PACKAGING TEAMS MAKE BIG IMPACTS AT FAIRS
MORE

FEDERAL REGULATIONS EXPOSE BIOGENIC FORMALDEHYDE

THE WEI’S AMBITIOUS CHALLENGE
In the Fall of 2015 the Virginia Science Festival hosted an event in Blacksburg at the Moss Performing Arts Center. At this event there were many booths set up to display various facets of science done in the Blacksburg area. This event was heavily attended by all ages, but was mainly geared towards K-12 students.

Our Sustainable Biomaterials department was fortunate enough to be included as part of this event, which served as a great way to spread the word about our department and to discuss important issues of sustainability in modern society.

Once the event was underway, the hallways of the Moss Arts Center began to become increasingly filled with people of all ages. We met many people who had traveled from a

VT SBIO/Packaging students are introducing how much the sustainable packaging system reduces the environmental impacts using “Biodegradable Packaging materials vs traditional plastics”
different area with a high school class just to attend this event in Blacksburg. With so many people and such a large selection of different booths, we laid out a selection of flyers, laser-engraved wood plaques, and small corrugated HokieBirds to provide our visitors with some information about the kinds of things we are studying in this department. However, the largest attractions that we offered at our booth were the free hot beverages from the Keurig, the corrugated HokieBird statue, and Dr. Kline’s “Wood Magic Show” where wooden strips would “come alive” when one side would swell with water while the other side remained dry.

The weather outside during this event was chilly and rainy, making hot-chocolate from the Keurig a big hit with kids and adults alike. This being said, we gave out hundreds of free hot beverages to our visitors, most of whom stuck around and learned about packaging technologies found in the K-cups and compostable drink cups, as well as about biomaterial technologies and programs. We were all very excited to share our respective knowledge with the visitors to our booth, and most visitors left knowing more than they did before about K-cups, biomaterials, wood, and how a Hokie Bird statue was made from corrugated.

Overall, this event was incredibly successful for our program. We had a very high volume of visitors who were interested in our studies, with many of them being high-school students. Our goals were to spread the word about our programs, spark the interest of prospective students, and to show that our department is very important in promoting a sustainable future.

I believe that we did this very successfully, but could not have done so without our dedicated faculty and students. I am very proud of our department and was incredibly excited to be involved with this event. Perhaps some of our visitors will join our department in the future and will find themselves serving hot chocolate to more prospective SBIO Hokies!

SBIO/PACKAGING TEAMS MADE A BIG IMPACT AT THE 2015 VT MAJORS FAIR

BY LOCSHAM AND MARLON LEVY-FAIGEN, PACKAGING SYSTEMS DESIGN

On Wednesday, September 30, Virginia Tech held its annual Majors Fair in the Squires Commonwealth Ballroom. There was a large attendance of primarily first year students exploring different majors. The Department of Sustainable Biomaterials hosted two booths
where many of these new prospective students were introduced to Sustainable Biomaterials and Packaging Systems and Design as a major or a minor. Several SBIO/Packaging faculty and many student volunteers worked at the booths garnering enthusiasm and interest for the department. The success of faculty and students working together to showcase our majors is one of the many regular campus activities to promote and grow our educational programs.

With more students choosing our majors to study and develop professionally, Sustainable Biomaterials and Packaging Systems and Design is becoming highly recognized at Virginia Tech and across the country (by Loc Pham and Marlon Levy-Faigen).

SBIO STUDENTS EXCEL IN EASTMAN SYMPOSIUM  
BY KEVIN EDGAR

On October 29, Eastman Chemical Company once again sponsored the annual Eastman Graduate Symposium in lignocellulosic chemistry at Virginia Tech. VT graduate students presented their research in posters and oral presentations for much of the day to fellow students, interested VT faculty, and Eastman visitors in the Kelly Hall lecture room. A team of Eastman and VT faculty judges had the difficult task at the end of the day of selecting the best oral presentations and poster from among those presented; everyone agreed that the students all gave outstanding presentations. Finally the winners were announced, and certificates, water bottles made from Eastman polymers, and cash awards were presented by the Eastman representatives to the winners. First place oral presentation was by Yifan Dong, a third year chemistry student in the Edgar lab. Second place oral presentation went to Shu Liu, also a third year chemistry student in the Edgar lab. The third place winner was Cigdem Arca, a fourth year student in the Edgar lab in Macromolecular Science and Engineering
(MACR). The outstanding poster was by Chuck Wang, a second year MACR student in Chip Frazier’s group. Eastman has supported this great event for our students for seven years, and their continued support for our students is greatly appreciated.

**FEDERAL REGULATIONS EXPOSE BIOGENIC FORMALDEHYDE**  
*BY CHIP FRAZIER*

For decades the federal government has set limits for allowable formaldehyde emissions from nonstructural composite products like particleboard. The industry has repeatedly met those regulations with innovations in resin technology, the intended target for emissions regulation. However new emission limits are so low that now the industry must account for the natural, biogenic formaldehyde that trees produce. Consequently industry members of the [Wood-Based Composites Center](https://www.wbcresearch.org) (WBC) have requested Professor Chip Frazier’s research group to improve the understanding of how wood produces formaldehyde, and how biogenic formaldehyde levels differ in various tree species. Leading the effort is Frazier’s student Guigui Wan, Ph.D. candidate in Macromolecular Science & Engineering, and helping last summer was George Lewis, senior in Materials Science Engineering. Guigui is studying how lignin forms formaldehyde; and George helped demonstrate that living trees contain biogenic formaldehyde and at vastly different levels among three different
tree species ranging across North and South America. The WBC is a National Science Foundation Industry/University Cooperative Research Center devoted to industry service for manufacturers of wood-based composites and for suppliers of the corresponding adhesives. WBC headquarters is at Virginia Tech and the Center includes Oregon State University, the University of Maine, the University of British Columbia, and North Carolina State University. Faculty at all universities conduct research requested and funded by industry members in North America, South America, Europe, and Australia.

GREEN BUILDING SYSTEM CLASS PROJECTS

BY DAN HINDMAN

SBIO 3324, Green Building Systems, was held in Fall 2015. The class discussed the definition of green building, concepts in green building structures (water, site, materials, energy, indoor environmental quality) and discussed some of the various green building certification systems.

The students also participated in a series of service learning style projects, where the students were able to study more in-depth areas related to green building. The students were assigned clients and had to develop the goal and scope of the project, then execute the project according to the client’s needs.

The projects included:

Springhouse Community School – Springhouse Community School is a private high school located in Floyd, VA. The school focuses on project-based learning and has a large focus on the environment and environmental science. The school is located at the Floyd Eco-Village, which has a large acreage for continued growth. The high school students wanted to design and specify a tiny house to be built on site. The house would be a small 1-2 person building that was off-grid with a total budget of $30,000. SBIO 3324 students served as
mentors to the high school students, explaining the green building concepts and acting as coaches.

**Plenty!** – Plenty! Is a local food bank which accepts donations of both canned and fresh food. Plenty! Emphasizes health and includes a cannery and kitchen where local people can learn to cook. As the food bank grows, storage space is a priority. To help out with the storage of non-food items, SBIO 3324 students built a custom shelving unit from recycled materials. Materials were obtained from the Wood Engineering Lab and donations from Shelter Alternatives. The final unit will be installed next week.

**Tinyhouse** – Tinyhouse is a minimal living concept which has been featured on many home renovation shows lately. Tinyhouses are anywhere from 80 to 300 square feet. Working with a Highland Farm, a local farm and music venue, a group of students from SBIO 3324 designed a tinyhouse unit to be built onsite. Originally, the owner expressed an interest in building the house as well, but this was beyond the scope of the class.

**Energy** – Many students were interested in learning more about energy sources which could be used to make a home ‘off-grid’. One student group was asked by Dr. Hindman to examine different energy solutions for housing and discuss the positive and negative aspects. Various items explored included using a generator from a small stream to a Tesla Powerwall to thermoelectric camping stoves.

**Green Building Education** – While green building education has been at Virginia Tech for many years (SBIO 3324 first began in 2009), there is little education in green building at the high school level, particularly for trade-oriented students. This group developed a lesson and interactive activity (game) to share the concepts of green building with high school students.

**Green Building Perceptions** – Understanding the current attitudes of the architecture, engineering and contracting community to green building is important. This group, with Dr. Hindman, has devised a survey to be sent to contractors to understand their opinions and feeling about green building. Students became Internal Review Board (IRB) certified surveyors, developed the survey based upon previous research and submitted all the paperwork to the IRB. The survey will commence in the Spring semester.
The entire class would like to extend a special thank you to our clients, specifically Joe Klein from the Springhouse Community School, Jonathan Vandergrift and McCabe Coolidge from Plenty!, and Mike Hedlesky from Highland Farm.

**USDA VIETNAM COCHRAN FELLOWS VISIT DEPARTMENT**  
**BY BOB SMITH**

The Department of Sustainable Biomaterials hosted four Vietnamese Cochran Fellows and their USDA-FAS advisor for two weeks the beginning of November to better understand forest practices and forest product manufacturing and markets in the United States. The Fellows came from all regions of Vietnam and were owners or top management personnel in primary and secondary manufacturing companies. Each of the companies are major importers of US hardwood lumber into Vietnam. The teaching faculty included Dr. Scott Barrett and Ms. Jennifer Gagnon from the Department of Forest Resources and Environmental Conservation, and Drs. Brian Bond, Henry Quesada and Bob Smith from SBIO. The program coordinator was Jeremy Withers, a MS student in SBIO. The program started with two days of forestry education with trips to the college’s Fishburn forest and an active logging site. The Fellows were quite interested in sustainable practices and the certification of forest land. They spent a day on hardwood lumber manufacturing and drying offered by Dr. Bond. They toured sawmills, secondary processing operations, a lumber wholesaler, and hardwood distributor in Central Virginia. They spent an afternoon at the Virginia Department of Forestry to better understand the monitoring and planning of forestry operations. The second week focused on markets and secondary manufacturing including tours of mills in southwest Virginia. Mr. Mike Snow, Executive Director of the American Hardwood Export Council spoke on international markets for US hardwoods and Ryan Turman of the Turman Lumber group discussed their companies export operations. The fellows were interested in new products from hardwoods and learning about future opportunities for collaboration with the US.
As a 1991 Ph.D. graduate in Agricultural Economics from Virginia Tech, I was very happy to host a group of Hokie students and professors at my farm Finca Rio Perla in the Caribbean Highlands of Costa Rica on January 9, 2016. The group, which was participating in a course at nearby Earth University, came to see our (re)forestation and agro-forestry projects. Yes, a far distance from the suburbs of Baltimore, Maryland (where I was born and raised) and the rolling hills that surround Blacksburg, Virginia (where I spent about 4 years as a student). But, not so far flung considering my longtime interest in farming and in seeking a lifestyle to “walk-the-talk” with respect to growing my own food, building community, living sustainably,
and making a difference in the world. I lived for 2 years on communal (kibbutz) and coope-
ratve (moshav) farms in Israel - some where my relatives lived - which greatly influenced my life path. I decided to go back to university and got a B.S. in Horticulture from University of Maryland and a M.S. in agricultural economics at Hebrew University of Jerusalem (Rehovot Campus), Israel.

After getting my Ph.D. at Virginia Tech, I was a professor in the USA and in Israel, and I have been a consultant for the World Bank for 30 years. Thus, I have been lucky to work in more than 25 countries around the world on a wide range of subjects from coffee/cocoa policy to addressing human vulnerability to climate change and natural disasters. But, giving advice and writing reports and journal articles is different than “doing it”. In late 2004 I was working on a study for the World Bank with Virginia Tech Professor Jeff Alwang (one of my PhD advisors) when I bought a farm in Costa Rica from a colleague at the World Bank. I also bought a few other farms on the same mountain and now have about 240 acres in total.

Over the past 10+ years I have been trying to develop/manage the farm(s) as an agro-eco tourism farm, to provide an authentic “hands-on” farm and rural village experience so that people can connect with the amazing nature and good natured people at Finca Rio Perla, in the small village of Union Rio Perla (“La Perla”).

Trying to juggle my life between the USA and Costa Rica has been very challenging, but also incredibly rewarding. I feel that my family and I are changing the lives of our workers and breathing life into an abandoned village; and of course it is an incredible feeling and responsibility to be steward of such incredible natural beauty (we have amazing waterfalls and natural pools, trees, plants and birds of all types) and to contribute to its betterment by planting trees and trying to practice organic agriculture. The plan is to move to the farm on a more permanent basis, but it is a process.

As a Virginia Tech grad, it was really special to host the Hokie students and professors at Finca Rio Perla. We took a great hike in a forest, planted trees, visited some beautiful natural waterfalls and pools, drank refreshing carambola (starfruit) juice, munched on fresh cocoa seeds, made/drank sugar cane juice, and checked out the horse stables and dairy. So, come visit us on line at: www.fincarioperla.com and better yet, come visit us in-person and come to “Hokie Hilltop”. Pura Vida.

10 Spring 2016
During the current 2015-2016 academic year, the Wood Enterprise Institute has taken on an ambitious challenge to lead a project that is quite different from past years. This year’s 17 member WEI team includes a diverse mix of students who bring many perspectives to the project and work together very well to meet their project challenges. The group has come to acquire a unique piece of Virginia Tech history, the wood from a 314 white oak tree from Virginia Tech’s Grove (the home of President Sands). The tree died in 2014 due to a root disease and was acquired for an urban forestry project on campus. The goal of this project is to determine if historical wood can be utilized to best reflect its unique value in an elegant way that “gives back” to Virginia Tech. This material features over 4 feet wide complete slab lumber that has lived through important historical events such as the birth
of our nation, the establishment of Virginia Tech, and much more! This year, the WEI team plans to play a role in the urban forestry project to design and craft 3 or 4 custom live-edge tables to showcase how history and location of a unique tree can increase the value of the products produced.

Full tree width slab lumber cut, dried and registered to where it comes from in the tree.
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 and BSE extension specialists joined efforts to support education and vocational training in Nicaragua

Extension specialists John Ignosh from the Department of Biosystems Engineering and Henry Quesada from the Department of Sustainable Biomaterials both at Virginia Tech traveled to Nicaragua last October 2015 to document efforts on technical and vocational education and training (TVET). The project is funded through the U.S. Agency for International Development (USAID) under the grant Innovation for Agricultural Training and

Students at the TVET school in Wawashang, Nicaragua explain to USAID mission employees how they produce organic fertilizer using composting techniques.
Education (InnovATE) that is led by the Office for International Research, Education and Development (OIRED) at Virginia Tech.

Ignosh and Quesada visited a TVET school located in Wawashang in the Atlantic Coast in Nicaragua. The TVET program is managed by FADCANIC, a non-profit Nicaraguan organization funded mostly through the Norwegian Agency for Development and Cooperation (NORAD) and USAID.

The goal of this project to developed a case study of the TVET school. During a previous visit to the TVET school, Quesada realized that the school model could be expanded to other countries where agroforestry education is much needed. In addition, Quesada and Ignosh are conducting an alumni survey of the TVET school to understand better the long-term impacts of TVET education.

**Upcoming Events**

**Educational Session at the 2016 Expo Richmond**

**Taking Advantage of Current Trends, Market Opportunities and Improvements**

Thursday, May 12, 2016
Richmond, VA

8:00-9:00 a.m.

The Housing Market, its impact on the Wood Products Industry, and opportunities
Urs Buehlmann

This session will focus on the current state of the housing market and discuss its future. The U.S. private construction market generates, with roughly $750 billion per year, approximately 5% of U.S. GDP and if housing services are included it accounts for about 18 percent of U.S. GDP. An estimated $360 billion is spent on residential construction, four-fifths (on a Dollar basis) on single-family homes (700,000 units/year) and one-fifth on multi-family homes (350,000 units/year). The residential building market is of outmost importance to the U.S. wood industry, with an estimated 70 percent of softwood and more than 50 percent of the appearance hardwood harvest going to this market.

9:00 a.m.

Building Bigger : New Market Opportunities in Massive Timber
Dan Hindman

Massive timber is a new class of wooden building materials including cross laminated timber and nail laminated timber. Current production in the United States is limited, but growth and interest in the engineering and architecture community continues to grow. This presentation will discuss what massive timber is and what market opportunities for softwood and hardwood lumber are available.
10:00-10:15 a.m. **Break**

10:15-11:15 a.m.
Hardwood Exports: Current State and Opportunities  
Mike Snow (TBD)

11:15 a.m.-noon  
The Pallet Story – Hardwood and Softwood Use, Recovery/Repair/Recycling, and Greenness Opportunities  
Phil Araman

This session will cover information on wood material use and pallet production and will focus on ways to minimize production waste from pallet cants and parts while producing better pallets. Pallet recovery, repair, and recycling techniques and numbers will be discussed. Ways to be certified by an international environmental group for recycled pallets will be covered.

1:00-3:00 p.m.  
**Identifying and measuring waste in your supply chain**  
Henry Quesada

Measuring waste in your manufacturing process is a critical activity to increase production efficiencies and customer satisfaction levels. However, little has been developed to adopt lean management tools to the entire supply chain. In this presentation we will explain how to use value-stream mapping, a key tool in lean management, to quantify and analyze waste in your supply chain in wood products industries.

3:30-3:45 p.m. **Break**

3:45-5:00 p.m.  
**Meeting Your Customer’s Needs: Improving Your Lumber Drying Quality**  
Brian Bond

Regardless of your position in the value chain, logger, sawmill, drying facility or secondary producer, many aspects of wood quality and customer satisfaction are related to the drying process. This session will focus on achieving the best final moisture content, proper moisture content spread, prevention of warp, stain, and other drying quality issues.

For more information and registration please visit the [Center for Forest Products Business website](#).