1, 2018	36,260.67
Deposits by H. Rosen	2,655.22
Incoming bank wires	2,768.98
Transfers from PayPal	7,500.00
Interest	18.81
Withdrawal – Fees	-295.00
– Wires	-7,033.35
– Checks	-3,404.06
– Paypal transfer payment	-1,929.75
End Balance December 31, 2018	\$36,541.52

PayPal Account	
Beginning balance January 1, 2018	403.09
Deposits (62 active, 26 retired, 6 life, 10 Affiliate)	8,622.36
Transfers	-7,500.00
Payments	-400.00
Fees	-367.48
End Balance December 31, 2017	\$757.97

Total Assets

- CD Bank Sandy Spring Bank **\$34,498.55**
 -renewed 10/12/18 at 2.75% for 35 months
 -interest is accumulated
- Vanguard Dividend Appreciations Index Fund **\$64,401.72**
 -opened 5/23/13
 -dividends are reinvested

Checking + PayPal Accounts = **\$37,299.49** Total Assets = **\$136,200 (2018)**
\$136,513 (2017)

Net change **2018 – 2017** **-\$313**

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Report IAWS Scouting Team

Report IAWS Scouting Team

The purpose of the effort of the IAWS Scouting Team is “To combat gender and geographical imbalance in our Academy”, and the team constituted to scope the effort is Ruben Ananias, Pieter Bass (Convenor), Roberta Farrell, and Barbara Lachenbruch. The purpose and team were reported to the Academy in the IAWS Bulletin Issue 01 – 2018, accompanied by some excellent analysis by Lloyd Donaldson, shown on pages 36 and 37, of the geographical distribution of Fellows, and male: female ratio; only 7% of IAWS Fellows are females. Additionally, in the Bulletin was the statement: “Any suggestions to help remedy the imbalances in the Academy will be welcome”, but until now, no suggestions have been offered outside of the team or the EC. The Scouting Team encourages all of the Fellowship for any suggestions or generally comments about the Academy.

This report was discussed at the Executive Committee meeting in Guadalajara, with the following reported in the Minutes: **“Pieter recommended to consider a special fellows election to address gender and regional imbalance. The candidate search should be expanded to nanotech and biotech. Academic standards being proposed – Lloyd noted it would be really useful to develop specific guidelines for academic standards to avoid nominating candidates who are unlikely to attract votes. The scouting committee might already be applying these standards but they need to be shared if others are to nominate candidates also. Rob will ask Lennart to recommend female chemists. Rob will ask Bob Ross to find wood technology candidates. There is a list of people who represent regions on the web site so maybe ask some of them to nominate local candidates identified by the scouting committee. Currently there are 350 fellows, but only 100 are actively voting. It was suggested to find a team to work on nominations.”**

After some electronic discussion amongst the team and EC, it has been decided that the imbalances will be handled by the standard election process, and not by any special elections or changes to By-Laws.

Yoon Soo Kim extended the consideration of female representation as Fellows of IAWS with an analysis of women represented in Academia, worldwide, which shows continued gender imbalance:

“Percentage of woman professor in USA universities in 2013: Harvard 23.0%; Yale 22.9%; Princeton 21.6%; average in the USA 28.4%. And in Japan, University of Tokyo in Japan 5.2%”.

Pieter commented on this data as follows: *“The lists of Fellows elected over the last 5 years should I think constitute our “database” to see what sort of requirements the Fellowship as a whole has applied to select for “excellence” in wood science. This list also shows that we are moving in the right direction: over the last 5 years about 13% of the elected Fellows were women. However, we have a very long way to go to achieve 30% or more. The very interesting percentages of professorial appointments in some top universities should be viewed in the light that these universities were still*

in the initial phase in 2013 of doing something about the huge gender imbalances in their appointments."

Roberta has distributed to the team the website containing the document "Unconscious bias", which the Royal Society of New Zealand has made mandatory to all committees involved in the selection process of new Fellows. Suggest this is fruitful reading for the EC, and Roberta has suggested this be distributed to the Academy.

Pieter Baas has commented: *"The geographical imbalance has much to do with the history of the Academy, with its roots in Western Europe and later waves of recognition of North American, Australian, Japanese, and Chinese scholars, but still a seeming negligence of talent in Central and South America, Africa and SE.Asia. Here the problem is not so straightforward as with the gender imbalance, because in some emerging economies several wood scientists working in isolation simply have not had the chance to achieve the international level of excellence required by the Academy. However, I am sure that by active scouting many worthy candidates for the IAWS fellowship can be identified."* The team is encouraging others and proposing candidates for consideration of Fellowship, an action already done (16 candidates) by Rubén, Pieter and Roberta.

It has been discussed, though, that the team has to do more than propose candidates for Fellowship. If that would be the main outcome, then for one or two years, the team might propose candidates for Fellowship but the 'mindset/culture' of IAWS, and wood science in general, (okay, the world but let's just consider IAWS for now) needs to be addressed for greater geographic/other diversity, gender equality. To that aim, we suggest **Fellowship Geographic and Gender Balance** be a regular feature in the IAWS Bulletin, and on the website.

In that regard, the team wants to continue the activity reflected in the Bulletin's statement that we are "analyzing the extent of the imbalances and planning its activities". Kim did an excellent job to analyze the numbers but what else can we do? "Planning its activities" includes understanding and highlighting to the Fellowship how best to correct imbalances, which directly draw on two points: nominations and voting. [We're not addressing here education, societal factors etc. The continued work of the PhD Awards should also be included in the consideration of imbalance, though.]

Generating more nominations is crucial, and our team's proposals, and reaching out to others to expand the nominations, are correct. Assessing how the nominations are presented is also an action that can be considered. Some people don't publish, for many reasons, as much as others; patent applications can have weight as well as journal publications; completed student theses, MSc or PhD, contracted reports and other outputs can be considered. This aspect of assessing the excellence of one's career has been done by other societies, and we can draw on their work.

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

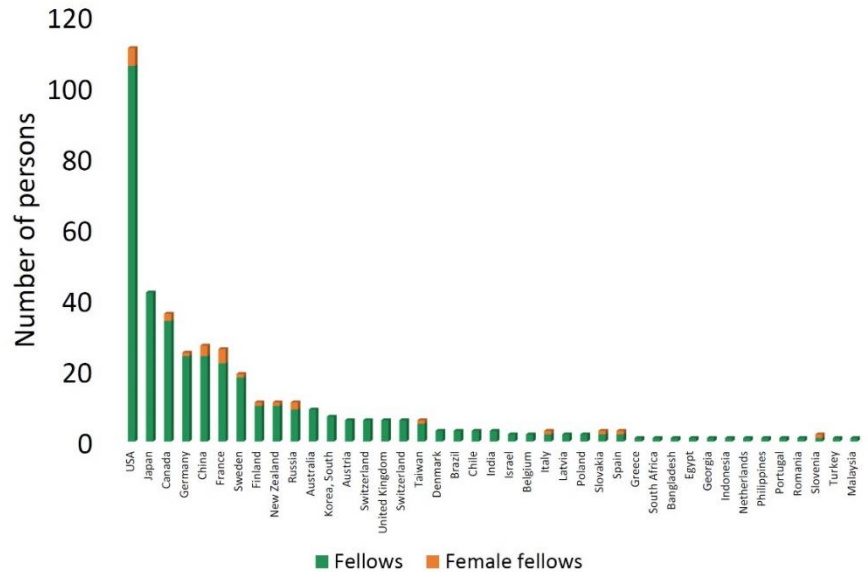
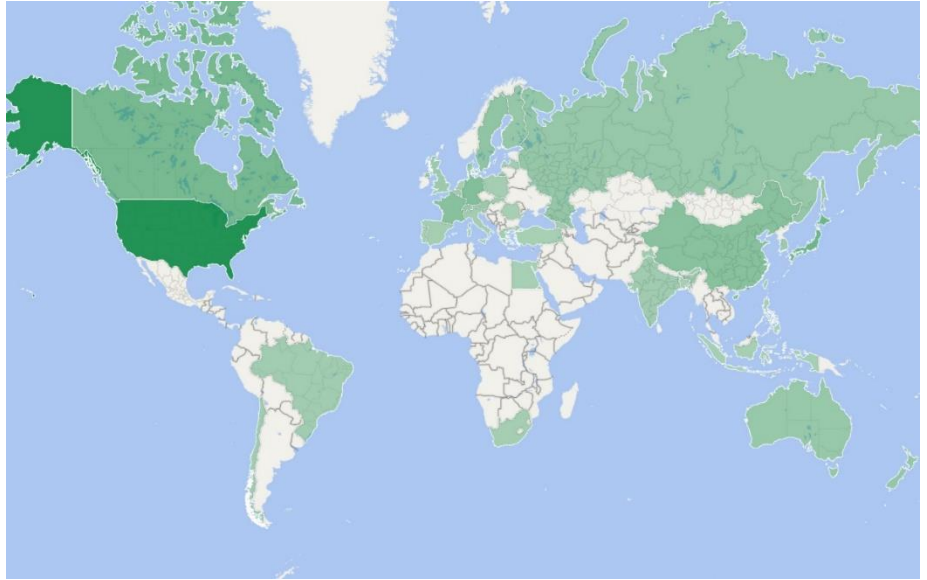
[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

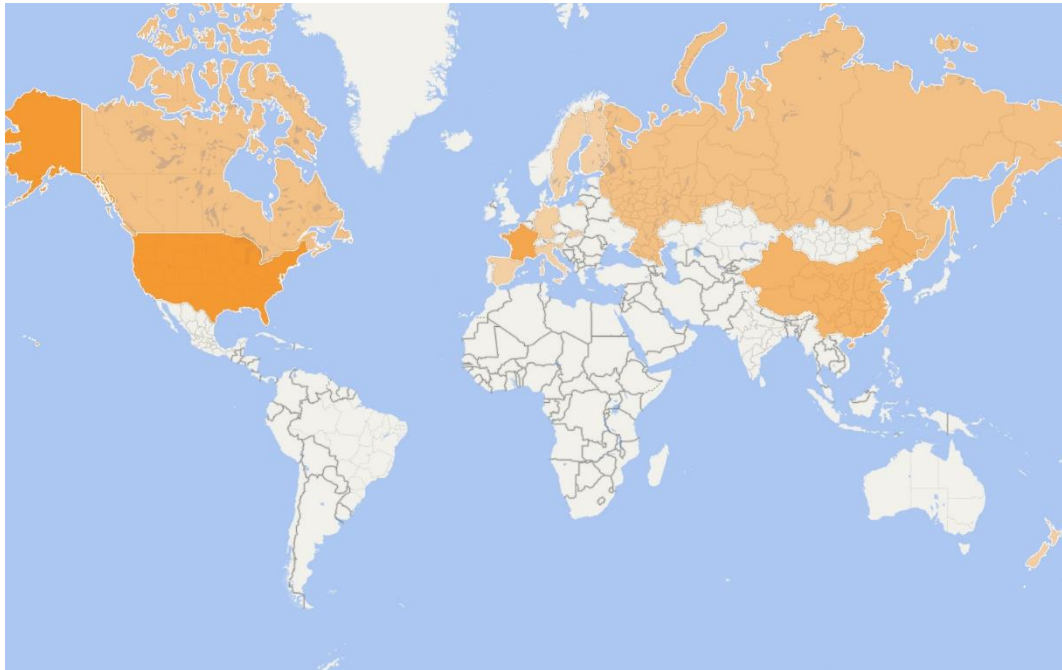
IAWS Membership Report

Distribution of Fellows by Country: 42 Countries, 383 Fellows. 7% of fellows are female.



IAWS Membership Report

Distribution of Female Fellows by Country: 14 Countries, 25 Fellows.



Affiliated Members elected in 2017

International Wood Culture Society, USA
Department of Wood Science – UBC, Canada

Affiliated Members elected in 2016

Vietnam Forestry University, Hanoi, Vietnam
Seoul National University, Seoul, Korea
International Center for Bamboo & Rattan, Beijing, China
Göttingen University, Göttingen, Germany

Fellows elected in 2018

Alfredo Aguilera, (Chile)
Paul Gatenholm, (Sweden)
Galina A. Gorbacheva, (Russian Federation)
Chunde Jin, (China)
Nam Hun Kim, (Korea, South)
Per Tomas Larsson, (Sweden)
Seung-Hwan Lee, (Korea, South)
Alex C. Wiedenhoeft, (USA)
Yafang Yin, (China)
Joe R. H. Zhao, (Canada)

Fellows elected in 2017

Umesh Agarwal (USA)
Junyou Shi (China)
Alain Celzard (France)
Nicolas Brosse (France)
Youngcan Jin (China)
Yuzou Sano (Japan)
Andrey Pranovich (Finland)

Fellows elected in 2016

Joris van Acker, (Belgium)
Katarina Cufar, (Slovenia)
Phillipe Gerardin, (France)
Yonghao Ni, (Canada)
Byung-Dae Park, (Korea, South)
Xiping Wang, (USA)
Cordt Zollfrank, (Germany)

Chair of Academic Board elected in 2016

Pieter Baas The Netherlands

New Board Members elected in 2016

Geoffrey Daniel Sweden
Ana Gutierrez Spain
Alfred Teischinger Austria
Siqun Wang USA

Fellows deceased in 2019

Robert KENNEDY, Canada

Fellows deceased in 2018

Mikhail ZARUBIN, Russian Federation
Hikaru SASAKI, Japan
Wayne WILCOX, USA

Fellows deceased in 2017

Peter ALBERSHEIM, USA
Kazumi FUKAZAWA, Japan
Takayoshi HIGUCHI, Japan
Peter F. NELSON, Australia
Dereck H. PAGE, Canada.

Fellows deceased in 2016

Ants TEDER, Sweden
Emmanuel POPPEL, Romania
Josef SCHURZ, Austria
John David BARRETT Canada
Ramon ECHENIQUE-MANRIQUE, Mexico
Kunio HATA, Japan

Deceased Fellows (2010 - 2015)

John M. HARRIS (2010) New Zealand
Shinji HIRAI (2010) Japan
Tamio KONDO (2010) Japan
Otto R. GOTTLIEB (2011) Brazil
Huntly HIGGINS (2011) Australia
Knut O. LUNDQUIST (2011) Sweden
Hubert POLGE (2011) France
Stanley K. SUDDARTH (2011) USA
Jerzy WAZNY (2011) Poland
Abraham FAHN (2012) Israel
Wolfgang KNIGGE (2012) Germany
Harold TARKOW (2012) USA
Anne-Marie CATESSON (2012) France
Eugene ZAVARIN (2012) USA
B.J. ZOBEL (2012) USA
Wilfred A. CÔTÉ (2012) USA
Horst H. NIMZ (2013) Germany
John D. BRAZIER (2013) United Kingdom
Fernand BARNOUD (2013) France
Gösta BRUNOW (2013) Sweden
Shigeo ISHIDA (2013) Japan
Thomas M. MALONEY (2014) USA
Sandor MOLNAR (2014) Hungary
Geza IFJU (2014) USA
John ERICKSON (2014) USA
Paul KIBBLEWHITE (2015) New Zealand
Börje K. STEENBERG (2015) Sweden
Boris N. UGOLEV (2015) Russia
Rolf BIRKELAND (2015) Norway

Compiled by Yoon Soo Kim, Gwangju

Affiliate Members

Affiliate Members shall be educational, research, industrial, or governmental organizations and individuals, who are actively engaged in carrying out or promoting research in wood science or the enhanced utilization of wood on the basis of scientific or technological principles and practices. The importance of Affiliates to the Academy is two-fold:

- The Academy derives direct contact with organizations and individuals actively engaged in the utilization of wood and wood products
- The Academy receives financial support for its activities from these members.

Contact details are available on the IAWS website.

AFFILIATE MEMBERS LIST

BAUMAN MOSCOW STATE TECHNICAL UNIVERSITY/MYTISHCHI BRANCH , Russia, www.bmstu.ru/en
CHINESE ACADEMY of FORESTRY (CAF), China, www.caf.ac.cn
CIRAD FORETS (French Agricultural Research Center for International Development), France, www.ur-bois-tropicaux.cirad.fr
DEPARTMENT OF WOOD SCIENCE – UBC, Canada, www.wood.ubc.ca/
ESB- ECOLE SUPÉRIEURE DU BOIS, France, www.ecoledubois.com
FORESTRY & FOREST PRODUCTS RESEARCH INSTITUTE, Japan, www.ffpri.affrc.go.jp
FP INNOVATIONS, Canada, www.fpinnovations.ca
FRAUNHOFER-INSTITUTE OF WOOD RESEARCH, Germany, www.wki.fraunhofer.de
HOLZFORSCHUNG MÜNCHEN, Germany, www.holz.wzw.tum.de
RISE - RESEARCH INSTITUTES OF SWEDEN, Sweden, www.ri.se/en
INTERNATIONAL CENTRE OF BAMBOO AND RATTAN, China, www.icbr.ac.cn/en
INTERNATIONAL WOOD CULTURE SOCIETY, USA, www.iwcs.com
KYOTO UNIVERSITY, Japan, www.rish.kyoto-u.ac.jp
MISSISSIPPI STATE UNIVERSITY, USA, www.cfr.msstate.edu/forestp
OREGON STATE UNIVERSITY, USA, www.woodscience.oregonstate.edu
SCION, New Zealand, www.scionresearch.com
SEOUL NATIONAL UNIVERSITY, Republic of Korea www.adhesion.org
STATE UNIVERSITY OF NEW YORK, USA, www.fla.esf.edu
TECHNICAL UNIVERSITY in ZVOLEN, Slovakia, www.tuzvo.sk/en
THÜNEN INSTITUTE, Germany, <https://www.thuenen.de/new/>
UNIVERSITE LAVAL, Canada, www.xylo.sbf.ulaval.ca
UNIVERSITY OF GÖTTINGEN, Germany, www.holz.uni-goettingen.de
UNIVERSITY OF MINNESOTA, USA, www.bbe.umn.edu
US FOREST PRODUCTS LABORATORY, USA, www.fpl.fs.fed.us
VIETNAM NATIONAL UNIVERSITY OF FORESTRY, Vietnam, www.vfu.edu.vn
WOOD TECHNOLOGY INSTITUTE, Poland, www.itd.poznan.pl

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Marcus Wallenberg Prize

Cross-laminated timber, CLT, explains the expansion of multi-storey wood buildings in the world. Gerhard Schickhofer is awarded the 2019 Marcus Wallenberg Prize for research and knowledge transfer behind the stable and eco-friendly material.

Professor Gerhard Schickhofer, the Institute of Timber Engineering and Wood Technology at Graz University of Technology, Austria, has laid the scientific and technological foundation for the development of cross-laminated timber, CLT. For his discoveries he is awarded the 2019 Marcus Wallenberg Prize of SEK 2 million.

Cross-laminated timber, CLT, consists of several layers of solid wood laminations glued together crosswise measuring a length of up to 20 metres, a width of four meters and a thickness desired for every purpose. The elements are stable and load-bearing. They are also easy to process, shape and even curve using modern manufacturing technologies. All these qualities have made wooden skyscrapers possible.

Many projects around the world are competing to construct the world's tallest buildings in wood. Brock Commons, an 18-storey student residence in Vancouver, Canada, has kept the lead after being completed in 2017.

It was however recently reported that the first tenants will move in to HoHo tower in Vienna, Austria, in June 2019. The 24 floors will house apartments, offices and a hotel, a restaurant and a gym. Even higher so called plyscrapers have been proposed in several countries. The 80-storey River Beech Tower in Chicago, USA, is among the tallest.

Gerhard Schickhofer and his research team have played a leading role in establishing European standards and Technical Approvals for CLT production and use in industrial applications of wood construction.



CLT has radically transformed the view on construction and design in the wood building industry. Its orthogonal, laminar structure allows applications as full-size walls and floor elements as well as linear timber elements able to bear heavy loads.

Prefabrication of different modules at the factory makes the assembly time on the building site shorter.

Conifers such as spruce, larch or pine, but also deciduous species such as birch, ash and beech, can be used in the engineered panels. Since the layers of solid wood are glued together longitudinally and transversely the elements are less affected by changes in dimension due to humidity fluctuation.

Buildings made of CLT are characterised by slender wall constructions and high loadbearing capacity. They provide excellent performance with regards to fire safety and impact of earthquakes. CLT is, like solid wood, a sustainable and renewable material. It preserves the environment due to its ability to store carbon dioxide and substitutes for example concrete and steel as a building material – both resulting in large carbon dioxide emissions when produced.

The Prize Selection Committee of the Marcus Wallenberg Foundation states in its motivation that Gerhard Schickhofer has made scientific and engineering contributions required to standardize the development of CLT and enable its adoption as a building material. He has also succeeded in transferring scientific knowledge to practical applications. His user-friendly software tools and handbooks have had a great influence in the field.

The Institute of Timber Engineering and Wood Technology and the Competence Centre at the University of Technology in Graz also stand out by their application-oriented research. Both organisations provide the industry with technical support, testing and training. Gerhard Schickhofer's passion and commitment to the field of CLT have played a key role in raising the profile of wood for the construction of massive and tall structures. His work has been seminal in interpreting the technological opportunities of CLT to architects and designers, says professor Johanna Buchert, chairperson of the Selection Committee.

The 2019 Marcus Wallenberg Prize will be presented by HM the King of Sweden to Gerhard Schickhofer at a ceremony in Stockholm in October this year.

Gerhard Schickhofer was born in Vorau in Austria in 1962. In 1994 he presented his PhD thesis on "Starrer und nachgiebiger Verbund bei geschichteten, flächenhaften Holzstrukturen" at Graz University of Technology. For this work he received in 1995 the Josef-Umdasch Award from an international group of wood and metal businesses based in Austria. A scientific compilation of his work was published in 1996 with the title "Elastic Analysis of Flexibly Jointed Laminated Timber Plates". He received the Austrian Industrial Research Promotion Fund award in 1998 for his work on the first Austrian approval of CLT. Due to his contributions the first national guideline on CLT, the so-called Holzmassivbauweise, was published in 2002 and led to the acceptance of the engineered elements in multi-storey buildings. Gerhard Schickhofer was appointed Professor and Head of the Institute of Timber Engineering and Wood Technology at Graz University of Technology in 2004. Together with Reinhard Brandner he recently summarised the contributions of the Graz group in the publication "Cross laminated timber, CLT: Overview and development".

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

2019 PhD Award - First place, Dr Jinze Dou, Aalto University

Fractionation of willow bark for combined production of extracts and fiber bundles

Applicant: Jinze Dou **Date of Defense:** 3rd December 2018

Thesis advisor: Professor Tapani Vuorinen, Aalto University, Finland

Opponent: Professor Dimitris Argyropoulos, North Carolina State University, United States

Department of Bioproducts and Biosystems, Aalto University

Abstract

This study investigates the coproduction of willow bark sclerenchyma fiber bundles and extracts in order to increase the potential added-value from short-rotation willow biomass. Willow is a fast growing biomass source that is grown mainly for heat and power generation, especially in the Northern Hemisphere on marginal lands. On afforested peatland, willow can be grown to prevent erosion and to remove excess nutrients from the soil. A few sporadic studies investigating useful bioactive phenolic compounds from willow bark have been conducted, but burning bark for energy purposes is prevalent.

The novel introduced biorefinery concept aims to use 1) the bark fraction for the production of fibers and extractives and 2) the wood fraction is hydrolyzed for sugars and lignin recovered for the chemical industry. The morphology and chemical constitution of the inner bark is characterized as the first step towards complete willow valorization. The distinguishing features of inner bark are its high ash and extractive content and bundles of relatively long and thick-walled sclerenchyma fibers. We discovered that picein, triandrin and catechin could be extracted at an approximate 14% overall yield rate from bark by hot water (20 min at 80 °C). 2D-HSQC NMR spectroscopy and wet chemical analyses demonstrate that guaiacyl is the predominant unit in bark lignin over syringyl and *p*-hydroxyphenyl. Therefore, the bark lignin structure is the key for developing a novel strategy for separating fiber bundles by judiciously using a mild alkali treatment, followed by fabrication of a composite from the fiber bundle layer and polylactic acid (PLA). Effective routes for separating such fiber bundles require a much lower amount of energy and chemicals than does the separation of individual fibers by conventional methods. Moreover, the fiber bundles exhibited the best compatibility (fiber surface lignin up to 40%) with the matrix PLA compared to other reinforcements. This strategy expands novel composite applications of bark fiber bundles, indicating considerable promise for utilizing this otherwise burned bark material. Additionally, bark lignocellulose nanofibrils exhibit higher hydrophobic properties, and its films display higher tensile strength in comparison with wood, which again provides another example of the superior properties of the bark compared to the wood. This thesis carried out a general, integrative study regarding the morphological structural and chemical characterization of bark and wood, their fractionation, as well as a review of the literature in order to achieve full utilization of fibers and extractives from bark. Gaps in our current knowledge and potentially interesting research approaches are identified and discussed.

Thesis outcomes

J. Dou, L. Galvis, U. Holopainen-Mantila, M. Reza, T. Tamminen and T. Vuorinen, Morphology and overall chemical characterization of Willow (*Salix* sp.) inner bark and wood: Toward controlled deconstruction of Willow Biomass. *ACS Sustainable Chem. Eng.* **2016**, *4*, 3871–3876. DOI: 10.1021/acssuschemeng.6b00641.

L. Chen, **J. Dou**, Q. Ma, N. Li, R. Wu, H. Bian, D. J. Yelle, T. Vuorinen, S. Fu, X. Pan and J.Y. Zhu. Rapid and near-complete dissolution of wood lignin at $\leq 80^\circ\text{C}$ by a recyclable acid hydrotrope. *Sci. Adv.* **2017**, *3*, e1701735. DOI: 10.1126/sciadv.1701735.

T. Pääkkönen, R. Pönni, **J. Dou**, M. Nuopponen and T. Vuorinen. Activation of TEMPO by ClO₂ for oxidation of cellulose by hypochlorite – Fundamental and practical aspects of the catalytic system. *Carbohydr Polym.* **2017**, *174*, 524–530. DOI: 10.1016/j.carbpol.2017.06.117.

J. Dou, W. Xu, J. J. Koivisto, J. K. Mobley, D. Padmakshan, M. Kögler, C. Xu, S. Willför, J. Ralph and T. Vuorinen. Characteristics of hot water extracts from the bark of cultivated willow (*Salix* sp.), *ACS Sustainable Chem. Eng.* **2018**, *6*, 5566–5573. DOI: 10.1021/acssuschemeng.8b00498.

J. Dou, H. Kim, Y. Li, D. Padmakshan, F. Yue, J. Ralph and T. Vuorinen. Structural characterization of lignins from willow bark and wood. *J. Agric. Food Chem.* **2018**, *66*, 7294–7300. DOI: 10.1021/acs.jafc.8b02014.

J. Buffiere, N. A. Fernandez, P. Ahvenainen, **J. Dou**, M. J. Cocero, and H. Sixta. Tailoring the structure and morphology of low-molecular-weight cellulose produced during supercritical water hydrolysis. *ACS Sustainable Chem. Eng.* **2018**, *6*, 16959–16967. DOI: 10.1021/acssuschemeng.8b04296.

J. Dou, H. Bian, D. J. Yelle, M. Ago, K. Vajanto, T. Vuorinen and J. Zhu. Lignin containing cellulose nanofibril production from willow bark at 80 °C using a highly recyclable acid hydrotrope. *Ind. Crops Prod.* **2018**, *129*, 15–23. DOI: 10.1016/j.indcrop.2018.11.033.

J. Dou, J. Paltakari, L.-S. Johansson and T. Vuorinen. Novel insight into the separation and composite utilization of sclerenchyma fiber bundles of Willow bark. *ACS Sustainable Chem. Eng.* **2019**, *7*, 2964–2970. DOI: 10.1021/acssuschemeng.8b04001.



Photograph of Jinze Dou holding willow bark
(Image source: Markus Jokela / Helsingin Sanomat)

Background Information

Willow (*Salix* sp.) has been studied mainly as an energy crop for combined heat and power generation but also for liquid fuel production. The benefits of willow plantations include high productivity and ability to grow on marginal land areas. It can also be cultivated on peatlands where it largely prevents nutrient flow to water after peat harvesting. Several willow species and hybrids can be grown in Finland and new hybrids can be developed in order to improve the growth rate much in the same way as for eucalyptus in Brazil. The total forestry land area in Finland is 26 million ha of which 6 million ha is of low productivity (< 1.0 m³/ha/a or 0.38 dry ton/ha/a). The willow growth on forestry land of low productivity can be up to 20 times (6 - 8 dry tons/ha/a) higher than the growth of natural forests on similar land. Forest industry uses debarked wood for production of timber, veneer and pulp while the bark is used for heat and power generation. Some studies on possible alternative uses of bark have been conducted but the burning of bark is hardly questioned.

Back to 2014, Aalto University and VTT (Technical Research Centre of Finland) together launched a short-term project (1.8.2014 - 31.12.2015) on a willow biorefinery concept for valorization of willow biomass for significantly higher value than the baseline energy value. In this concept, the bark fraction is used for production of fibers and extracts while the wood fraction is hydrolyzed for sugars and the lignin is recovered as a solid residue to be used as a polymer or platform for chemicals. The products obtained were expected/shown to be of higher quality than references from traditional processes: willow bark fibers are longer and stiffer than wood fibers and the lignin is sulfur-free unlike Kraft lignin. Interestingly, the debarking actually doubled the sugar yield from willow wood in hydrolysis after steam-treatment and achieved higher ethanol production in yeast fermentation in comparison with willow material with bark, as visualized at Figure 1. [1] The biorefinery concept was envisioned to give benefits to forest owners (more efficient use of land), pulp producers (high quality fibers for special applications), sugar/ bioethanol producers (novel source of lignocellulosic sugar) and chemical manufacturers (phenolic extractives, lignin and products of them).

Figure 1. Ethanol production in yeast fermentation after 6h prehydrolysis of the willow samples, in 5 and 10 % d.m. content. [1]

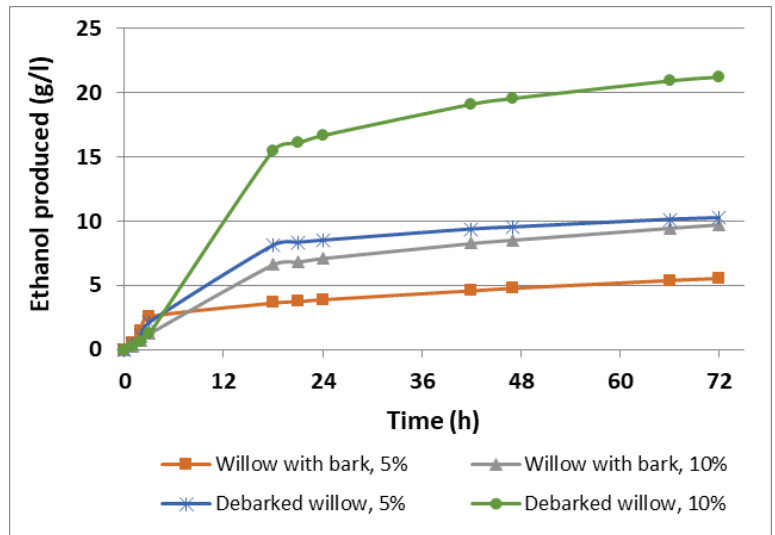


Figure 2. Photograph of a Doctoral hat made from willow bark fiber bundles. (Image source: Azovskaya Valeria/ Aalto University)

Summary of the PhD study (Long version)

This dissertation summarizes a fundamental study towards a high-value utilization of willow bark. The initial hypothesis on the potential value of the extracts and sclerenchyma fibers of the bark has been confirmed qualitatively. This suggests that the novel biorefinery approach presented could be studied as part of existing industrial utilization of willow biomass. The contribution of this dissertation is threefold. Firstly, a deeper understanding of the morphological and chemical composition of willow bark and the lignin structure was obtained. Similar comparative studies on the structure of lignin in (willow) wood, inner bark and whole bark have not been published earlier. The results are also in agreement with the literature on variation in lignin biosynthesis depending on the plant tissue. Secondly, high value extractives from the willow bark were for the first time identified solely using hot water. Although this hot water extraction was demonstrated here under mild conditions (< 100 °C) with willow bark alone, similar extraction under mild conditions could possibly be applied for extracting the bark of industrially more widely used wood species. Currently, the debarking waters may form rather a problem with their dissolved organic matter than an additional source of income. Therefore, the isolation of the valuable bioactive or phenolic compounds from aqueous extracts of bark could potentially provide additional revenues to the forest industry. Thirdly, this thesis reports on unconventional strategies for separating fiber bundles or lignin containing fibrils from willow bark. The hydrophobicity of these fibers and fibrils make them compatible with polymers, such as polylactic acid (PLA), and suitable for reinforcing them in composites. Moreover, this work visualizes the different fractions from bark, especially the fiber bundles, in a way that encourages others to invent new uses for the bark that is otherwise underused as a source of energy only. It should also be emphasized that debarking of willow may reduce the recalcitrance of the biomass and make the conversion of the woody part easier for production of ethanol, for example. Fructose present in the bark is easily converted into hydroxymethylfurfural which then condenses with the phenolic components of the biomass forming recalcitrant substances, as shown in this thesis.

The highlights from this dissertation are highly informative and show considerable promise. It has been shown that the significant features of willow inner bark are the high content of extractives, up to one fourth of the dry mass, and the presence of long and stiff sclerenchyma fibers and their bundles (ca. 40% on dry mass). [2] Hot water extracts are easy to separate from willow bark under mild conditions, e.g. with a 20 min treatment at 80 °C, and the extracts may contain only few main components. For the willow hybrid studied in this thesis, picein, triandrin and catechin formed the majority of the extract with an overall yield of up to 14%. [3]

The 2D-HSQC NMR and the wet chemical analyses demonstrated that guaiacyl (G) as a unit in the willow bark lignin was predominant over the syringyl (S) and p-hydroxyphenyl (H) units. The monomer yields, as well as the S/G ratio, rose progressively from WB to WIB to WW, indicating the lignin may be more condensed in WB than in other tissues. [4] Therefore, the willow bark lignin structure, discussed above, is the key for developing the customized methods for the separation of the unique willow bark fibers or their bundles or fibrils for specific applications, such as automobile composites. [5] The highly recyclable acid hydrotrope used in this work, proved to be a viable alternative for production of hydrophobic cellulose nanofibrils in a single step from the biomass into the product. [6]

The completion of this project opens the door for producing a variety of high-quality and high-value materials and chemicals (extractive-derived chemical compounds or intermediates) from willow bark. In combination with the efficient use of debarked willow wood, willow bark has the potential to enhance the overall value of the production.

Figure 3. Photograph of the wool scarf dyed with willow bark hot water extracts. (Image source: Azovskaya Valeria/ Aalto University)



In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

2019 PhD Award - Second place,

Dr Qiliang Fu, KTH Royal Institute of Technology

Wood Nanotechnologies for Transparency, Fire Retardancy and Liquid Separation

Applicant: Qiliang Fu **Date of Defense:** 7th March 2018

Thesis advisor: Professor Lars Berglund, KTH Royal Institute of Technology, Sweden

Opponent: Professor Hiroyuki Yano, Kyoto University, Japan

School of Engineering Sciences in Chemistry, Biotechnology and Health, KTH Royal Institute of Technology

Abstract

In this thesis, wood nanotechnologies for transparent, fire-retardant and hydrophobic/lipophilic wood have been developed. There are two main parts; wood template preparation/processing concepts and materials design using these templates.

In the wood template processing part, highly porous nanostructured wood templates are prepared. Relationships between processes and material structures are studied. Three chemical treatment methods are used. Lignin and/or chromophores are removed from the cell wall so that nanoscale pores are formed in the cell wall. For preparation of transparent wood, a lignin-retaining method improves physical properties of the template. The pore structures are characterized by scanning electron microscopy and gas adsorption measurement of specific surface area. The compositions of the templates are characterized. Compared with native wood, these templates have nanoscale porosity which provides opportunity for new types of wood modification.

In the materials design part, wood nanotechnologies are used for transparent wood as well as for hydrophobic/lipophilic and fire-retardant wood. Two main strategies are used: i) nanoparticles are embedded inside the cell wall; ii) polymers are impregnated in the lumen space, and sometimes also inside the cell wall. The transparent wood is prepared by MMA monomer/oligomer impregnation of the lumen space. MMA has similar refractive index to the delignified template, so that scattering is reduced and transparent wood with favorable optical and mechanical properties is obtained. The structure and functional properties are studied. Laminated transparent plywood is designed to modify mechanical properties. Transparent wood and transparent plywood are demonstrated in applications combining loading-bearing properties with optical performance such as luminescent properties.

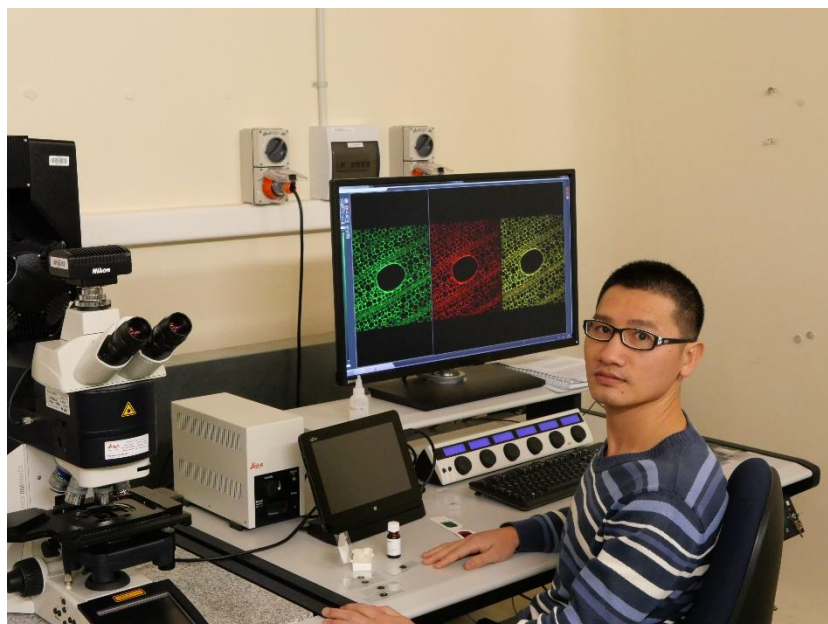
The highly porous wood template cell walls are also impregnated with colloidal montmorillonite clay or epoxy/amine solutions to modify the cell wall and form nanostructured biocomposites. The structure and properties of the two materials are investigated; wood/clay hybrids for flame-retardancy and wood/epoxy biocomposites for oil/water separation.

Outcomes: (*' co-first author)

1. Qiliang Fu. (2018) Wood Nanotechnologies for Transparency, Fire Retardancy and Liquid Separation. Ph.D Thesis, KTH Royal Institute of Technology, Sweden. ISBN 978-91-7729-671-3
2. Qiliang Fu, Min Yan, Erik Jungstedt, Xuan Yang, Yuanyuan Li, and Lars A. Berglund. Transparent plywood as a Load-bearing and luminescent biocomposite. *Composites Science and Technology*, 2018, 164, 296-303.
3. Qiliang Fu, Farhan Ansari, Qi Zhou, and Lars A. Berglund. Wood nanotechnology for strong, mesoporous, and hydrophobic biocomposites for selective separation of oil/water mixtures. *ACS Nano*, 2018, 12(3), 2222-2230.
4. Yuanyuan Li, Xuan Yang, Qiliang Fu, Ramiro Rojas, Min Yan, Lars Berglund. Towards centimeter thick transparent wood through interface manipulation. *Journal of Materials Chemistry A*, 2018, 6(3), 1094-1101.
5. Yuanyuan Li*, Qiliang Fu*, Xuan Yang*, and Lars A. Berglund. Transparent wood for functional and structural applications. *Philosophical Transactions of The Royal Society A*, 2018, 376 (2112), 20170182.
6. Qiliang Fu, Lilian Medina, Yuanyuan Li, Federico Carosio, Alireza Hajian, and Lars A. Berglund. Nanostructured wood hybrids for fire retardancy prepared by clay impregnation into the cell wall. *ACS Applied Materials & Interfaces*, 2017, 9(41), 36154-36163. (Cover Paper)
7. Yuanyuan Li, Qiliang Fu, Ramiro Rojas, Min Yan, Martin Lawoko, and Lars A. Berglund. Lignin-retaining transparent wood. *ChemSusChem*, 2017, 10(17), 3445-3451.
8. Yuanyuan Li*, Qiliang Fu*, Shun Yu, Min Yan, and Lars A. Berglund. Optically transparent wood from a nanoporous cellulosic template: combining functional and structural performance. *Biomacromolecules*, 2016, 17(4): 1358-1364. (The pioneer work of transparent wood).

Background

The term “chemical modification of wood” started to be used at this time. Chemical modification of wood is usually defined as involving covalent bonds between chemical groups in the modification agent and some reactive part of the cell wall components. To achieve this, wood cell wall swelling is desirable. However, swelling and bulking of cell walls is limited by the low porosity of the cell wall, requiring for miscibility between the modification agent and the cell wall, and chemical solution permeation. If we could increase the porosity of cell wall and change the chemistry of wood cell wall, we could make a new bioarchitecture of wood-based composites with novel functionalities other than what nature gives. This ambition goes further than to just reduce problems with moisture sensitivity, but also looks for new wood material functionalities. In this thesis, “wood nanotechnology” is applied to design functional materials based on wood, using its hierarchical structure to achieve specific property combinations.



Summary of the thesis

The present thesis investigates the preparation of delignified or bleached wood templates and nanostructural functionalization of wood. Various delignification approaches are carried out, and results for cell wall structures are investigated in terms of the size and distribution of the resulting nano- and microscale porosity, as well as the specific surface area. These templates offer hierarchical porosity with microscale lumen channels combined with nanoscale cell wall porosity, where the solid material is dominated by nanocellulose fibrils. This is of great interest as a scaffold for biobased materials providing new functionalities.

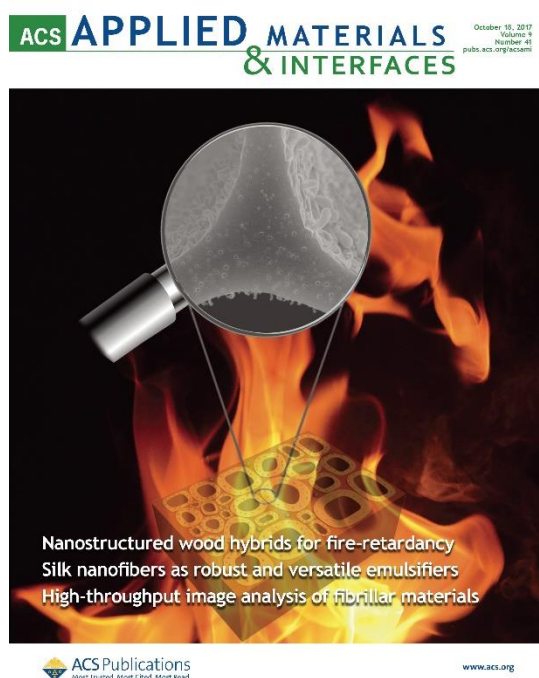


Figure 1. Nanostructured wood hybrids with fire-retardancy.

Delignified and nanoporous templates were soaked in hydrocolloidal nanoclay suspensions. This resulted in inorganic hybrid wood structures of improved fire retardancy (Fig. 1). [6] It was verified that after treatment, clay nanoparticles were present in the cell wall of delignified templates. This methodology opens a route for nanoparticle modified wood hybrids with fire-retardancy.

Delignified templates were also used to prepare hydrophobic/oleophilic wood/epoxy biocomposites for separation of oil/water mixtures (Fig. 2). [2] A procedure was developed where epoxy precursors were successfully impregnated into the cell wall and cured, and the epoxy location was verified.

Optically transparent wood for engineering purposes was prepared by impregnating wood template pore space with MMA monomer/oligomers resulting in high transparency and optical haze (Fig. 3). [4,5,7,8] The material was analysed as a composite and synergy effects were revealed, so that the composite showed better properties than both the porous wood template and the PMMA. In order to obtain more isotropic optical and mechanical properties, a plywood approach was developed as a means to tailor composite properties. [3]

Chemical bleaching to remove chromophoric substances can also be used for transparent wood preparation. The advantage is that the mechanical stability of the template is improved compared with delignification approaches. Compared with alternative transparent materials, such as glass, the present material is more ductile with much higher work of fracture.

Wood nanotechnology for nanoscale modification is in its infancy. Transparent wood, fire retardant wood and wood for liquid separation purposes are examples of potential applications of wood modified at molecular and nanostructural scale. Mechanical performance, liquid transport properties and large-scale potential can still be retained as new functionalities are added. This also points to a need for improved characterization methods for nanostructural details in the new types of modified wood presented in the present thesis.

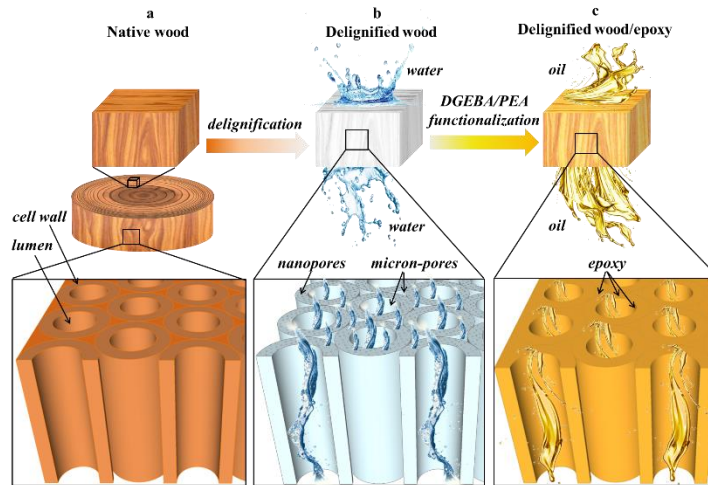


Figure 2. Wood/epoxy composite for liquid separation.

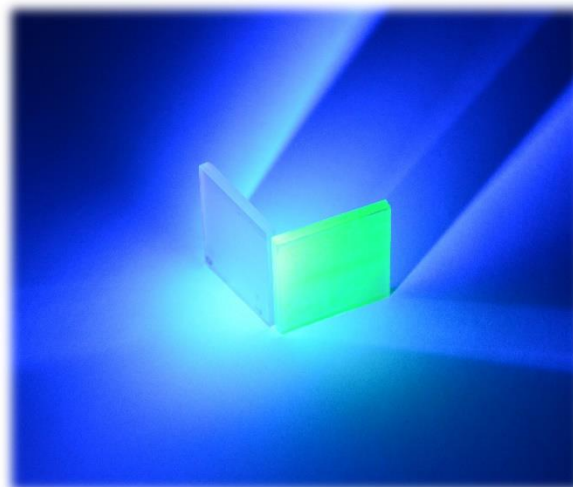


Figure 3. Transparent wood.

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Academy Lecture

Prof. Dr Alfred Teischinger

2019 World Wood Day Symposium & The 2nd IUFRO Forest Products Culture Research Group Colloquium. Open Air Museum Stübing, Austria

“Wood Technology in the Course of Time”

The word Technology is transliterated from the two Greek words “téchne” (art, skill, cunning of hand) and “logos” (the utterance by which inward thought is expressed). It comprises the scientific and practical collection and application of techniques, skills, methods, and processes used in the production of goods or services and the accomplishment of objectives in general. Technology can be seen as the knowledge of techniques, processes, and literally it is somewhat to be embedded in machines to allow for operation without detailed knowledge of their workings.

A survey of the beginning of a structured and natural science-based wood technology to the current state of the art is provided, highlighting some selected technologies. The basic principles of wood utilization applying different technologies such as disintegration of the material, classifying and grading, modifying and engineered re-assembling are addressed. The main emphasis is put on the reduction of the natural variability of the raw material wood and the transformation into an economically viable and reliable material and the various products made thereof.

It can be shown, that technology development and technology maturity is a matter of time, and, as a general rule, it takes about 15 years from the basis invention to an industrial application.

Currently, technology development occurs at all main routes of wood processing (e.g. mechanical processing and chemical processing) at all length scales of the material wood. Nano- and micro fibrillated cellulose as a potential high-performance material of the future has hypes in research and technology development as well as mass-timber construction, where there is a race for the highest wooden building. The key-driving forces for technology development can be seen within the sector but also in competition to other industrial and technology sectors. It is necessary, that technologies from outside such as information technology, high-performance material technology is transferred to the wood sector. Wood technology has always been a bit behind the common development of the application of modern techniques, but currently it seems, that wood technology can take over a leading part in some specific applications. “Green technology” has become a buzzword, but modern wood technology has become a major part and role model in the utilization of renewable materials.

In any case, modern technology development is strongly based on scientific knowledge, new findings in research, outstanding ideas in development. This needs a technologically literate community, which is based on a proper education system.



In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

World Wood Day 2019 held in Stübing-Graz, Austria March 19-24, 2019

Howard Rosen
Chairman, WWD Foundation

The 7th Annual World Wood Day celebration was held in Stübing, Austria March 19-24, 2019. This exceptional and extensive event is held in a different part of the world each year to raise awareness on the key role wood plays in a sustainable world through biodiversity and forest conservation, as well as to explore the value and usage of wood from a cultural perspective. This year's theme was "change" which emphasized the need for awareness to make changes for an eco-friendly and sustainable future. Two highlights were unique to this year's celebration which included 600 participants from 90 countries or regions of the world; first, the venue itself and second, the technical symposium.

The Austrian Open Air Museum at Stübing has almost 100 original farm buildings from across Austria that tell the story of the farming population in earlier days. Methods of harvesting and wood working from earlier days are seen all around the Museum, as demonstrated by horses used for logging. Along the nearly one and half mile path through the Museum, our World Wood Day programs of wood turning, wood carving, wood design, young adult furniture making, folk art, musical performances, and a photo contest were interspersed so that the nearly 10,000 visitors were able to easily interact with the artisans and musicians. Also during the celebration an historic wooden mill for grinding grain with a horizontal waterwheel was built with historical tools and techniques from 250-300 years ago.

The technical symposium, which was held over 3 days with 9 sessions and 52 talks was accomplished with international cooperation from the International Academy of Wood Science (IAWS), International Academy of Wood Anatomists (IAWA), International Union of Forest Research Organizations (IUFRO), and World Wood Day Foundation (WWDF). Also, several significant awards were presented or announced during the symposium. Gerd Wegener from the Technical University of Munich, Germany was presented the IAWS Distinguished Service Award in recognition of an individual who has contributed distinguished service to any aspect of the broad field of wood science. Alfred Teischinger, University of Natural Resources and Life Sciences, Vienna (BOKU) delivered the Academy Lecture for distinguished achievements in the science of wood. Finally, Gerhard Schickhofer from the Institute of Timber Engineering and Wood Technology at Graz University of Technology, Austria was awarded the prestigious Marcus Wallenburg prize for his scientific research that has established the scientific and technological foundation for the development of cross-laminated timber (CLT). The award will be presented in Sweden in October of 2019.

More details and pictures from these meetings and tours can be found at the World Wood Day 2019 websites <http://www.worldwoodday.org/2019/> and <https://www.facebook.com/worldwoodday>



Horses used for logging.



Path along the open-air museum.



Construction of historic wooden mill.



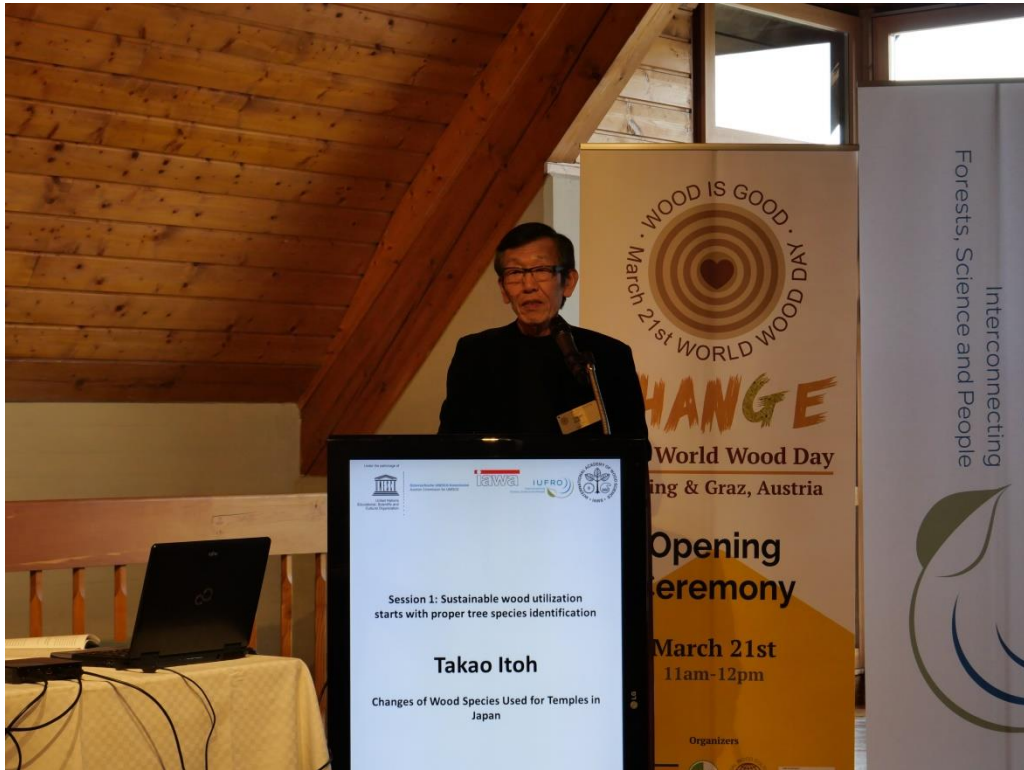


Graz looking towards Stübing in the background.



The symposium venue in Stübing.









In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Upcoming Meetings



FIRST ANNOUNCEMENT

International Symposium



«FOREST COMPLEX IN THE DIGITAL ECONOMY»,

dedicated to the 100th anniversary of the foundation of Mytishchi Branch of
Bauman Moscow State Technical University
(ex. Moscow Forest Technical Institute – Moscow State Forest University)



Mytishchi Branch of Bauman Moscow State Technical University
Mytishchi, Russia
December 2–5, 2019

Mytishchi Branch of Federal State Budgetary Educational Institution of Higher Education «Bauman Moscow State Technical University» (National Research University), The Regional Coordinating Council of Wood Science (RCCWS), International Academy of Wood Science (IAWS) organize International Symposium «FOREST COMPLEX IN THE DIGITAL ECONOMY», dedicated to the 100th anniversary of the foundation of Mytishchi Branch of Bauman Moscow State Technical University (ex. Moscow Forest Technical Institute – Moscow State Forest University) from 2 to 5 December, 2019 at Mytishchi Branch of Bauman Moscow State Technical University. In the framework of the symposium an Annual Meeting of the IAWS Executive Committee and an annual session of the Regional Coordinating Council of Wood Science (RCCWS) will be held.

PROGRAM COMMITTEE

Sanaev Victor G., Fellow of IAWS, Prof., Dr., Director of Mytishchi Branch of Bauman Moscow State Technical University, Mytishchi, Russia (chairman)

Oblivin Alexander N., academician of RAES and International Academy of Science of Higher Education (IASHE), Prof., Dr., advisor of BMSTU rector, Former rector of Moscow Forest Technical Institute – Moscow State Forest University, Mytishchi, Russia (co-chairman)

Vaganov Eugene A., academician of RAS, Prof., Dr., scientific supervisor of Siberian Federal University, Krasnoyarsk, Russia

Lukina Natalia V., academician of RAS, Dr., Director of Center for Forest Ecology and Productivity of the Russian Academy of Sciences (CFEP RAS), Moscow, Russia

Onuchin Alexander A., Prof., Dr., Director of Sukachev Institute of Forest SB RAS, Federal Research Center «Krasnoyarsk Science Center SB RAS», Krasnoyarsk, Russia

Loskutov Sergei R., Prof., Dr., Fellow of IAWS, Head of the department in Sukachev Institute of Forest SB RAS, Federal Research Center «Krasnoyarsk Science Center SB RAS», Krasnoyarsk, Russia

Chubinskiy Anatoly N., Prof., Dr., Fellow of IAWS, Saint Petersburg State Forest Technical University named after S.M. Kirov, Saint Petersburg, Russia

Klassen Nikolay V., Ass. Prof., Dr., Institute of Solid State Physics of the RAS, Chernogolovka, Russia

Evans Robert, Dr, President IAWS, Fellow Australian Academy of Technological Sciences and Engineering, Fellow Australian and New Zealand Pulp and Paper Technical Association, Honorary Fellow University of Melbourne, Director SilviScan Pty Ltd., Melbourne, Australia

Deglise Xavier, Prof., Dr., Fellow and a former President of IAWS, Member of the French Academy of Agriculture, University of Lorraine, Nancy, France

Niemz Peter., Prof., Dr., Fellow of IAWS, Swiss Federal Institute of Technology in Zurich, Switzerland

Kim Yoon Soo, Dr., Professor, Vice-President of IAWS, Former President of Chonnam National University, Gwangju, South Korea

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Rosen Howard, Dr., IAWS Treasurer, Forest Products USDA Forest Service, Washington, USA

Schmitt Uwe, Dr., Past-President of IAWS, Federal Research Institute for Rural Areas, Forestry and Fisheries, Thünen Institute of Wood Research, Hamburg, Germany

Wang Siqun, Dr., Professor, Chair Academy Board of IAWS, Executive Director of the Center for Biomass Science and Engineering, University of Tennessee, Knoxville, USA

Kasal Bohumil, Prof., Dr., Fellow of IAWS, Director of the Fraunhofer Institute for Wood Re-search, Wilhelm-Klauditz-Institute WKI, Germany

Stampfer Karl, Dr., Professor, Head of Institute of Forest Engineering, University of Natural Resources and Life Sciences, Vienna, Austria

Sedliačik Jan, Dr., Professor, Technical University in Zvolen, Slovakia

Pásztor Zoltan, Dr., Director of Innovation Center, University of Sopron, Hungary

ORGANIZING COMMITTEE

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SYMPOSIUM SECTIONS

Structure, properties and quality of wood and wood materials
Space monitoring of forest management and reforestation
Progressive technologies of logging industries
Innovative environmentally friendly technologies of wood processing industries in the digital economy
Advanced chemical technologies in the forest complex
New materials and technologies of wooden housing construction
Bioenergy as a vector of development of the digital economy
Forest resources and the global forest products market in the digital economy

SYMPOSIUM LANGUAGES

Russian, English

FORM OF PARTICIPATION

Oral presentation (Plenary and section reports)
Poster presentation

The registration forms are to be filled in and submitted to rccws.msfu@gmail.com before August 1, 2019.

SYMPOSIUM PROCEEDINGS

The Conference Proceedings will be included in the bibliographic database of Russian Science Citation Index (RSCI).

Call for abstracts

An Abstract is required for all oral and poster presentations. Abstracts are submitted to e-mail rccws.msfu@gmail.com, before September 1, 2019.

Abstracts should be arranged using MS Word editor. Abstract should not exceed 250 words, should be typed in 14 pt Times New Roman, single-spacing, 2,5 cm margins on all four sides. The title of the paper should be in capital letters. Under the title one should indicate the full names of authors and affiliations. Keywords (up to five, italic, justified, Times New Roman, 12 pt). Files should be named by the first author (e.g.: Ivanov.doc).

According to the decision of the Program Committee the best papers will be published in the journal "Forestry Bulletin", <http://les-vest.msfu.ru/eng>.

POSTER PRESENTATION GUIDELINE

Each poster will be mounted on a free standing display panel (supplied). The size of the poster should not exceed 1 sheet of A1 format (1200 mm wide by 850 mm high).

REGISTRATION FEE

The symposium participants are to pay the registration fee of 400 €. The registration fee is intended for the proceedings publication (one copy of the Symposium Proceedings for every delegate), coffee breaks, Symposium dinner, bus tour around Moscow (duration 4 hours, Red square, Kremlin, St. Basil's Cathedral, Mausoleum, Zaryadye Park, The Cathedral of Christ the Saviour), excursion to Bolshoi Theater (<https://www.bolshoi.ru/en/about/excursions/>).

The symposium fee for accompanying persons is 200 €.

The information about the payment details for paying the registration fee will be presented in the 2nd announcement. The registration fee can be paid at the Symposium desk.

ACCOMMODATION

Hotel Cosmos

<https://www.hotelcosmos.ru/eng/>

Address: 129366, Russia, Moscow, Prospect Mira, 150

Tel.: +7 (495) 234 10 00

Reservation:

Tel.: +7 (495) 234 12 06

Fax: +7 (495) 234 24 63

E-mail: reservations@hotelcosmos.ru

Art-hotel Lecco

<http://www.lecco-hotel.ru>

Address: 141021 Russia, Moscow region, Mytischki, Str. Letnaya, 32

Reception:

Tel. +7 (495) 787-8545

Fax: +7 (495) 787-7034

info@lecco-hotel.ru; reservations@lecco-hotel.ru

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E-mail:
Tel: +7 498 687 37 25
Fax: +7 495 586 94 77
Web-site:

IMPORTANT DATES:

1 st announcement	June 1, 2019
Registration form deadline acceptance	before August 1, 2019
2 nd announcement	before July 1, 2019
Proceedings deadline acceptance	before September 1, 2019



REGISTRATION FORM



International Symposium
«FOREST COMPLEX IN THE DIGITAL ECONOMY»,
dedicated to the 100th anniversary of the foundation of Mytishchi Branch
of Bauman Moscow State Technical University
(ex. Moscow Forest Technical Institute – Moscow State Forest University)

Mytishchi, Russian Federation
December 2–5, 2019

Surname, Name, Middle Name _____

Affiliation _____

Position (please, point out if you are a young scientist before 35 years old, or PhD student, student)

Scientific Degree _____

Address for correspondence with country _____

E-mail _____

Fax _____

Phone _____

Form of participation (oral / poster presentation) _____

Title of presentation _____

Symposium section _____

Authors _____

Presenter/Reporter _____

Arrival date _____

Departure date _____

Excursion around Moscow (yes/no) _____

Excursions to Bolshoi Theater (yes/no) _____

I guarantee payment of the registration fee _____

« ____ » _____ 2019

Upcoming Meetings



XXV IUFRO World Congress 2019

"Forest Research and Cooperation for Sustainable Development"

Curitiba, Brazil; 29 September - 5 October 2019

Congress website:

Twitter:

Facebook:

XXV IUFRO WORLD CONGRESS - CALL FOR ABSTRACTS - DEADLINE EXTENDED

Forest Scientists, Colleagues,

We are pleased to inform you that the **Deadline for Abstracts** for the XXV IUFRO Congress in Curitiba, Brazil, 29 September – 5 October 2019, **has been extended to Thursday, 10 January, 2019!**

Abstracts may address any aspect of forest research, but preference will be given to abstracts addressing one of the Congress technical sessions. Abstracts not associated with a technical session may be assigned to a general poster session.

In order to submit your abstract, please take the following steps, detailed at <http://iufro2019.com/abstracts-submission/>:

Consult the list of sessions at <http://iufro2019.com/technical-sessions/>;

Register for the Congress at <https://registration.galoa.com.br/en/real/iufro-2019>.

Please note that you need to register for the Congress already now, but payment for your registration may be made until 31 May 2019;

Submit your abstract at <https://app.oxfordabstracts.com/stages/792/submission> (find detailed instructions there).

Please note that abstracts may be submitted in English, Spanish or Portuguese.

Authors are limited to **a maximum of two abstracts as presenting author**. All abstracts will be reviewed for scientific rigour and relevance to Congress themes, and may be assigned to oral or poster presentations. The Congress will feature digital as well as static poster displays to ensure high visibility for poster presentations.

Abstracts will be accepted until **10 January 2019**, but authors are encouraged to submit abstracts as early as possible.

Authors will be advised if their presentation is accepted by **28 February 2019**. Early advice of abstract acceptance is possible if requested (e.g., for funding applications), but the presentation mode will not be confirmed until the end of February.

We are looking forward to receiving your excellent and numerous abstracts!

Alexander Buck

Executive Director of IUFRO

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

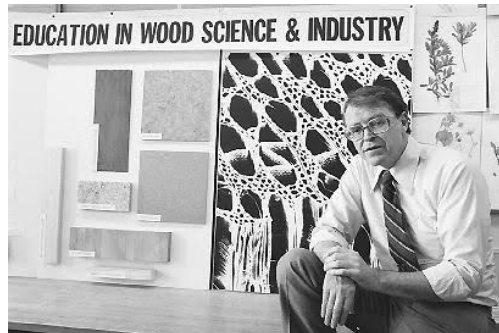
[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

In Memoriam: Prof. Robert Kennedy



It is with sadness I want to inform our Faculty community of the passing of Dr. Robert (Bob) Kennedy, UBC alumnus, professor, and former Dean of the Faculty. He passed peacefully at age 87 in the early hours of June 17, 2019, surrounded by family. Dr. Kennedy was a wood scientist who combined a university career and research in forest products and wood behaviour for industry. His association with the UBC Faculty of Forestry began following his graduation from the State University of New York, where he received his Bachelor of Science degree in 1953. While at UBC, he was awarded the degree of Master of Forestry in 1955 and served as an instructor between 1955 - 1961. After completing a PhD at Yale University (1962), Professor Kennedy was with the Faculty of Forestry at the University of Toronto from 1962 until 1966, when he returned to BC to join the federal government's Western Forest Products Laboratory (now FPInnovations), on the UBC campus, serving as director from 1975 to 1979. As the Laboratory Director, he was primarily responsible for technology transfer and client relationships. Several laboratory developments were translated to industrial use and client relations maintained through a series of industrial advisory committees. Dr. Kennedy returned to UBC Forestry in 1979 and taught wood anatomy and properties, wood chemistry, timber mechanics and microtechnique. He served as Dean of the Faculty from 1983 until his retirement in 1991. In 1971, Professor Kennedy was named a fellow of the International Academy of Wood Science. He was active in a wide range of national and international professional and forest-industry organizations, including the Forest Products Research Society, the International Union of Forest Research Organizations, the Canadian Forestry Association and the Canadian Institute of Forestry. Until his appointment as Dean of Forestry in 1983, he was one of only two members of the Faculty of Forestry who served on the UBC Senate. Dr. Kennedy also served as Vice-Chairman of the BC Forest Resources Commission and as President of the International Academy of Wood Science. After his retirement, he remained connected with the Faculty as Dean Emeritus, part of the Dean's Circle as an informal advisor to the Faculty, mentor to graduate students and a philanthropist, supporting students through the [Robert and Averil Kennedy Forestry Graduate Scholarship](#). Along with his three children and three grandchildren, he is survived by his wife, Averil who was also active in the UBC community. In lieu of flowers, Dr. Kennedy's wish was that donations be made to the Scholarship in his name. Please contact Emma Tully for more details.

Dr. John Innes
Professor and Dean,
Faculty of Forestry
University of British Columbia

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Wood Science Journal Ranking

The six journals of interest cover six subject categories with only two (*European Journal of Wood & Wood Products*, and *Wood & Fiber Science*) being directly comparable.

Table 1 displays the results of the search on the requested journal titles and their rankings within the subject area, e.g. *Holzforschung* ranks 40 out of 91 titles in the subject category, Biomaterials and 4th highest out of the titles. The highest ranking journal is *IAWA Journal*, the lowest is *Journal of Wood Science*.

Table 1

Journal	Biomaterials [91]	Forestry [159]	Industrial & Manufacturing Engineering [590]	Materials Science (misc) [630]	Plant Science [444]	RANK
<i>European Journal of Wood & Wood Products</i>		34		169		3
<i>Holzforschung</i>	40					4
<i>IAWA Journal</i>		24			106	1
<i>Journal of Wood Science</i>	50					6
<i>Wood & Fiber Science</i>		37		190		5
<i>Wood Science & Technology</i>		29	72	162	131	2

Green=Quartile 1, Yellow=Quartile 2. Square brackets indicate number of journals in that subject category.

The journal statistics (and links to their home pages) are in the accompanying spreadsheet. The latest Impact Factor details (2017) are also displayed – note that *Holzforschung* ranks the highest in that metric, with *IAWA Journal* number 2.

Journal ranking data are derived from Scimago; the Impact Factor is mainly derived from the individual journal website.

References

ScImago, (n.d.). SJR — SCImago Journal & Country Rank [Portal]. Retrieved 28/05/2019, from <http://www.scimagojr.com>

Subject area	Subject cat	Journal Title	Rank	Out of	SJR	H-index	Quartile-SJ	Ranking	%Top	Impact	Fact Website
Agricultural a Forestry		European Journal of Wood and Wood Products/	34	159	0.624	46	Q1	Q1: 034/159	21	1.401	https://link.springer.com/journal/107
Materials Sci Materials		European Journal of Wood and Wood Products/	169	630	0.624	46	Q2	Q2: 169/630	27	1.401	https://link.springer.com/journal/107
Materials Sci Biomateria		Holzforschung	40	91	0.709	63	Q2	Q2: 040/91	44	2.079	https://www.degruyter.com/view/j/hfsg
Agricultural a Forestry		IAWA Journal	24	159	0.771	43	Q1	Q1: 024/159	15	1.903	https://brill.com/view/journals/iawa/iawa-overview.xml
Agricultural a Plant Scien		IAWA Journal	106	444	0.771	43	Q1	Q1: 106/444	24	1.903	https://brill.com/view/journals/iawa/iawa-overview.xml
Materials Sci Biomateria		Journal of Wood Science	50	91	0.536	48	Q2	Q3: 50/91	55	1.413	https://woods.science.springeropen.com
Agricultural a Forestry		Wood and Fiber Science	37	159	0.556	39	Q2	Q2: 37/159	23	0.75	https://wfs.swst.org/index.php/wfs
Materials Sci Materials		Wood and Fiber Science	190	630	0.556	39	Q2	Q2: 190/630	30	0.75	https://wfs.swst.org/index.php/wfs
Agricultural a Forestry		Wood Science and Technology	29	159	0.659	59	Q1	Q1: 029/159	18	1.706	https://link.springer.com/journal/226
Engineering		Industrial - Wood Science and Technology	72	590	0.659	59	Q1	Q1: 072/590	12	1.706	https://link.springer.com/journal/226
Materials Sci Materials		Wood Science and Technology	162	630	0.659	59	Q2	Q2: 162/630	26	1.706	https://link.springer.com/journal/226
Agricultural a Plant Scien		Wood Science and Technology	131	444	0.659	59	Q2	Q2: 131/444	30	1.706	https://link.springer.com/journal/226

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Vacancy for Assistant Professor

Assistant Professor - Center for Renewable Carbon - - Full Time - Position Announcement

Assistant Professor, Center for Renewable Carbon (CRC) Overview: The Center for Renewable Carbon (CRC) is an interdisciplinary research and development unit in The University of Tennessee Institute of Agriculture. Its mission is to advance the potential for non-food biomass to create new economic activity for the state of Tennessee and the Nation. The CRC team advances the science needed to develop new technologies that enable the expanded use of forest and agricultural biomass for sustainable materials, chemicals, fuels, and energy; trains the workforce needed by advanced technology industries; and transfers research advances to our stakeholders and partners involved in building a sustainable bioeconomy. The Center comprises 10 faculty tenured in various academic departments and more than 30 staff, students, and research associates with skills in chemistry, material (wood, polymer, composites, etc.) science, biomass analytics, and statistics. More information about the CRC can be found at <https://ag.tennessee.edu/CRC/Pages/default.aspx>

Job Responsibilities: This is a full-time, 12-month, tenure-track position with a 100% research appointment. Tenure for this position will be in the appropriate academic department at UTIA based on the background and expertise of the successful candidate. The successful applicant will develop a nationally and internationally recognized research program on synthesis and characterization of novel polymer materials derived from renewable building blocks, and will identify methods to manipulate chemical structure to introduce innovative performance properties in sustainable lignocellulosic derived systems. The successful candidate is expected to acquire extramural funding to support their program, contribute to graduate student training, and publish research findings in peer-reviewed scientific journals. The candidate will advise and mentor graduate students in a diverse, multicultural and transdisciplinary program. The candidate will foster relationships and develop new opportunities for collaborative research initiatives in support of the CRC's mission.

Required Qualifications: A Ph.D. degree in chemistry, chemical engineering, material science, or closely related field is required. Communication, creative leadership, congeniality, and the ability to work cooperatively among a diverse population of students, faculty, staff, industry, and agency groups are essential in our Center and University.

Preferred Qualifications: 1. Relevant postdoctoral experience. 2. Experience in outreach and understanding of the Land Grant mission. Application: Interested candidates should send a letter of application, a curriculum vitae including research publications and grant experience, a statement of research, names and contact information (including email address) of at least three professional references, and an official transcript showing PhD degree to: Nicole (Niki) Labbé, Search Chair Professor Center for Renewable Carbon 2506 Jacob Drive Knoxville, TN 37996-4570 nlabbe@utk.edu Inquiries about the position should be directed to Lyssa McKenry at lmckenry@utk.edu We will begin reviewing applications on June 1, 2019, but the position will remain open until filled.

All qualified applicants will receive equal consideration for employment and admissions without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, gender identity, age, physical or mental disability, or covered veteran status. Eligibility and other terms and conditions of employment benefits at The University of Tennessee are governed by laws and regulations of the State of Tennessee, and this non-discrimination statement is intended to be consistent with those laws and regulations. In accordance with the requirements of Title VI of the Civil Rights Act of

1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990, The University of Tennessee affirmatively states that it does not discriminate on the basis of race, sex, or disability in its education programs and activities, and this policy extends to employment by the University. Inquiries and charges of violation of Title VI (race, color, and national origin), Title IX (sex), Section 504 (disability), ADA (disability), Age Discrimination in Employment Act (age), sexual orientation, or veteran status should be directed to the Office of Equity and Diversity (OED), 1840 Melrose Avenue, Knoxville, TN 37996-3560, telephone (865) 974-2498. Requests for accommodation of a disability should be directed to the ADA Coordinator at the Office of Equity and Diversity.

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Guidelines for Highlights

The purpose of the Highlights, published in the Bulletin, is to promote the integration of the fields of wood science. Fellows are encouraged to submit Highlights to any of the Officers.

Highlights should:

- Be free of jargon and highly technical language and (unexplained) acronyms, and be readily understood by wood scientists in other fields
- Be no more than 1000 words (roughly 4 pages in the Bulletin)
- Begin by providing a brief background or framework to put the report in perspective
- Give due credit to the work of others in the field, not just summarize the author's work
- Contain important references to the literature for further reading
- Finish with a statement of future direction in the area

In this issue

[MESSAGE FROM THE PRESIDENT](#)

[TREASURERS REPORT](#)

[IAWS SCOUTING TEAM](#)

[MEMBERSHIP REPORT](#)

[AFFILIATE MEMBERS](#)

[MARCUS WALLENBERG PRIZE](#)

[PHD AWARDS](#)

[ACADEMY LECTURE](#)

[WORLD WOOD DAY](#)

[UPCOMING MEETINGS](#)

[OBITUARY](#)

[JOURNAL RANKINGS](#)

[JOB VACANCY](#)

[GUIDELINES FOR HIGHLIGHTS](#)

[NOMINATION PROCEDURE FOR](#)

[ELECTION OF FELLOWS](#)

Nomination for Election of Fellows

The nomination process is relatively simple; all you need to do is fill in the Nomination form and send it to me. For those to be considered in the next election, the deadline for receipt of nominations is 30 September.

I then contact the nominee, confirm their willingness to stand for election, and then have them complete the more detailed application form. The Executive Committee reviews the nominees to determine if their applications are complete, and then, in early November, submits the completed applications to the membership for ballot.

Typically, scientists who are nominated are either mid-career, showing great promise and accomplishments, or near the end of their career, when their peers feel that they have made major continuing contributions over their professional life.

There are two areas of Fellowship that are under-represented in IAWS. One is Fellows from developing countries, where the number of refereed scientific contributions, as viewed by the developing world, may be somewhat lacking because of the past or current inability to publish in the leading journals, and/or difficulty with the English language. The other area relates to the few numbers in certain scientific disciplines; if you are in one of those, you are aware of that. The Executive Committee is also interested in election of wood science managers who have had a major impact through their oversight of research activities, without necessarily having the expected number of refereed publications.

Please spend some time thinking about potential nominees, perhaps looking through the Directory and the listing of Fellows by countries. Since we do not “promote” ourselves to gain members, it is up to the Fellows in the Academy to provide the basis for this recognition.

Robert Evans

NOMINATION FORM

Nomination for Fellowship of the International Academy of Wood Science

Name of Candidate: Position of Candidate: Candidate Mailing Address:

Candidate email address (required!):

Candidate's Background (maximum 100 words):

Reasons for the candidate's nomination (outstanding in his/her field; substantial contributions to wood science; major results in management of research; etc):

Date:

Nominator name:

Email address:

Telephone:

Please return to: Robert Evans

robertxevans@gmail.com

Imprint

Editorial

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21031 Hamburg
Germany

Responsible for contents

Dr. Robert Evans - President
Dr. Lloyd Donaldson – Secretary

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