



2016

Annual Report

Dr. Patricia Layton

Institute Purpose

WU+D is a multidisciplinary engine of innovation where foresters, architects, engineers, constructors and building industry stakeholders coalesce to design advancements in wood-based products through education and training, product research and development, and technology transfer of technical and design solutions. WU+D will focus on engineering innovative new wood products that can better compete with steel, concrete and other building materials used in the non-residential buildings.

Activities Towards Goals

- 1) Support new businesses and industry to South Carolina to take advantage of its proximity to vast tracts of southern pine and hardwood forests, unique prototyping and testing facilities at Clemson, and opportunities to collaborate with faculty having expertise in wood-related applied research and building design;
 - a. Met with the SC Department of Commerce (SCDOC) about how to collaborate with their business team to recruit businesses to SC (along with State Forester Gene Kodama and Tim Adams)
 - b. Invited presentation to 2016 Mass Timber Conference in Portland Oregon to promote CLT in the Southeastern US. (this now on YouTube)
 - c. Met with Weyerhaeuser SmartLam, LignaTerra, Nordic, Structurlam and several other interested companies at Mass Timber
 - d. Had meetings in SC with one potential CLT firm, which included a tour of potential sites. That firm continues to look and is in contact with SCDOC,
 - e. Had one meeting with another firm at Clemson University and had SCDOC attend the meeting.

- f. Had at least 2 other firms' contact me after the YouTube video came out.
 - g. One firm not interested in CLT and already invested in SC has visited and we hope to help them with potential investments in their SE operations
 - h. Another company has visited several times and plans to become founding partner; they may choose to invest in SC in the future.
 - i. Fellows presented information about the Institute at 1) an industry meeting sponsored by the Baruch Foundation, 2) the Oconee Business Development Forum, 3) the City Council of Clemson University, 4) the "New Languages of Wood" Symposium at the Fay Jones School of Architecture, University of Arkansas, 5) 20/15 Forestry Summit (SC Forestry Commission), and 6) SC AIA meetings around the state.
 - j. Meet with the Georgia State Forester about Building Codes and Cross Laminated Timber issues. Robert Farris is a national leader with the National Association of State Foresters. This was a meeting that was recommended by USFS and Weyerhaeuser/Plum Creek connections.
- 2) Prepare the next generation of architects, builders, engineers and material and wood scientists, and prepare business and policy leaders to manufacture and promote wood products and utilize these products in sustainable construction of the built environment;
- a. Worked closely with the Indigo Pine Team and Creative Inquiry groups to develop their knowledge of building with wood. In October 2015, the team built the Solar Decathlon entry in California. http://newsstand.clemson.edu/students-faculty-design-a-whole-new-way-to-build-a-home-no-nails-required/?utm_source=feed
 - b. The Institute supported the spring 2016 Architecture studio to redesign the house and create a Pavilion for the Pee Dee Research and Education Center, this project has been closed however and the house will be sent to State surplus.

- c. Previous submission to Binational Softwood Council did not get funded due to time constraints after a lengthy negotiation process
- d. Submitted a proposal to the USDA NIFA to develop and implement online certificate programs in Civil Engineering and Architecture, awaiting notification on this award
- e. The WU+D sought and hired its first student, a Ph. D. student in Civil Engineering to continue with our structural engineering research at the lab. His name is Lancelot Reres and he joined Clemson in August 2016.
- f. The Institute supported Michael Stoner, MS student in CE to spend 3 weeks working at the US Forest Products Laboratory on Cross Laminated Timber safe rooms.
- g. The Civil Engineering Department completed the first major renovation of the Structural Engineering Research Laboratory, installing a strong floor where we are finishing the original CLT research on the Hollow Core Floor system. The research is being presented at the World Conference on Timber Engineering August 22-25, 2016.
- h. Revamped the Forest Products summer course (FOR 2540), combining it with Forest Operations, which allowed us to see more mills throughout the state.
- i. At the end of August 2016 we organized a field trip for the School of Architecture's Studio Appalachia, part of these students will work on the equestrian team barn to tour a sawmill as part of the trip where the students meet John Blackwell and see one of his barns in SC.
- j. Held 3 workshops in May entitled Building Sustainably in SC with Wood http://newsstand.clemson.edu/mediarelations/use-wood-for-sustainable-construction-in-south-carolina/?utm_source=feed.

- k. Held a Wood Summit workshop for our USDA NIFA RREA grant, work continues on this grant to educate SE Extension agents about wood products. Work continues to build web site with content for this project – website name will be AskforWood,
 - l. Supported and sought additional funding to support two business students travel to British Columbia to join a trade mission that was organized by the Canadian Consulate in Atlanta
http://newsstand.clemson.edu/business-students-helping-clemson-forge-ties-to-global-industry-2/?utm_source=feed
- 3) Attract undergraduate research teams wanting to innovate new wood products that meet the needs of the building construction industry, while knowing that these developments will eventually benefit the economy of South Carolina. Students will have the opportunity to travel abroad to see how other countries manufacture and utilize wood-based construction materials;
 - a. Solar D CI teams concluded work on the house. Decipher magazine for 2015 featured their CI work.
 - b. Presented the CI idea to several companies this year but have not established any projects to date.
- 4) Foster broad collaborative research across Clemson's main campus and research and public service centers throughout the state of South Carolina:
 - a. The Pee Dee Project, which has been canceled, was a major emphasis in the spring and summer for this effort.
 - b. We continue to work on the RREA grant that began last year which will train extension agents.
- 5) Solicit industry partnerships to contribute funds and direct the mission and research operations for WU+D.
 - a. Founding Partner funding secured from:
 - i. Collum's Lumber

- ii. Huber Engineered Wood Products
- iii. Mac Rhodes
- iv. SmartLam

b. Have proposals out to request Founding Partner funding from:

- i. Simpson Strong-Tie
- ii. Boise Cascade, Southeast Division
- iii. Weyerhaeuser
- iv. LendLease
- v. LignaTerra Global, LLC

Significant Activities for the Year

The Institute held its first member/board meeting in December. Bo Shaw acted as Interim chair for this meeting. Draft bylaws and other materials were briefly discussed but did not get completed for ballot. The members were presented with summaries of all research ongoing in the Institute.

The attendees spent most of the board meeting discussing research needs on CLT following a presentation by LendLease about their CLT hotel at Redstone Arsenal in Alabama. The board also discussed the need for a CLT manufacturer in the Southeast, preferably SC. This discussion pushed the fellows and development to work with Commerce more on recruitment of companies to SC.

The Sim[ply] system was submitted to CURF for patent application. There has been some interest in this system and the fellows continue to look at the next development steps in the process.

The team continued to seek members for the Institute, including Lendlease, Plum Creek (now Weyerhaeuser) SmartLam, LignaTerra, Boise Cascade, Ingram

Lumber, and others. WE have hosted many of these companies on visits to Clemson University and organized speakers, lab tours.

Presentations and papers by the Institute Team were numerous. The complete list is attached.

Our students, which are our biggest product, are being highly sought. Architecture graduates received more than one job offer. Both MS students that finished in Civil Engineering were employed with Greenville engineering companies.

The major effort of the Fellows to fund and build the Clemson University entry in the US Department of Energy's Solar Decathlon was a major push continuing from 2014-2015. This effort culminated in publications, social media, news releases and audience awareness of Clemson University for many.

Building the SC Wood Innovation Team and hosting the workshops, Building Sustainable with Wood in SC, was a major effort activity. This increased visibility for our Institute and allowed us to partner with other organizations that will benefit us in future years.

Produced reports for State Engineer John White about Fire Retardant Treated Wood and the changes that have been made in the product since its development. The state of SC has a policy against Fire Retardant Treated wood in buildings that the state builds..

Worked with Structurlam in British Columbia, we had southern yellow pine CLT manufactured into panels for our hollow core floor panel testing. To our knowledge these are the first "publically accessible" SYP CLT panels manufactured. They have been shipped to Clemson University and are being

tested. After testing we are reusing to make “gifts” for visitors and interested companies.

Proposals with Funding Status 2015-16

| Project Title | Sponsor | Sum of Total Sponsor Request | Sum of Award Increment | Status |
|---|---|------------------------------|------------------------|--------------------|
| Internship Program for Fire and Fuels Management (CESU) | USDI (US DEPARTMENT OF THE INTERIOR) | \$37,500.00 | \$37,500.00 | Awarded |
| ADVANCED SOFTWOOD MORPHOLOGIES: DESIGN INSTRUCTION FOR EMERGING WOOD AND TIMBER TECHNOLOGIES A Funded Studio Proposal to the Softwood Lumber Board | Softwood Lumber Board | \$144,226.00 | \$0.00 | Disapproved |
| Evaluating the Fire Performance of Southern Pine Cross Laminated Timber (CLT) for Building Code Acceptance | Softwood Lumber Board | \$124,477.00 | \$0.00 | Disapproved |
| Expanding the Use of Wood Building Products in SC | USDA (UNITED STATES DEPT OF AGRICULTURE)(207) | \$250,000.00 | \$250,000.00 | Awarded |
| Developing Massive Timber Construction Firefighting Training Materials and Full-scale Training Building | Federal Emergency Management Agency | \$1,469,042.00 | \$0.00 | Disapproved |
| Gap Analysis and On-line Certificates for Design and Engineering with Wood | Binational Softwood Lumber Council | \$350,952.00 | \$0.00 | Negotiation Failed |
| Wood Utilization: Pathway to Healthy Forests and Sustainable Communities | USDA (UNITED STATES DEPT OF AGRICULTURE)(207) | \$59,740.00 | \$59,740.00 | Awarded |
| Fuels Management and Cultural Landscape Restoration Project at Kings Mountain National Military Park and other parks within Southeast Region of the National Park Service | USDI (US DEPARTMENT OF THE INTERIOR) | \$97,000.00 | \$81,000.00 | Awarded |
| SoLo-ACE Longleaf Partnership Three Minute Management Videos | The Longleaf Alliance | \$17,250.00 | \$15,000.00 | Awarded |
| Collaborative Research: Unified Prescriptive Design for Multi-Hazard Resilient Residential Construction | NSF (National Science Foundation) | \$866,666.00 | \$0.00 | Disapproved |
| Utilization of Cross Laminated Timber (CLT) in Low and Mid-rise Buildings for Enhanced Wind Performance | USDA Forest Service (FS) | \$244,956.00 | \$244,956.00 | Awarded |
| Collaborative Research: Multi-hazard Evaluation of Seismic Resistant Steel Structures | NSF (National Science Foundation) | \$191,181.00 | \$0.00 | Disapproved |

| Project Title | Sponsor | Sum of Total Sponsor Request | Sum of Award Increment | Status |
|---|---|---------------------------------|---------------------------|---------|
| Expanding the Use of Wood Building Products in SC - supplement | USDA (UNITED STATES DEPT OF AGRICULTURE)(207) | \$21,014.00 | \$21,014.00 | Awarded |
| An Interdisciplinary Approach to Building the Bioproducts Workforce | USDA (UNITED STATES DEPT OF AGRICULTURE)(207) | \$2,983,427.00 | \$0.00 | Pending |
| Fuels Management and Cultural Landscape Restoration Project at Kings Mountain National Military Park and other parks within Southeast Region of the National Park Service | USDI (US DEPARTMENT OF THE INTERIOR) | \$12,900.00 | \$0.00 | Pending |
| Total of all submissions | | \$6,870,331.00 | \$954,166.00 | |
| Total Awarded | | | \$709,210.00 | |

A few of these grants are only tangentially related to the Institute. They were in Dr. Layton's portfolio and moved with her to the Institute. Their expenses, indirect returns and employees are reflected in the financial documentation in subsequent sessions of this report

Future Opportunities

Several companies, Atlanta Hardwoods and Robison Lumber, have made visits to campus and sought to partner with Clemson University by donating lumber to some of the housing projects that are under construction including core campus and football operations. I believe that none of these has happened, however the core campus team got a price reduction from one vendor because of a potential gift from Atlanta Hardwoods. I believe there are significant opportunities but to make this happen I think engagement early in the process is important.

- a) Need to meet with Brett Dalton and/or Development as to how WU+D can help early in the process.

Dr. Pang attended a US Forest Products Lab meeting last November. After that and with some help from other relationships, we received a visit from Michael Ritter at the laboratory. As a result of this visit we sent one of our students, Michael Stoner to the FPL for three weeks this summer to work with their scientists on safe houses made from CLT, which is Michael's research area. We are now working on a proposal to seek funding from FPL to continue his work. Architecture developed a preproposal to fund a studio about CLT for row house construction in Baltimore MD and we are in discussion about a timber bridge project, and all of these may be rolled together for funding in the next month or so.

- a) Began discussions with US Endowment for Forests and Communities to discuss their co-funding of the project.

Studio Appalachia -- Prof. Albright / Prof. Russell

Studio Appalachia will focus on two projects selected to invoke a critical examination of contemporary design in the foothills region of the Blue Ridge. This blended studio will partner architecture and landscape architecture students in careful master planning and design exercises for Camp Hope in Canton, NC and

for the Clemson Equine Center in Clemson, SC. The latter project will also incorporate Equine Business students as special consultants, and will draw on the expert oversight of alumnus John Blackburn, who has dedicated much of his professional career to the art and science of equestrian architecture and planning.

Students on both projects will begin with a carefully orchestrated series of site visits and case studies designed for exposure to the broader ecological and cultural forces that impact design and operation in the sorts of complex settings under consideration. This will be followed by careful site analyses and master plan studies. The projects will conclude with detailed landscape and building designs, targeting elements of need as identified by the master plans. The design proposals will necessarily make reference to the evolving formal and material contexts of Southern Appalachia, including wood construction craft – from regional vernacular traditions to emerging prefabrication technologies.

- a) WU+D has organized / will participate in a field trip on August 31, 2016 to the GP sawmill in Prosperity, SC.

Publications and Presentations WU + D Institute 2014 - 2016

Layton, Patricia A. 2014. Selling Wood – Showcasing Innovative use and Design. 2014 South Carolina Forestry Magazine. pp 40-43. SC Forestry Association.

Layton, Patricia A. 2014. Advancement Board for Real Estate Development A Brief Overview. Presented to the Clemson University Advancement Board for Real Estate Meeting, September 26, 2014 Clemson, SC.

Layton, Patricia A. 2014. CLT Meeting, Introduction to WU+D. Presentation to a select group of SC and NC Sawmill Owners. October 8, 2015, Clemson University, SC

Layton, Patricia A. 2014. Second Century Society A Brief Overview. Presented to the Clemson University Second Century Society meeting October 14, 2014 Columbia, SC.

Layton, Patricia A. 2014. Pickens Rotary A Brief Overview. Presented to the Pickens Rotary Club Meeting October 28, 2014 Pickens, SC.

Montgomery, William Graham, "HOLLOW MASSIVE TIMBER PANELS: A HIGH-PERFORMANCE, LONG-SPAN ALTERNATIVE TO CROSS LAMINATED TIMBER" (2014). *All Theses*. Paper 2015.
http://tigerprints.clemson.edu/all_theses/2015

Montgomery, W. Graham, Schiff, Scott D. and Pang, Weichiang. 2014. HOLLOW MASSIVE TIMBER PANELS: A HIGH- PERFORMANCE, LONG-SPAN ALTERNATIVE TO CROSS-LAMINATED TIMBER. World Conference on Timber Engineering. Quebec City Canada August 10-14, 2014
http://schd.ws/hosted_files/wcte2014/e1/ABS418_Pang_web.pdf

Pang, W., Schiff, S., Gu, M., Montgomery, G. and Albright, D. 2014 Wood Engineering Research Civil Eng. @Clemson. Presentation to a select group of SC and NC Sawmill Owners. October 8, 2015, Clemson University, SC.

2015

Albright, D. 2015. "Recalibrated: An Interdisciplinary, Studio-Based Study of Massive Timber for Student Housing." Proc. of 2015 Architecture Research Centers Consortium (ARCC) International Conference, Chicago, Illinois, April 2015.

Albright, D., Dias, C., Latham, A., Martin, A. 2015. "Clemson University Indigo Pine", Invited Presentation to AIA Columbia Monthly Meeting. Columbia, SC. April 15, 2015.

Gu, Mengzhe, Pang, Weichiang and Schiff, Scott. 2015. Displacement Design Procedure for Cross Laminated Timber (CLT) Rocking Walls with Sacrificial Dampers. 2015 Structures Congress, Portland, Oregon, 23–25 April 2015.

Albright, D., Blouin, V., Harding, D., Heine, U., and Pastre, D. 2015. "Sim[PLY]." Proc. of 2015 PLEA Conference, Bologna, ITALY. June, 2015.

Layton, Patricia A. 2015. Clemson's Wood Utilization + Design Institute – Helping to Create Market Demand. Invited Presentation to the 20/15 Forestry Summit. SC Forestry Commission, Columbia, SC. August 18, 2015.

Layton, Patricia A. 2015. Green Buildings, Tall Buildings: Soaring For Sustainable Forestry. Invited Presentation at the SFI Annual Meeting, October 9, 2015. Lake Tahoe, California.
<https://www.youtube.com/watch?v=PTyfPT2SPF4&feature=youtu.be>
and <http://www.sfiprogram.org/files/pdf/2015-ac-ppt-layton/>

Albright, D., Blouin, V., Harding, D., Heine, U., Pastre, D. 2015. Clemson University Solar Decathlon House. U.S. DOE Competition and Exhibition throughout exhibition. Irvine, CA. October 8-18, 2015.

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Albright, D., Herrero, D., Latham, A., Wohlers, A. 2016. "Indigo Pine: Rethinking Housing and Reshaping Architectural Education", Invited Presentation to AIA Greenville Monthly Meeting. Greenville, SC. February 10, 2016.

Albright, D., Blouin, V., Harding, D., Heine, U., Pastre, D. 2016. "A Solar Decathlon House Intentionally Designed to Increase Teaching Opportunities," Proc. of 2016 EAAE/ARCC International Conference, Lisbon, PORTUGAL. June, 2016.

Albright, D., Blouin, V., Harding, D., Heine, U., Pastre, D. 2016. "Sim[PLY]: Achieving Carbon Neutrality Through Innovative Building Assemblies and Processes," Proc. of 2016 PLEA Conference, Los Angeles, CA. July 2016.

Albright, Dustin. 2016. "Wood + Timber Design: Trends and Outlook", invited speaker, Climate Learning Network of UGA Extension. Online Webinar. July 14, 2016.

Albright, Dustin. 2016. "Spaces for Innovation: Materials and Technologies of the Indigo Pine House", Invited Presentation to AIA Charleston Monthly Meeting. Charleston, SC. July 20, 2016.

Albright, D., Stoner, M., Blouin, V., Harding, D., Heine, U., Pastre, D. "Sim[PLY]: Innovative Platform Framing with CNC-Fabricated Plywood Componentry," Proc. of 2016 WCTE Conference. Vienna, Austria (August 22-25 2016).

Gu, M., Pang, W. 2016. "Rolling Shear Strengths of Southern Pine Cross Laminated Timber". Wood Design Focus, Volume 26, Number 1. Forest Products Society.

Gu, M., Pang, W., Stoner, M. 2016. "Bending and Rolling Shear Capacities of Southern Pine Cross Laminated Timber (CLT)". Proc. of 2016 WCTE Conference. Vienna, Austria (August 22-25 2016).

Hasburgh, L. E., K. J. Bourne, P. Peralta, P. Mitchel, S. Schiff, W. Pang. 2016. Effect of adhesives and ply configuration on the fire performance of Southern pine cross-laminated timber. Proc. of 2016 WCTE Conference. Vienna, Austria (August 22-25 2016).

Layton, P.A. 2016. Cross-Laminated Timber in the Southeastern USA: Opportunities. Invited Presentation to Mass Timber Conference, Portland, Oregon, March 22-24, 2016.
<https://www.youtube.com/watch?v=L2hDiQ4axSI&index=40&list=PLv bHKeZGe7rtsPPgCBI mNi-IVeWBYPkwi>

Layton, P. A. 2016. WU+D Institute: What We Do. Oconee Business Development Forum. August 11, 2016. Seneca, SC.

Ross, B., Chen, D., Conejos, S., Khademi, A. 2016. "Enabling Adaptable Buildings: Results of a Preliminary Expert Survey," Proc. of International Conference on Sustainable Design, Engineering and Construction. Phoenix, AZ May, 2016.