

THE WOOD-BASED COMPOSITES CENTER

In it for the Long Haul

by Linda C. Caudill

The Wood-Based Composites Center is an industry/university research consortium with a mission to advance the science and technology of wood-based composite materials. Since its founding in 1999, industry service has been the motivation, inspired by the center's industry members that provide guidance and oversight on all matters including research, student training and fiscal decisions. Besides strong industry support, the durability of the WBC is due to a stable leadership triad

composed of center directors Linda Caudill, Fred Kamke and Chip Frazier. As the Center's 20th anniversary approaches, this is the story of a member-driven, multi-university research center, with long-lasting partnerships and a reputation as a leader in research and education in wood composites.

In the Beginning

In 1998, Professor Fred Kamke convened a group of industry leaders to envision an industry/university partnership start-

ing at Virginia Tech. Kamke established the Wood-Based Composites Center on January 1, 1999, with funding from nine founding members. Kamke recruited Professor Chip Frazier to complement his research and 13-year industry veteran Linda Caudill to provide industrial perspective in her role as managing director. Kamke knew that a successful center must include multiple universities, reflecting regional interests for the North American industry. As a result, the WBC started as an industry/univer-



Image courtesy of WBC

Co-director Fred Kamke uses special microscope images to teach Wood Adhesion Short Course participants about adhesive penetration and distribution in different wood species.

Red = adhesive; Brown = wood cells

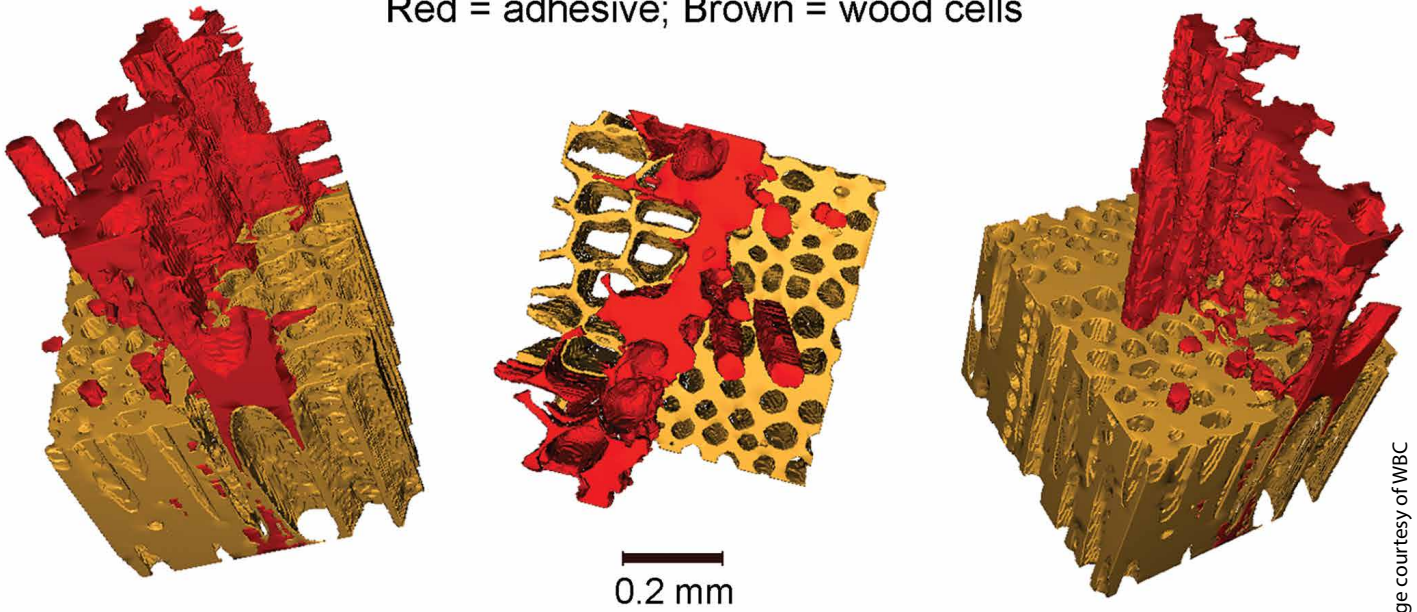


Image courtesy of WBC

WBC research often focuses on the wood-adhesive interphase, as seen in these 3D tomography reconstructions of phenol-formaldehyde adhesive in a bondline of parallel-laminated Douglas-fir.

sity consortium including Oregon State University, Mississippi State University and the University of Minnesota. Center members created a research agenda and membership fees were used to support graduate research and undergraduate scholarships.

Early on, the center members provided guidance, but not the direct control that they enjoy today. Nobody knew if the WBC would last, and Kamke directed the center through turbulent downturns, hustling to maintain industry support. Despite the challenges, a foundation was laid that enabled the WBC to survive the economic storm that was on the horizon.

In 2005, opportunity knocked, and Kamke stepped down as WBC director at VT and accepted the JELD-WEN Endowed Chair faculty position at OSU. The center members appointed VT's Chip Frazier as director, and operations continued with the Caudill/Kamke/Frazier triad intact. Under Frazier's leadership and the industry's guidance, the center reformulated its research offerings and emerged with a new academic partnership including VT, OSU, University of British Columbia and University of Maine.



Image courtesy of WBC

Virginia Tech student Niloofar Shivryari is working on a way to reveal the source of formaldehyde emissions as either biogenic (from wood) or synthetic (from adhesive).

Change on the Horizon

Then came the perfect storm, the Great Recession of 2008. WBC membership plummeted from 17 to six in just one year, and hope was in short supply. The center had to be reinvented; something new with greater industry value had to be created. Enter the U.S. National Science Foundation. Frazier, Kamke and Caudill convinced the remaining members to compete for an NSF Industry/University Cooperative Research Center grant in hopes that the federal funding and recognition would help the center survive the recession and thrive in the future.

The I/UCRC model imposed the critical missing ingredient: greater industry control. The center members had to assume ownership, creating an extension of the members' own research efforts. Likewise, the faculty had to become more responsive and more accountable to the industry.

In 2010, the NSF awarded an I/UCRC grant to VT and OSU; UBC and UM remained as subcontracted partners. The WBC steadily toiled under the new model, and as the industry value grew,

the membership rebounded. The successes cultivated by the members earned an NSF renewal for phase-two operation in 2016.

Currently, the WBC enjoys record funding, most of which is supplied by the industry. The NSF three-phase model progresses with less and less federal support, and ultimately the WBC must operate exclusively from industry funds by 2026. The academic partnership was redefined in 2016 to include VT and OSU as equal partners, and competitive

FACES OF WBC: SUDIP CHOWDHURY



WBC STATUS: Former student

JOB TITLE: Research and Development Group Leader (Fillers/Extenders)

COMPANY: Willamette Valley Company

DEGREE: PhD, Macromolecular Science and Engineering, 2011

UNIVERSITY: Virginia Tech

JOB DESCRIPTION: "(I) lead and manage projects to support the entire fillers and extender product line, primarily intended for the wood composite industry. In addition, my group also develops products for the erosion control industry, where we make binders/adhesive for water and wind erosion control products. As a chemist and group leader I am heavily involved in developing novel fillers/extenders for adhesives for wood composites."

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subcontracts are awarded to any North American university faculty willing to embrace industry service. Currently, the WBC subcontracts research at UBC, North Carolina State University, Michigan State University and Auburn University. Graduate research remains the emphasis, and undergraduate scholarships were replaced with undergraduate research. Today the WBC is an international operation with 16 members from around the globe.

Wood-Based Composite Center Members

- Arauco North America
- Arclin
- Ashland
- Boise Cascade Company
- Columbia Forest Products
- Fraunhofer WKI Institute for Wood Research
- Georgia-Pacific Chemicals
- Henkel Corporation
- Hexion
- INVISTA
- LP Building Products
- Oxiquim
- Queensland (Australia) Government
- Roseburg Forest Products Company
- Weyerhaeuser Company
- Willamette Valley Company

FACES OF WBC: JESSE PARIS



WBC STATUS: Former student

JOB TITLE: Chemist II, Fillers and Extenders Group

COMPANY: Willamette Valley Company

DEGREE: PhD, Wood Science and Materials Science, 2014; MS, Wood Science, 2010

UNIVERSITY: Oregon State University (PhD) and Virginia Tech (MS)

JOB DESCRIPTION: As an R&D chemist, Paris is involved in numerous wood-products and composites research projects including fillers and extenders for a variety of adhesive chemistries, water-based wax emulsions and even learning more about mass timber building materials. Data analysis, method development, product formulation, lab panel production and testing, customer trials, and even attending sales presentations and academic conferences are all part of his job responsibilities.



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Member Benefits

Benefits of membership include pre-competitive research, networking in a scientific forum, access to outstanding faculty from multiple universities and early access to students. Members share their research needs and industry-wide challenges; faculty translate this into project proposals for pre-competitive research. Industry advisory board members review proposals and select funded projects, often by consensus but always with a formal vote. They review progress and provide feedback to faculty and students at semi-annual meetings, and during conference calls between meetings.

“The industry members guided me to research topics I never would have selected under the federal research agenda,” says Frazier. “Topics like biogenic formaldehyde and filler effects in plywood resins. We discovered great science with technological impact – the industry guidance transformed my career.”

Examples of major research efforts include modeling the three-dimensional nature of the wood-adhesive interphase, adhesion challenges of specific wood species, how wood naturally makes formaldehyde and product durability.

FACES OF WBC: KATE BRYANT



WBC STATUS: Former student

JOB TITLE: Technical Manager

COMPANY: Weyerhaeuser

DEGREE: BS, Wood Science, 2004; MS, Forest Products, 2006

UNIVERSITY: Virginia Tech

JOB DESCRIPTION: OSB quality control and process improvement

FACES OF WBC: CHRISTA STABLES

WBC STATUS: Former student

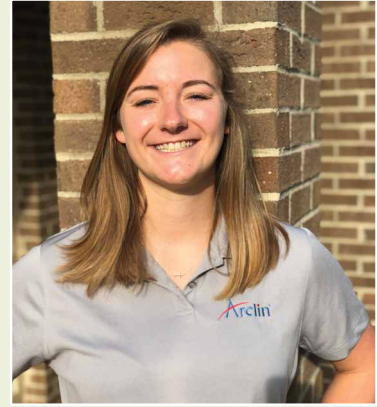
JOB TITLE: Application Technologist II

COMPANY: Arclin

DEGREE: MS, Sustainable Biomaterials, 2017

UNIVERSITY: Virginia Tech

JOB DESCRIPTION: “I work in research and technology, acting as an interface between the laboratory and the customer. I verify our resin technologies in a practical sense, by creating customer products and testing them with industry standards.”



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Industry Advancement

Members have reported positive economic impacts resulting from WBC membership. One member anonymously reported a \$10 million impact over a three-year period due to ideas generated from center research. The research is pre-competitive; the members exclude research on existing products and processes, but knowledge is generated that members can take home and use. In some cases, connection with WBC faculty leads members to private research contracts, separate from center activities, to help solve specific problems.

The WBC has offered 44 continuing education short courses since 1999. *The Wood Adhesion Short Course*, held 15 times since 2000, fills to near capacity each time it is presented. Over 1,000 individuals from 139 companies have

attended WBC short courses. A new WBC offering, focused on structural plywood and veneer-based composites, will be offered at Oregon State University in 2019. After many years in absence, this course made a come-back this year and will become part of the WBC short course portfolio under the leadership of Professor Scott Leavengood and OSU.

The WBC also sponsors the Wood-

Based Composites Online Short Course Series, which currently offers seven courses. Topics include: wood structure fundamentals, wood and water relationships, applied statistical methods, adhesion science, applied adhesive technology, wood strand composite manufacture and plywood and veneer-based composite manufacture. Each course offers approximately 10 hours of online instruction.

FACES OF WBC: ARIJIT SINHA



WBC STATUS: Former student

JOB TITLE: Associate Professor, Oregon State University

COMPANY: Oregon State University

DEGREE: PhD, Wood Science and Engineering, 2010

UNIVERSITY: Oregon State University

JOB DESCRIPTION: “(I) conduct research to increase the use of wood-based composites in the built environment by developing and characterizing new materials, evaluating existing materials under extreme exposures and recommending categorical improvements. I teach classes on sustainability of building materials and advanced wood design.”

FACES OF WBC: KYLE MIRABILE

WBC STATUS: Former student

JOB TITLE: Technical Sales Representative, OSB

COMPANY: Hexion Inc.

DEGREE: MS, Forestry and Forest Products, 2015

UNIVERSITY: Virginia Tech

JOB DESCRIPTION: “(I am the) liaison between customers, research and development chemists, manufacturing, supply chain and logistics to increase customer value by identifying current and future manufacturing needs.”



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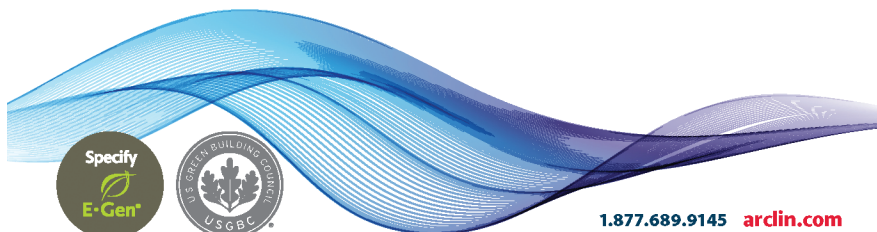


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Access to the Next Generation

For many WBC members, the most important benefit of the Center is early access to technically trained hires, who have pre-selected the wood composites industry for their careers. Graduate and undergraduate students conduct member-requested research. They gain experience and confidence presenting results to members who, in turn, provide review and critique. Students gain a huge motivational charge when a roomful of industry leaders takes interest in their research and personal development. Members get to know the students well, and many extend job offers before students complete their degrees. It's a win-win for students and members.

A founding member of the WBC, Weyerhaeuser Company finds value in the students they have hired since 2000.

“Weyerhaeuser Company continues to gain considerable value from our

FACES OF WBC: SARAH EVERETT



WBC STATUS: Summer intern

JOB TITLE: Laboratory Technician Intern

COMPANY: Ashland

DEGREE: BS, Sustainable Biomaterials; Minor in Chemistry

UNIVERSITY: Virginia Tech, 2019

JOB DESCRIPTION: “(I am) responsible for preparing samples, testing new adhesive formulations, improving test methods and exercising safe handling practices. (Also) developing and improving industrial adhesives to mitigate hazards to homeowners and firefighters by increasing the durability of building materials at high temperatures.

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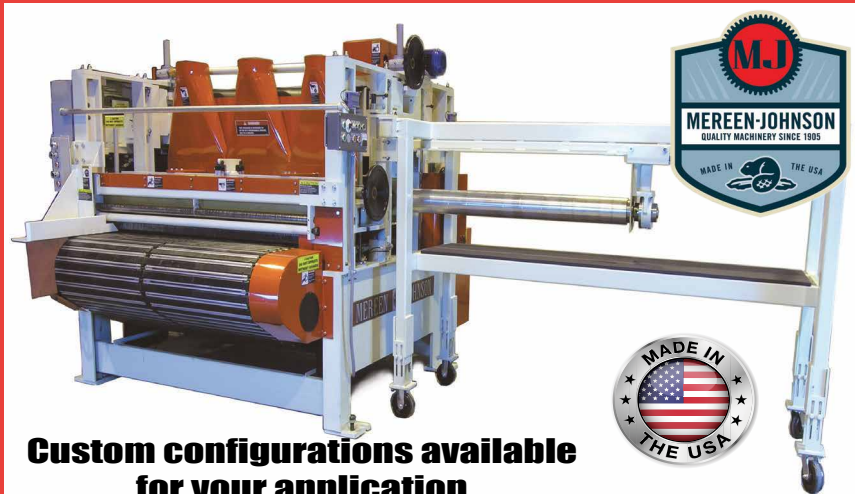
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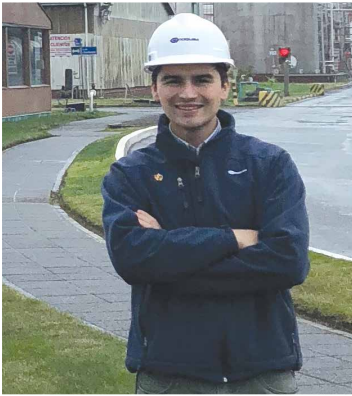
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FACES OF WBC:
LUIS FELIPE MOLINA IRRIBARRA



WBC STATUS: Former student
JOB TITLE: Technical Assistant
COMPANY: Oxiquim S.A.
DEGREE: Civil Mechanical Engineer, 2018
UNIVERSITY: University of Bío-Bío; BS Candidate, Oregon State
JOB DESCRIPTION: "My job consists of quality assurance of adhesives used as engineered wood products. This creates value for our clients through technical support and improvement in the production processes, quality and final product."

FACES OF WBC: DANNY WAY



WBC STATUS: Former student
JOB TITLE: Senior Product (EWP) Engineering Technician
COMPANY: Boise Cascade
DEGREE: PhD, Wood Science, 2018
UNIVERSITY: Oregon State University
JOB DESCRIPTION: "(I am) responsible for developing, planning, and managing engineering projects aligned with strategic business objectives."

association with the WBC," says Allan Bradshaw, vice president of engineering for the company. Weyerhaeuser has hired 11 graduates to work in mill operations and in the company's corporate technology center. "These graduates come to us with a disciplined approach to scientific inquiry and practical knowledge of our business. Their work contributes to outstanding product quality control for our customers and innovative product development that ensures our continued growth and profitability. We are proud to be associated with this exceptional

industry/academic partnership."

A member since 2014, Boise Cascade, too, seeks technically trained student recruits to replace retiring professionals.

"Through our membership in the Wood-Based Composite Center, Boise Cascade has had the opportunity to meet several participating students, hiring one in 2017 and another in 2018," says Dan Hutchinson, executive vice president, wood products, at Boise Cascade. "We have benefited from our affiliation with the WBC in both the technical and human resource arenas."



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Smaller companies see the benefit of hiring WBC students as well. Tony Vuksich, vice president, Willamette Valley Company, says the company has hired several WBC students and will continue to use the WBC to seek future talent.

“Being a member of the WBC has opened our eyes to the business value of finding young talent for the wood

products industry through exposure to well-educated students,” says Vuksich.

Likewise, past students appreciate the training they have received at the WBC, crediting the center with their success in their current careers. “The WBC gave me more opportunities than some of my colleagues, and I believe it better prepared me to enter the workforce,” says Christa

Stables, an application technologist at Arclin who graduated from Virginia Tech with a master’s degree in Sustainable Biomaterials in 2017. “I felt like I received a greater graduate school experience, as my research directly applied to the industry, and I was able to receive feedback from industry members about my results.”

Arijit Sinha received his PhD in Wood Science and Engineering at OSU in 2010 and is now a professor there, teaching classes on sustainability of building materials and advanced wood design.

“Being a WBC student is a surreal experience where you are in close contact with the industry and academic leaders,” says Sinha. “You are working on solving a problem or developing science that you know will benefit the industry at-large. WBC members are invested in your project and deeply care about your education and career.”

Support is Critical

The ability of the WBC to grow depends on support from the industry. The more members contributing to the center, the more students it can bring in to do research.

FACES OF WBC: PAIGE MCKINLEY

WBC STATUS: Former student

JOB TITLE: Quality Control Supervisor, Engineered Wood Products

COMPANY: Boise Cascade

DEGREE: MS, Wood Science and Engineering, 2016; BS, Wood Science and Forest Products, 2014

UNIVERSITY: Oregon State University (MS), Virginia Tech (BS)

JOB DESCRIPTION: “(I) lead the quality control and quality assurance department at Boise Cascade’s White City Engineered Wood Products facility, where we manufacture LVL and I-joists.”



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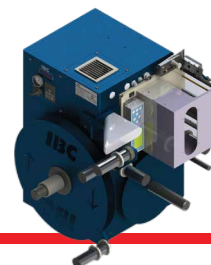


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“Young people are looking for meaningful careers where they can make a difference and meet their expectations for quality of life,” says Kamke. “Financial support for their education, and the opportunity to contribute to meaningful research, attracts students to the WBC. They will be the future industry leaders. We’ve made progress, but we need more students and more WBC members to provide financial support. This is not a single-company issue, but rather an industry-wide effort.”

The WBC is different from industry associations and government research labs because of its strong commitment to training students and providing continuing education programs. It differs from a single university offering research services to individual companies because its leaders regularly listen and respond to key industry representatives, provide a forum for debate on technical issues and leverage company financial support for the greater good of the industry.

The wood-based composites industry is vibrant, nimble and sustainable.

Nevertheless, short-term economic cycles are challenging; resource availability and prices fluctuate; environmental concerns are growing; technology is becoming more complex; other materials manufacturers are competing for markets; and young talent is needed to fill the pipeline

for an aging workforce. The WBC exists to meet these challenges. We are in it for the long haul. 

Linda C. Caudill is the managing director of the Wood-Based Composites Center. She can be reached at lcaudill@vt.edu



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