



*The Department of*

# SUSTAINABLE BIOMATERIALS

College of Natural Resources and Environment  
25  
1992  
2017  
Virginia Tech

# Hello from your Department



The college recently celebrated its 25th anniversary with a wonderful weekend of events. I was a graduate student here (1992) when the college was established, and it was interesting that most of the students were

unaware of the changes occurring at the time and the impact that it would have on the future of our college and the department. Since that time, the college has become the number one ranked program in natural resources for three years in a row. This department was established in 1979, so in just two years we will reach 40 years as an independent unit with the college and university. As with the college, our department has went through many changes over the years, but we remain one of the leading programs in North America (if not the world) in providing education, research, and learning experiences for students in the efficient management and sustainable utilization of America's most abundant, renewable natural resource. During this time, the department has grown from 4 faculty in 1979 to 19 today. We have broadened our base from traditional wood science and forest products to sustainable biomaterials and packaging science. The number of undergraduate students has grown to over 175 in the department today and for the second year in a row we have

increasing numbers of incoming freshmen. I believe this is vital for our program and our profession. We need high school students to recognize the great opportunities that exist in our discipline and by choosing us as a major, they can impact the future of our society and have great careers.

As we look to our future, the faculty developed a mission statement two years ago to help guide us through the changes occurring in our discipline. The statement clearly states why we show up for work every day and how we hope to impact students and others by our work. The statement is our guiding principle as we adjust research and courses to meet students' and society's needs.

Mission: "Create and disseminate knowledge, and prepare professionals to advance the use of natural, renewable materials and products."

I am sure our programs will continue to change to meet the challenges of the future. We do not know what this future will look like, but we do know that our natural resources will play a vital part in providing materials for new types of buildings, new energy sources, new applications for bio-resources, and help reducing the impact of a changing climate. Our department will remain a leader in these areas.

This newsletter will provide updates on what our students and faculty have been recently doing. We have a number of new graduate students and a few have left us after completion of their degrees. The department had some improvements in our graduate student offices in the loft

area this summer and updates in our classroom to be able to hold more students. Thank you for your support of our efforts and if you have any questions regarding the department, please contact me at [rsmith4@vt.edu](mailto:rsmith4@vt.edu).

## Henry Quesada and Bob Smith Visit Atlanta Hardwoods, Inc.

Drs. Henry Quesada and Bob Smith were recently hosted by Hal Mitchell, President of Atlanta Hardwoods Inc., at their White County Moulding facility in Cleveland, Georgia. Hal earned his Bachelors and Masters' degrees from the department in the late 1990s and became president of Atlanta Hardwoods last year. He has been with the company for 15 years, working himself up to the president. Atlanta Hardwoods is a large wholesale lumber manufacturing and distributor in the Eastern U.S. and regularly hires two to four interns from the department every summer. Currently, there are at least six department graduates in various management roles in the company.

The White County Moulding facility just installed a thermo-modified wood chamber to heat treat wood to improve its longevity, durability and overall performance in exterior environments. Thermo modified wood has been used in Europe for over a decade and now is entering the US market. Atlanta Hardwoods is one of the first companies in the US using this technology.

Hal said although they are still in the trial phase of the production process, it has received great reception in the market place. They have tested a number of hardwood species and some pine. The process turns most of the wood to a dark color similar to walnut.



Bob Smith, Hal Mitchell and Henry Quesada at the Thermo-modified heat treating chamber at the White County Moulding facility of Atlanta Hardwoods Inc. in Cleveland, Georgia.

COVER: Coasters made by the Society of Renewable Resources student organization for the College of Natural Resources and Environment 25th anniversary.

# Houri Sharifnia Participated in the Marshall Plan Scholarship

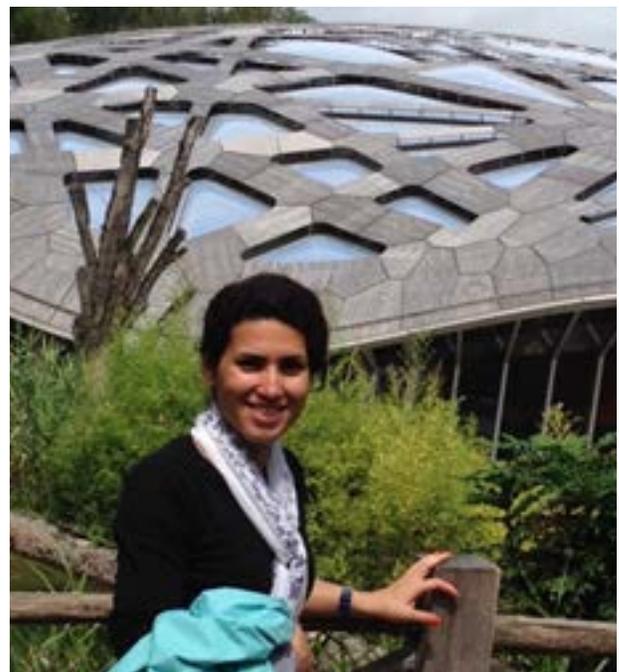


This summer I participated in the Marshall Plan scholarship research at the Salzburg University of Applied Sciences in Austria. During this time I investigated advanced

Cross Laminated Timber, CLT, technology being utilized in the European building industry; for more than a decade Austria has been the leader in CLT panel production and building construction. Working with my host university, I also visited two key CLT production facilities, the Stora Enso Company which produces CLT panels and Rothoblaas which is the world leader in CLT connection technology. I also had the opportunity to visit some of the landmark CLT structures in Europe. For example the elephant enclosure at the Zurich Zoo (see photos).

I was specially honored to represent Virginia Tech as one of six North American university students at the Schweighofer student workshop and prize ceremony (<https://www.schweighofer-prize.org/>) in Vienna. This event is recognized as the Oscars of the wood industry and I would like specially to thank the Canfor Corporation for sponsoring my attendance. ([www.canfor.com](http://www.canfor.com)).

My time in Europe allowed me to see how beneficial it is when industry and academia work together. I now look forward to completing my dissertation research in CLT connections and hope that it will inspire this important sustainable building material within the American construction industry.



# New perspective on formaldehyde emissions from wood composites

BY CHIP FRAZIER

Niloofar Shivyari is a 1st year Ph.D. student that is helping the wood-based composites industry obtain a new understanding of formaldehyde emissions from nonstructural wood composites. These are materials like particleboard, etc., used to make cabinetry and other interior home products. Formaldehyde regulations have become so stringent that natural, biogenic, formaldehyde produced by wood can impact regulation compliance. The regulations were intended to control, synthetic formaldehyde originating from the adhesive. Synthetic formaldehyde is derived from fossil fuels and it is identical to natural, biogenic formaldehyde in every way except one- the ratio of stable carbon isotopes ( $^{13}\text{C}/^{12}\text{C}$ ). Niloofar is using the stable isotope ratio to distinguish synthetic and biogenic formaldehyde, and determine how the natural, wood-derived formaldehyde impacts emissions.

Niloofar is from Iran where she obtained a B.S. in Polymer Engineering. Her first stop in the U.S. was at the University of Maine where she earned her M.S. degree in Wood Science. Now she is pursuing a Ph.D. in Macromolecular Science and Engineering with industry funding from the Wood-Based Composites Center WBC ([www.wbc.vt.edu](http://www.wbc.vt.edu)).



The WBC is a National Science Foundation Industry/University Cooperative Research Center that stimulates innovation through research funded by the industry. Professor Chip Frazier is the Director of the WBC; he and Associate Professor Brian Strahm (VT's Department of Forest Resources and Environmental Conservation) are advising Niloofar's research and mentoring her graduate education.

# Student group makes coasters for College of Natural Resources and Environment's 25th anniversary

BY OLIVIA COLEMAN

When a tree on campus came down with a deadly disease, the wood needed to be repurposed. The white oak ended up at the Thomas M. Brooks Forest Products Center one day, so the Society of Renewable Resources (SRR) made use of it.

With the 25th anniversary of the College of Natural Resources and Environment (CNRE) coming up on Sept. 15, students in the SRR began making 500 coasters in June.

The process includes cutting the wood down to the right dimensions and design, laser engraving the design on both sides of the coasters, sanding the coasters, then soaking them with a seal. Watch the video below to see how it all happens.

<https://www.youtube.com/watch?v=ZV1uHn8UjPU>

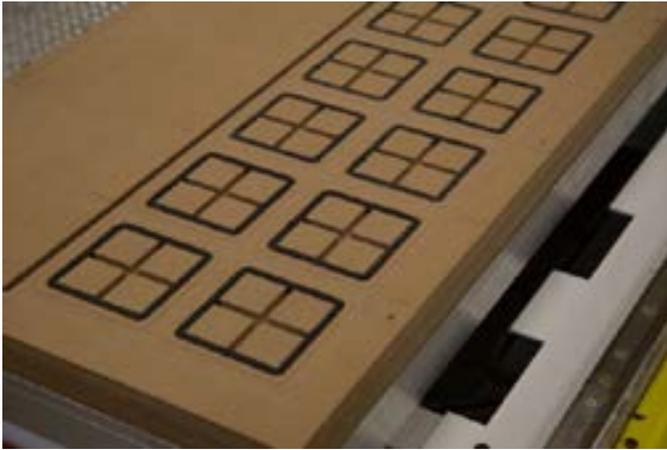
The coasters were given as gifts at CNRE's 25th anniversary celebration. SRR also sold some coasters with a modified design during the Share Fair on September 15.



Slabs of wood sit on the floor of the Brooks Forest Products Center waiting to be used.



A computer numerical control (CNC) machine is used to cut the coasters.



A vacuum seal is used to hold the wood in place as the CNC machine cuts it into coasters.



The CNC machine runs a program to move the blade to cut the wood into coasters.



Students use Adobe Illustrator to laser print the 25th anniversary design on the coasters.



A freshly sealed coaster lays out to dry at the Brooks Forest Products Center.

Photos and video by Olivia Coleman. Article first published in the VT news on September 13, 2017.

# An Emphasis on Experiential Learning . . .

BY MAREN ROMAN, TOM HAMMETT, LASZLO HORVATH, AND EARL KLINE

Research has shown that “learning by doing” is still the most effective way of learning, even at the college level. That is why, in the Department of Sustainable Biomaterials, we integrate experiential learning opportunities into our courses wherever possible. Here are a few examples of experiential learning opportunities in SBIO undergraduate and graduate courses:

**SBIO 3434: Chemistry and Conversion of Sustainable Biomaterials** (3rd year undergraduate course). After being taught the chemistry and processes of pulping and papermaking, SBIO 3434 students have an opportunity to visit a nearby papermill and see the industrial application of the science and concepts that

they have learned. At the WestRock paperboard manufacturing facility in Covington, VA, the students are shown the wood yard, where roundwood and wood chips are received and chips are stored in large piles and retrieved for pulping, the paper machine, where stock enters the wet end is formed into paperboard and wound up onto large reels that are changed by robots, and the many consumer products that use paperboard packaging. During this trip, students also learn about the mill’s environmental conservation efforts and the many career opportunities that exist in the pulp and paper industry. One of the students who attended the field trip has been invited back for an interview.



SBIO 3434 students at the WestRock paperboard manufacturing facility. From left to right, front row: Leah Johnson, Meron Abate, Hajar Chokhmane, Maren Roman. Back row: Seth Trivett, Jessie Arevalo, Clay Wilson, Nathan Rogers, Duncan King.

## **SBIO 3004: Sustainable Nature-based Enterprises** (3rd year undergraduate course).

Our curriculum is increasingly linked to and focused on real-life activities that will better equip our graduates for the workplace. This course is built around a semester-long student service project that gives students experience working directly with organizations (profit-making, not-for profit, and government) in the community. Three or four person teams ("learning groups") assess feasibility of new processing facilities, offering new products or services, or expanding into new markets. This year's projects include two teams working with the State of Virginia, Department of Forestry – one will be assessing a new site for manufacturing, and new locally available species for CLTs. Two other groups will be working with Phoenix Hardwoods, a furniture company in Floyd – one to assess and recommend new market strategies, and the other looking for ways to increase efficiencies in raw material procurement. Other projects this semester include working with the Virginia Industrial Hemp Coalition to identify ways to raise awareness about hemp products, designing an information program on sustainability for a local horse logging group, devising an educational program for outreach and local schools at Sinkland Farms in Riner, and designing a maple syrup operation to extend the season for a local bed-and-breakfast. We appreciate the time spent by these organizations while working with our students. We know that students' experience working on these projects should give skills and confidence not gained

in the classroom. Employers are increasingly looking for students who have not only technical skills, but also have soft skills (i.e., planning, presenting, communication, and writing skills). So, the course includes reporting and presenting progress and final reports to the clients, giving and receiving comments and feedback, and career seeking skills.

## **Sustainable Packaging Designer Trainee Program.**

The Sustainable Packaging Designer Trainee (SPDT) program was established in 2012 and it has been a great success. Students completing the training program more effectively apply for summer internship and jobs at major corporations such as Newell, WestRock, PCA, HP, Amazon, Samsung, etc. The training program is one of the most extensive extracurricular training programs offered by the department. The interested students apply to the position early in the year and go through multiple interviews where the students with greatest potential for success are selected for the program. The program officially starts around mid-May with a 3-day off-site team building training when the students go through team building exercises, learn the basics of wood identification, testing standards, wood mechanics and have a lot of fun. Following the team building training they spend the whole summer with the Center for Packaging and Unit Load Design where they work as Undergraduate Laboratory Technicians on industry contract testing projects. During the summer, the students also learn more extensively about compression, shock, vibration,

and atmospheric conditions and take the ISTA® Certified Laboratory Packaging Professional Exam.



2016 Sustainable Packaging Designer Trainees

Following the summer, in addition to their regular academic schedule, the students are required to work a minimum of 8 hours per week as laboratory technicians and take two 3 credit courses called SBIO 3005-3006 Sustainable Packaging Design and Innovation I-II. During the course, the students learn relevant industry skills such as report writing, professional presentations, packaging testing, project management, principles of Lean Management, and standard operating procedures development. In addition, they get their own small-scale research project for the fall and an industry project sponsored by an affiliate packaging company during the spring.

As an example, in 2015, our students worked on about 60 industrial projects, completed a research project sponsored by National Wooden Pallet and Container Association (NWPCA), and completed a packaging redesign for an electric stator for Moog Motion Technologies. The research project conducted by the students became so successful that NWPCA invited four of them to NWPCA's Annual Leadership Conference to present the results to their membership. The students did an amazing job during the presentation.



2015 Trainees presenting at the NWPCA's Annual Leadership Conference.

In addition to the industry projects the students actively apply the principles of Lean Management in the laboratory. In recent years, they participated in rapid improvement events (Kaizen) for three of our pieces of testing equipment, applied 5S principles to three of our storage rooms and offices, and developed an automated replenishment system (Kanban) to track our inventory. See the following page for pictures of the results of our continuous improvement projects.



Results of the continuous improvement projects by the 2017 trainees.

In its eleventh year, The Wood Enterprise Institute (WEI) SBIO 3445-6 supports a student driven, faculty supported innovation, design and entrepreneurship learning environment. This experiential learning environment is supported by creating a real business venture to finance, market and manufacture, sell, and deliver quality products with students directing the day to day operations and finances of the enterprise. The WEI learning environment allows students to study and practice business tools and techniques that are successfully

used by the best managed businesses in the world. More importantly, “hands-on” experience shows students how to set strategies to meet business goals and then to “practice” how to execute these strategies while minimizing business costs subject to the many risks associated with supply, capacity, and market uncertainties. The results and experiences from WEI are invaluable for students who will soon make business decisions in the organizations they will manage and lead after graduation.



The Wood Enterprise Institute (WEI) at Virginia Tech is recognized and respected as a leading student learning environment for creativity, innovation, and entrepreneurship. Each year, a new group of students join to design, produce, and sell a unique product. Throughout this experience, students learn how to run a small start-up business venture.

# New Graduate Students

## Dorina Bugledits



My name is Dorina Bugledits and I am a new PhD candidate under the direction of Dr. Horvath. I am coming from Hungary, where I did my Bachelor degree in Business Administration and Management in German in 2017. My main interest is travelling and I feel really lucky because I was able to discover different places inside and outside Europe as well. Also I enjoy learning new languages, my goal is to be able to communicate in as many languages as possible.

## Wei Liu

Hi! My name is Wei Liu and I come from China! This is my first year in Virginia Tech. Very wonderful!

I love long-distance traveling by riding bike. I have been to many places with my bicycle. Sometimes it was one-month riding with 2000-kilometer journey. I enjoy this way which brings me a different perspective and view in traveling. If you have the same interests, welcome to make friends with me. Ha-ha... Also I like reading books in the weekends. Now I am a first-year PHD student. My research works include sustainable utilization of forest-based and other renewable natural materials by chemical ways.



## Alina Mejias



I'm Alina Mejias. I was born in a small town in Costa Rica. I enjoy learning new languages and experiencing different cultures, it's something unique that makes me realize there is so much more of this world left to explore. I believe in continuous self-improvement and try to learn something new every day. Recently I graduated from an Industrial Engineering program at the Costa Rica Institute of Technology. I am very excited and thankful for the opportunity to start my master's degree at the Department of Sustainable Biomaterials. I will be working at the Center for Packaging and Unit Load Design, where I expect to learn much about the Packaging Industry. Go Hokies!

## Steven Morrissette

I graduated from Virginia Tech with a B.S. in Sustainable Biomaterials. The focus of my studies was residential structures. I also worked for various professors as an under-graduate allowing me a wide variety of experiences within the industry. During my time here as a graduate student I will study Cross Laminated Timbers. The main focus of my study will be to help develop better connections between components in the Cross Laminated Timber structures.

In my free time I enjoy being outdoors and traveling. I took a road trip across the country visiting over 30 states. I also love being on the river and fishing or kayaking. Recently, hiking and backpacking have become some of my favorite hobbies as I completed a thru hike of the Appalachian Trail this summer.



## Jonathan Stutesman

Jon earned his undergraduate degree in Sustainable Biomaterials at Virginia Tech this spring, focusing on residential structure design. He is currently researching, under Dr. Daniel Hindman, the European practice of using Cross-Laminated Timbers in modular construction with the goal of importing the practice to the United States. He enjoys travelling and just returned from a three-month internship in Buenos Aires, Argentina with a Sustainable Architect. He is hoping to get the opportunity to travel through Europe as a part of his research.



## Our Recent Graduates



**Gaurav Kakkar** from Delhi, India and **Li Liang** from Beijing, China successfully defended

their graduate work in late August 2017. Mr. Kakkar conducted research on the potential internationalization of prefabricated wooden structures for social housing in selected South American countries. As part of Gaurav's data collecting activities, he and professors Dr. Henry Quesada and Dr. Bob Smith visited industry, government officials, and non-governmental organizations in Peru, Colombia and Ecuador with the goal to understand better the policy and markets related to social housing. Dr. Joe Loferski was also part of Gaurav's MS committee. This project was funded through a competitive grant from the Federal State Marketing Improvement Program (FSMIP) with the US Department of Agriculture. Gaurav will continue to pursue a second MS degree during the fall at VT with the Department of Industrial Systems Engineering.

In addition to Gaurav's defense, **Li Liang** also defended her doctoral dissertation in late August. Li did work on the design and optimization of a supply chain for the commercialization of biobuth-



anol. Her work was funded through the grant US-India Energy Consortium from the Department of Energy. Professors Robert Bish from Industrial Systems Engineering (ISE) and Earl Kline in addition to Bob Smith and Henry Quesada (as chair) were the members of Li's dissertation committee. After successfully defending her work, Li has moved to California to join her husband and child. Li also graduated with a MS degree from the ISE Department at VT.

**Christa Stables** successfully defended her M.S. research; she is practicing in the background image. Christa started her research experience as a National Science Foundation Undergraduate researcher back in 2012 (upper left image). She earned her B.S. degree at Virginia Tech in 2015 and then started her M.S. project on wood/resin

surface interactions (image lower left). After defending her thesis, she celebrated (image right) her acceptance of a career position with Arclin, a chemistry and applications company supplying resins to the wood-based composites industry. Christa's research was funded by the Wood-Based Composites Center, a National Science Foundation Industry/University Cooperative Research Center directed by Chip Frazier, Christa's research advisor.



**Eduardo Molina** from Cartago, Costa Rica successfully defended his graduate work in May and received a Masters of Science degree. Mr. Molina's research focused on the evaluation of the effect of pallet stacking pattern on the deflection of the pallet as a function of the pallet support condition. The research project was part of a larger research initiative where the goal is to investigate the effect of various package properties such as dimensions, stiffness, stacking pattern, etc., on the load capacity of the pallet. His research concluded that interlock stacking packages on low and medium



stiffness pallets reduces the deflection of the pallet and potentially increase its load capacity. He also found that the ratio of the payload and pallet stiffness has a major influence on the magnitude of the change in pallet deflection as a consequence of interlock stacking. His research was funded through the Industrial Affiliate Program of the Center for Packaging and Unit Load Design. Upon completion, Mr. Molina started his Ph.D. studies in the Department of Sustainable Biomaterials. His Ph.D. research project focuses on developing a finite element model to predict the effect of packages on the deflection of pallets.

**Samantha Phanthanousy** from Alexandria, VA successfully defended her graduate work early May 2017 and received a Masters of Science. Ms. Phanthanousy conducted research to evaluate the effect of the stiffness of the pallet top deckboards on the compression strength of corrugated shipping boxes. She concluded that the stiffness of pallet top deckboards and the consecutive top deckboard twisting do not have an effect on the corrugated boxes compression

strength until less than 12% of the perimeter of the box is supported. She also investigated the effect of box content on the deflection of pallet deckboard simulators. This project was part of a larger research initiative where the goal is to investigate the effect of various package properties such as dimensions, stiffness, stacking pattern, etc., on the load capacity of the pallet. She concluded that the content of the corrugated boxes does not directly influence the deflection of the pallet. Her findings were crucial to simplify the complex interactions between corrugated boxes and pallets. Her research was funded through the Industrial Affiliate Program of the Center for Packaging and Unit Load Design. Upon completion, Ms. Phanthanousy received a job offer from Amazon and started to work in their Indianapolis, IN distribution center.



# Smith Named President of the Society of Wood Science and Technology

BY JESSICA STANLEY

Bob Smith, Head of the Department of Sustainable Biomaterials and Associate Dean in the College of Natural Resources and Environment, was recently named President of the Society of Wood Science and Technology (SWST). The Society is one of the largest internationally-recognized professional organizations of wood scientists, engineers, marketing specialists and other professionals concerned with lignocellulosic materials with over 500 members from around the world. Members are dedicated to the wise use of one of our most environmentally-friendly resources.

SWST is committed to protecting our forests through the development of new ideas, procedures, policies and products for the forest products industry. This organization establishes a forum for the exchange of ideas, the communication of knowledge, and the development of high standards, policies, and ethics for biomaterial research and the wood industry. The society publishes two journals, Wood and Fiber Science, which is not only in printed format but available in electronic format, and the fully electronic, free access, BioProducts Business Journal.

Only by supporting the high principles of conservation-minded use of our wood resources, can we reduce the impact on our natural ecosystems. Quality education in our field is a fundamental first step in taking wood science and

the industry into the 21st century. By fostering educational programs at all levels of the field—undergraduate, graduate and post-graduate—SWST aids universities and colleges in providing a quality educational foundation through accreditation of wood science and technology undergraduate programs.

Smith has been with the university over 25 years. He has coauthored 2 books, over 100 scientific publications and participated in over \$4 million in research activities. In his current role as department head, he leads 15 faculty in one of the leading departments in sustainable biomaterial science in North America. Bob holds a Ph.D. from Virginia Tech (1994) in Forest Products Marketing, a MBA from the University of Wisconsin at Oshkosh (1989), and a B.S. in Wood and Fiber Utilization from Michigan Tech (1977). Bob taught undergraduate and graduate courses in the areas of wood science, business management, and forest products marketing. As an extension specialist for 14 years his work focused on assisting companies with business and marketing issues to help increase their competitiveness. His research efforts focus upon industrial marketing and new opportunities for forest products in international markets. Prior to completing his Ph.D., he worked for a major U.S. manufacturer of wood products for 14 years as quality control director, production manager, and sales representative in the Midwest.

## Brooks Center Student Loft and Classroom Improvements

This summer the Brooks Center student loft in the Sardo Building was renovated. If you are a former graduate student of our program from the 1980's, 1990's and 2000's the loft probably looked the same as it did then before the renovation.

The Brooks Center Classroom received new furniture to accommodate our growing class sizes. Thank you to Dean Paul Winistorfer and the

College of Natural Resources and Environment for making this possible. Thanks also to Candice Albert, Director of Administration and Finance for CNRE for coordinating everything.

Jalen Hill, Matt Hixon, and David Jones (technicians for the department) had the difficult task of removing the old furniture which was more difficult because of the stairs. We appreciate your hard work and positive attitude!







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**Extension highlights**

The wood products industry in Virginia is a critical contributor to the economy of the state, an industry represented by more than 1,000 primary and secondary industries and over \$25 billion in economic impact.

The Department of Sustainable Biomaterials (SBIO) at Virginia Tech is one of the leading U.S. academic programs in the field of renewable materials with a focus on cellulosic materials such as wood products. Besides research and teaching efforts, SBIO has an important role in dissemination of new knowledge in the area of renewable materials through SBIO's three extension specialists.

**SBIO professors delivered educational session at the Virginia Forest Products Association (VFPA) Convention in Norfolk, VA.**



Associate Professors Dan Hindman and Henry Quesada along with architect and principal Tom Chung from Leers Weinzapfel Associates Architects and building contractor Charles Judd from Heron Timber delivered an educational session on cross-laminated timber (CLT)



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during the 2017 VFPA convention in Norfolk, VA. More than 150 people attended the convention that took place in the Hilton Marriot on Main. The CLT session was designed with the objective to cover critical information from building design, CLT production and logistics, CLT installation, and the latest research activities conducted in the Department of Sustainable Biomaterials at Virginia Tech.

As Susan Jennings, executive director of VFPA indicated, the session provided an outstanding background on the current markets and possibilities for VA forest products industries. Jennings stated that “this session was great to widen the scope of lumber producers to embrace the Future of Forest Products and how the producers play an important role in educating the public on CLTs, including their strength, their beauty, their naturalness, their local impact, etc. It is of utmost importance for the Commonwealth to be at the forefront of this industry. I believe your presentations broadly increased the audience’s knowledge, interest and foresight in CLT manufacturing.”



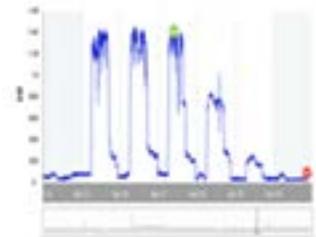
### **The Department of Sustainable Biomaterials partnered with the North American Wholesale Lumber Association (NAWLA) to deliver wood basic education and to offer scholarships to SBIO Students**



For the first time-ever after almost 40 years of delivering the most nation-wide recognized 101 Wood Basics short course, it was finally offered in the US East Coast at Virginia Tech during July 2017. Dr. Henry Quesada, associate professor and extension specialist in the SBIO department began the partnership with NAWLA during Fall 2016. The 4-day short course offers opportunities for newcomers to the forest products industry to learn about all aspects of the supply chain of wood products, including forestry issues, wood anatomy, lumber grading, lumber sales, wood composites, and logistics activities. The short course also includes

a full day of industry tours so the students can see how a forest products industry operates in real life. During July, there were a total of 22 participants coming from the US, Canada, and Mexico.

The fall version of the short course was offered in early September at Oregon State University (OSU) where 40 participants attended. The plan is to continue to offer a Spring course at Virginia Tech and a Fall version at OSU. Associate Professor Chris Knowles from OSU and David Jones from Benchmark International have been the co-instructors of this short course for the last 10 years. With the incorporation of Dr. Henry Quesada as one of the core instructors, it is expected that the course could expand and better serve the educational needs of the East Coast forest products industry.



## Graduate students Sailesh Adhikari and Paula Fallas provided a demonstration of bioenergy to Governor School students during Summer session at VT



Over 25 students as part of the Governor School Summer training visited the Brooks Forest Products Laboratory in June to learn about wood products and bioenergy. Doctoral student Sailesh Adhikari from Katmandu, Nepal hosted the students at Brooks along with MS student Paula Fallas from San Jose, Costa Rica. The high school students that were part of the demonstration learned about feedstock, production of syngas from wood fiber, and the generation of electricity through the operation of a portable power-plant manufactured by All Powers from Berkeley, CA. The unit has been operating for five years at Virginia Tech in the Department of Sustainable Biomaterials with the main goal to serve as a demonstration tool on how to produce bioenergy from wood fiber.



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# STATISTICAL ANALYSIS TO IMPROVE MANUFACTURING MAINTENANCE PROGRAMS

**WHEN**  
**November 14-15, 2017**

**WHERE**  
**Brooks Forest Products Center**  
Virginia Tech main campus, Blacksburg, VA

**PROGRAM** • Introduction to Maintenance Programs • Review of MS Excel • Probability distributions review • Statistical tools for failure analysis

**WWW.SIM.SBIO.VT.EDU**



## INVESTMENT

\$450. Includes: coffee breaks, lunch for two days and 1.6 CPU credits.

## WHO SHOULD ATTEND

- Quality Control Supervisors
- Production Managers
- Maintenance Managers
- Maintenance Engineers
- Supervisors
- Operators
- Maintenance personnel

## SPONSORS

- Department of Sustainable Biomaterials
- Virginia Cooperative Extension
- Sustainable Innovation Management at Virginia Tech

## INSTRUCTOR

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