

CMEC Alumni & Friends Newsletter

Tom Maloney, Editor
Suzanne Hamada, Associate Editor

Comments from the Editor

Dr. Vikram Yadama



Tom and Donna, April 2013

We have a lot of news for this edition of the Center's Newsletter. The Center has received recognition from the Alumni Cen-

ter at WSU, Vik Yadama has been promoted and granted tenure and Dan Dolan has been given the top faculty award for student advising.

The 47th International Wood Composites Symposium has just concluded and a feature story by Tina Hilding on the Keynote Speaker, Lynn Michaelis, and other featured speakers is presented. A full story on the Symposium will be in the next Newsletter. When I started this series in 1967, I had enough material set up for three symposia. It shows the wide spread interest in this symposium now at number 47. Never crossed my mind that it would be this successful.

Also, our early work on industrial hemp has been given more publicity. We are Spotlighting the research being conducted by graduate students David Aguilera and Yu Fu. Taking the prerogative of being editor I have put together a little article on the new tradition at WSU of

All university people know that gaining tenure at an institution of higher learning is difficult to achieve. Congratulations to Vik Yadama on tenure and his promotion to Associate Professor and Extension Specialist E-3.



Vikram Yadama

It is truly a highlight of one's university career. His technical interest include: mechanics of wood and wood composites, modeling of engineered wood composites, structure and behavior of wood joints and industrial extension/outreach in forest products.

As reported in the last Newsletter (No. 10), Vik recently received one of the prestigious National Science Foundation CAREER award for his work to develop unique, sustainable building materials from wood strands. This is a five year \$400,000 grant.

Many of our off campus readers know Vik for his work as co-chair of the Wood Composites Symposium. ■

Well done Vik!

Comments from the Editor, continued

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waving the flag. And, finally, we have some news of graduates and old friends.

And a final word from Will Rogers, "It isn't what we don't know that gives us trouble. It's what we know that isn't so."

We try to provide all of our readers with news of our alumni and friends. Some of you have been very forthcoming in sending me such news. I know many of you are interested on how your classmates and friends are doing. So, I am asking you again to send me any news about yourself or any of your classmates or friends to me at tmaloney@pullman.com. ■

Composites Center Recognition

The Composite Materials and Engineering Center received recognition for all of the Alumni and Friends of Washington State University in the University's Newsletter Alumni Link (Fall 2012, Volume 6, Issue 3). In the section called "Cougar Pride, Always on the Rise" it was noted that "Of the annual \$1 billion North American wood-plastic composites market, 40 percent originates from products using technology developed at WSU." ■



Brighter Economic Outlook at Wood Composite Symposium



Lynn Michaelis, keynote speaker at the Symposium, focused on a positive future outlook for the global wood industry

By Tina Hilding, College of Engineering and Architecture

SEATTLE - For the first time in several years, the outlook for key drivers of the forest products industry looks favorable.

That was the outlook of **Lynn Michaelis**, president of Strategic Economic Analysis (SEA), LLC, who was the keynote speaker at the annual International Wood Composites Symposium, which was held April 3-4 at the Red Lion Hotel on 5th Avenue in Seattle.

"Market Dynamics, Product Development, Process Innovation" was the theme of the Symposium, which is an industry-driven forum for producers, suppliers and researchers to focus on competing demands and opportunities in the wood composites industry. Participants come from more than 20 countries.



Symposium attendees at the keynote session.

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Dan Dolan Recognition



Dan Dolan

Dan Dolan has won the 2013 Certificate of Merit for Student Advising in the Faculty Category at Washington State University. A professor of structural engineering in the Department of Civil and Environmental Engineering (CEE) in the College of Engineering and Architecture and a professor and director of codes and standards in the Wood Materials and Engineering Laboratory at WSU, he was CEE's outstanding student advisor in 2011 and won the university-wide Sahlin Faculty Excellence Award for public service in 2007.

He teaches undergraduate and graduate civil engineering courses. His research pertains to improving the response of low-rise buildings (less than 10 stories) to earthquakes and hurricanes; most of his research is oriented toward changing U.S. building design regulations. He held a Fulbright Fellowship in 2008 and taught and conducted research on how to design and construct residential buildings to better survive large earthquakes at the Universidad de Concepción in Chile; he also advised the Chilean government and forest industry on how to update design codes and standards. ■

Symposium, continued.

For nearly 50 years, Washington State University's Composite Materials and Engineering Center (CMEC) has hosted the annual symposium for wood composite panel/engineered wood product producers, suppliers and researchers. This year's event was co-sponsored by *APA-The Engineered Wood Association*.

"The market for forest products and building materials is a critical indicator of our nation's growth and economic health," says **Robert Tichy**, Symposium organizing committee co-chair and a research engineer in CMEC. "I'm excited that we're bringing industry leaders, trade executives and researchers together to examine the question of how we are coming out of this recession."

Symposium topics included the latest developments in fiber, particle and strand composites and plywood, veneer and engineered wood product.

Michaelis' lecture focused on the global economic outlook. His company provides business managers with insights about the future of the economy with a focus on housing and forest products. Before starting SEA, he worked for Weyerhaeuser for 37 years, where he was the company's vice president of marketing and economic research.

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Doctoral Research: Yu Fu

Ionic Liquid-Assisted Exfoliation of Graphite Oxide for Simultaneous Reduction and Functionalization of Graphene to Produce Bionanocomposites with Improved Properties

By Yu Fu

PhD Candidate in Mechanical and Material Engineering

Advised by Dr. Jinwen Zhang



Yu Fu

Graphene, with its unique geometry and extraordinary properties, has become an ideal nanofiller candidate for the preparation of functional polymer nanocomposites. Since its discovery in 2004, graphene has sparked a great deal of interest in the research community. Compared to bottom-top production strategies like micromechanical cleavage and chemical vapor deposition, the top-bottom strategy can achieve graphene with low cost and mass

production. The latter strategy first involves formation of graphite oxide by oxidizing the abundantly available graphite precursors, followed by exfoliation and reduction.

However, the very toxic reducing agent hydrazine is widely used in this process. Furthermore, the incompletely exfoliated graphene sheets cannot effectively interact with the host media. Specifically, the high specific surface area and strong van der Waals interactions between the nanosheets make it inefficient to separate individual graphene sheets in some media, since they are prone to restack or even form graphite after reduction of graphite oxide. The resulting graphene sheets are insoluble in common organic solvents and indispersible in polymers without further treatment.

For many applications, a simple and facile preparation of graphene dispersions in organic media is an important prerequisite for the development of scalable solvent-assisted graphene processing, including surface spin-coatings, inkjet-printing on plastic substrates, graphene films or papers, and conducting displays for applications in nanoelectronics, nanophotonics, electric devices, and sensors. It is also desirable to have the ability to homogeneously disperse graphene in polymers and then achieve good affinity with polymers for the development of its applications such as graphene-based polymer composites and active graphene layers for organic electronic elements.

Exfoliation and dispersion of individual graphene sheets are the key technological challenge in the current preparation and processing of graphene for their end applications. For this reason, a widespread interest in the intensive

Yu Fu, continued

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investigation of graphite oxide exfoliation and subsequent reduction and/or further modification has never flagged. By functionalizing graphene with selective organic moieties, the resulting graphene can be made organophilic and may even be able to couple with certain polymers, thereby facilitating the translation of individual graphene properties to the final products. Furthermore, agglomeration normally encountered in most carbon nanofillers can be reduced largely or even prevented completely by surface modification. Therefore, the inherent characteristics of single layer graphene can be maintained. To date, new strategies for simple and facile exfoliation and effective reduction and surface modification of graphene sheets are still in urgent demand in the top-down preparation.

Ionic liquids (ILs) are extensively used as green reaction media in the synthesis of conducting polymers and nanoparticles due to their low vapor pressures and wide electrochemical potential windows. In this research, we present a novel one-step approach for the pH-triggered electrochemical exfoliation of graphene sheets in graphite oxide and simultaneous reduction and functionalization with the aid of an ionic liquid. No additional stabilizer or modifier is needed to stabilize the resulting processible graphene dispersion. Therefore, this method has the following significant advantages: i) pH-triggered electrochemical exfoliation, manipulating the corrugated surface affinity for its subsequent chemical reduction and functionalization; ii) excellent organophilic dispersibility, realizing homogeneous mixing with most organic solvents and; iii) a simple and facile approach to prepare graphene sheets without foreign stabilizers and surfactants,

stabilizing the graphene dispersion.

Our proposed research is to develop a viable technology for manufacturing multifunctional graphene-based PLA nanocomposites, which exhibits potential applications in electronic devices and electrical fields requiring high thermal stability. More specifically, we aim to promote dispersability of graphene in the PLA matrix, study how the functionalization of graphene influences the morphology and properties of the produced bionanocomposites, elucidate the structure-morphology-property relationship of the novel PLA nanocomposites, and to understand the underlying mechanisms of the property enhancement and finally engineer desirable properties of the produced bionanocomposites for its specific application.

The study and understanding of how the interfacial modifications of graphene with the host PLA matrix impact the morphology and properties of the produced bionanocomposites will open up new opportunities for the development of high-performance multifunctional bionanocomposites in packaging, the automotive sector, electronics and medical devices in the near future. This research also will be the development of the novel multifunctional bionanocomposites with tunable characteristics towards specific applications and eventually the transformation of the potential in the laboratory into a real achievement in the factory. ■

Industrial Hemp

Many of you know of our work with industrial hemp in the 1910's for a small group headed by **Dave Seber**. We were successful in producing a few MDF type boards that have been shown around the world since then many times. Dave has continued his activities in getting the laws changed to grow industrial hemp with success in his state of Oregon. Much more interest is now showing about using industrial hemp. Dave gave me an update on his activities recently and these are reported next.

"As always, it's really good to hear from you. I didn't know about this WSU thing, (Editor's note—I told Dave about the effort in the Washington State Legislature to have industrial hemp studied for biofuel by Washington State University—an effort that I believe did not get out of committee) but I can tell you that WSE 266 (Dave's course on industrial hemp) is to be released on the Oregon State University eCampus in March. The first time it will only be for OSU students, but after that the course will be available online for any student attending any accredited institution to take the course for credit towards any degree. Please tell the guys at WSU about it as there are 7 different universities & research institutes contributing with 90 hrs of classes (including a required viewing for the class on composite panels and a video interview featuring me talking and showing our boards and mentioning you, WSU and the pioneering work we did). There are 27 different speakers on every aspect of industrial hemp and 'allied' issues including history, agronomy, chemistry, and all known applications and potentials for applications including composites and coatings and sealers." Included in coatings and sealers is, no doubt, HempShield — Dave's new product that has been on the market for a while. ■

Symposium, Continued

Dennis Hardman, president of APA, spoke on "Opportunities and Challenges in a Recovering Economy." He held a number of management positions in wood products marketing with Weyerhaeuser and has been president of APA

since 2005. He has served as president of the Wood Products Council, a bi-national coalition of wood associations, and chairman of the Green Opportunities Task Force.

Tom Julia, president of the Composite Panel Association (CPA) since 2001, spoke on the "Competitive and Regulatory Outlook for the North American Composite Panel Industry: Are Better Days Ahead?" During his years with CPA, Julia has significantly expanded its governmental affairs programs.

This includes forming the California Wood Industries Coalition, to advocate for industry interests during federal rule-making on formaldehyde emissions, and leading the industry coalition that has proposed and fought for the national standard on formaldehyde emissions that is about to be promulgated by the U.S. Environmental Protection Agency. Federal legislation directing EPA was championed by CPA and passed Congress in 2010. ■



Amir Sahaf (center), doctoral candidate in Material Science & Engineering, presents a poster featuring his research on the characterization of thermoplastic blends of phenolic rich fraction of wood pyrolysis oil and biopolymers for adhesive application at the Technical Forum and Poster Session.

David Aguilera: Masters Research

Evaluation of Shear Wall and Diaphragm Constructions

By: David Aguilera

MS Student in Civil Engineering



David Aguilera

My college education began at Columbia Basin College where I obtained an Associate of Science degree. While attending college, I worked part-time as a CAD drafter for a local land surveying company, and it was there that I developed an interest in Civil Engineering. My desire to pursue a career that improved society, coupled with my fascination for large-scale infrastructure, prompted me to attend WSU and obtain a BS degree in Civil Engineering. Upon graduating in the spring of 2012, I decided to pursue an MS degree in Civil Engineering with an emphasis in structural engineering.

I've had the privilege of working under the direction of **Dr. Don Bender** as a Research Assistant. My research is to develop allowable unit shear and stiffness design values for common constructions of post-frame shear walls and

diaphragms. The post-frame industry was valued at \$6.4 billion in 2011 and lumber represents \$860 million of the material costs. Post-frame buildings represent a significant opportunity for wood construction to gain market share in non-residential markets.

Lateral loads are primarily resisted by roof diaphragms and shear walls in post-frame buildings. Corrugated steel panels are fastened to the wood frame to form shear walls and diaphragms. The strength and stiffness of these components must be known for proper analysis and design of the building; however, the design database and availability are lacking.

Our project involves the testing of several shear wall and diaphragm constructions, followed by modeling to allow us to develop a full matrix of design values. We recently completed our laboratory tests on nine different shear wall constructions and eight diaphragm constructions. Four main factors were observed for influence on shear wall and diaphragm performance: framing spacing, screw type, screw pattern, and steel profile.

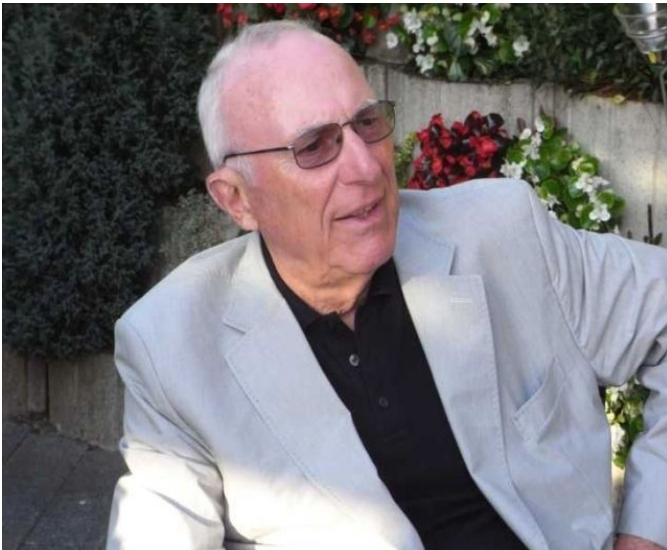
I'm currently in the process of validating a mathematical modeling approach to predict strength and stiffness values and compare results to those obtained from testing. Finally, I will use this method to compute additional design values which will provide design professionals with a larger variety of diaphragm constructions to choose from to meet a broad range of load demands.

It is our intention that the shear wall and diaphragm design values from my research will be published in the next revision of the ANSI/ASAE EP484 design standard. This standard, which is cited by the International Building Code, would be accessible to the structural engineering design community and lead to safer and more economical building designs. ■

News of Staff, Alumni, Friends

Alfred Schenkmann

Alfred (Fred) Schenkmann was and is a true “character.” In Newsletter No. 9, I reported on his contribution to the Symposium. If you missed that, go back and find the information, as it is quite impressive (he states that he spent about 1 % of his working life in Pullman due to his attendance at the Symposium). Fred was the President of his company but that did not keep from his fun loving ways. He delighted in leaving Pullman every year with a number of parking tickets that he presented to me as he left town. Below are some photos of him and family today. He reports he is well and provides the following comment on these photos, “These photos prove that my head is up, my feet are down and my purse is still operating with enough **“EUROS or DOLLARS.”** ■



Fred, the happy retired President.



Family

Brian Brashaw



Susan, Cole, Brian, in the foreground, Hannah

In the last Newsletter, we featured one of our alumni, **Brian Brashaw**. Unfortunately, we did not get a photograph of Brian and his family. Now, we have one that should be appreciated by all of Brian’s old classmates here at WSU and his many friends throughout the industry. ■

The Cougar Flag



Cougars showing the flag at the Coliseum (Kyle Martine, Alex Kaser, Darren Maloney)—International business majors spending the 2013 Spring Semester in Barcelona, Spain on a visit to Rome. Darren Maloney is the Editor's grandson so the Editor is taking the liberty of showing how proud these young men are of being Cougars.

I believe most Cougars are well aware of the popularity of the Cougar Flag program. It started in 2003 under the idea of Cougar Alumnus, **Tom Pounds**. ESPN has a pregame football show (ESPN's College GameDay) at the site of what they choose to be the game of the week. Commentators and pundits sit around a counter outside of the football stadium and present the show. Fans flock around the set and wave flags, show mascots, and do crazy things that fans do. Tom had the idea to wave the Cougar flag so he drove 800 miles to one of the shows and waved the flag (the Cougars were playing somewhere else). The camera crew picked up the flag showing it to the world.

Two weeks later, another Cougar, **Brent Schwartz**, thought this was a good idea, so drove 250 miles to Madison, Wisconsin and flew the flag. This led to Tom Pounds finding Cougars near the next Gameday show and FedExing the flag to them to wave at the show. By 2004, many volunteers were available to wave

the flag at the show and since then it has been flown at each show. All of this is done at the expense of the flag wavers.

This has been so successful, that the ESPN camera crew always looks for the Cougar flag showing it at every show. In addition, this "program" has been adopted by Cougars everywhere showing the flag at other events and at locations around the world. ■

Roland Jager

All of our old timers remember **Roland Jager**. For many years he was with Pallmann finishing up his career with Dieffenbacher. He reports that he and his wife, **Elke**, are doing well and enjoying retirement and grandkids. Roland helped us many times at the Symposium and was instrumental in obtaining donated equipment for the Laboratory. ■

Birth Announcement: Sophie Wang



Recent graduate (2012), **Yi Wang** and his wife are proud parents of **Sophie Wang**, born on June 17, 2013. Congratulations to both first-time parents from all of your friends at the CMEC!



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