Dear Friends,

As we welcome you to this first edition of the Renewable Bioproducts Institute newsletter for Fiscal Year 2015, we are delighted at the good news we have to share.

We have just held our inaugural scientific symposium as RBI – Renewable Bioproducts: Advances in Lignocellulosic Processes and Products. United States Senator Johnny Isakson and Dr. David Constable-Director, Green Chemistry Institute, American Chemical Society, gave important addresses to an audience of many company and faculty participants, friends old and new. We were pleased to connect with so many new companies and interests in the bioproducts arena, as well as with our pulp and paper colleagues. The input will be used to develop priority research projects and shape our future plans and strategies. Thanks to our member companies, our many speakers, and all who came to make this a most worthwhile event. See related articles in this newsletter for more about that event.

And so our expanding mission and scope are taking off. This August, the first students to enter our program as the new Renewable Bioproducts Institute joined our returning Fellows already hard at work with their advisors to turn forest biomass into opportunity for world markets. Our twelve FY 15 Fellowship awards were announced last issue and two more have recently been added. The annual Welcome/Welcome Back shrimp boil was a great success.

Dr. Preet Singh is offering an outstanding symposium on Corrosion in the Paper Industry and Biorefineries here on November 13-14 (see related article). He and a lengthy slate of speakers will address changes in mill and biorefinery environments, how these changes can promote corrosion, and what smart people are doing about it. Sign up soon using the link in the article, as space is limited and it is filling fast.

At RBI, we are transforming forest- and agriculture-based raw materials to create competitive advantages for industry. Come and visit—it’s a happening place.

Best wishes,

Norman Marsolan
Executive Director
Industry, Research Leaders Share Knowledge, Needs During Inaugural RBI Symposium

Private industry leaders, researchers, engineers and other technical experts converged on the Georgia Tech Global Learning Center Oct. 1-2 to exchange ideas on solving the challenges in the renewable bioproducts arena. United States Senator Johnny Isakson led off the event.

Read article

Marsolan Attends Wallenberg Prize Ceremony

Dr. Marsolan and many others from the TAPPI International Research Management Committee attended the Marcus Wallenberg Prize Ceremony September 22 in Stockholm.

Read article

Symposium to Explore Corrosion in Pulp, Paper Industry, Biorefineries

At a special symposium November 13-14, “Preventing Corrosion in Pulp & Paper Mills and Biorefineries”, distinguished industry and faculty experts will discuss new strategies for managing this significant risk to capital equipment, productivity, and profit. The event will be held at the Paper Tricentennial Building, Georgia Institute of Technology, Atlanta, GA. There is no registration fee to attend the symposium.

Read article

Students Welcomed Back to RBI with Shrimp Boil

The Fourth Annual Welcome-back Shrimp Boil brought new and returning students together for a Cajun-flavored confab August 21. A special drawing netted Nexus 7 tablets for three returning students.

See photos
RBI and IMat Recruit Communications Manager

The Renewable Bioproducts Institute and the Institute for Materials are delighted to welcome Kelly Smith to the shared position of Marketing Communications Manager, effective October 1.

Read article

Matthew Realff Appointed Associate Director, RBI

Dr. Matthew Realff, professor in the School of Chemical and Biomolecular Engineering and David Wang Senior Faculty Fellow, has been appointed associate director of the Renewable Bioproducts Institute to help develop programs in chemicals and fuels.

Read article

Professional Master’s Degree Development Gains Momentum

Georgia Tech is advancing the development of an online professional master’s degree in manufacturing leadership (PMML).

Read article

Georgia Pacific Joins RBI

RBI welcomes Georgia-Pacific to its family of members.

Read article
AIChE Forest Bioproducts Division To Visit RBI

The American Institute of Chemical Engineers will hold its annual meeting in Atlanta in November, and RBI will host the Forest Bioproducts Division for a visit and dinner to the Paper Tricentennial Building November 18. “This will be a great opportunity to showcase our broader scope and mission to representatives from a broad range of industries,” observed RBI executive director Norman Marsolan.

Graduate Fellowships Awarded in Paper Science and Engineering

Since our last issue, two additional FY 15 fellowships have been awarded, to Professor Andrei Federov for “Multimode Micro/Nanoscale Imaging to Enable Enhanced Pulp Washing,” and to Professor Meisha Shofner for “Tensegrity-Inspired Microstructures for Cellulose Nanocrystal Composites in Film and Packaging Applications.”
Read article

Georgia Institute of Technology Wins Grant from US Endowment for Forestry and Communities

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Read article

Robust Membranes Project Moving Forward

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Read article
**Corrosion Project Launched**

Dr. Preet M. Singh's research group is working on another RBI member-sponsored consortium project, "Corrosion Control in Paper Machines Using Reduced Fresh Water".  
[Read article](#)

**Faculty**

**Behrens, Meredith and PSE Student Develop Lightweight Cellulose-Based Capillary Foam**

A research team at Georgia Tech has created a new type of capillary foam which helps create lightweight and sustainable materials.  
[Read article](#)

**Linkun Xie**

Dr. Linkun Xie will collaborate as a visiting scientist with Drs. Dennis Hess and Victor Breedveld for one year.  
[Read article](#)

**Dennis Hess**

Chemical and Biomolecular Engineering Professor Dennis Hess gave an invited talk at a recent Specialty Papers Conference in Milwaukee, Wisconsin entitled, "Modification of Paper/Cellulose Surfaces for Controlled Wetting." Dr. Victor Breedveld is co-author of the paper.  
[Read article](#)
Yi Zhang, Carson Meredith, Sven Behrens’ Work on Cellulosic Particles is Published

PSE fellowship researcher Yi Zhang and professors Carson Meredith and Sven Behrens, who jointly supervise his work, have discovered a new type of lightweight foam material, in which cellulosic particles can play a central role.

Read article

RBI Poster Session Connects Students to Industry

The RBI invited PSE students to participate in a poster session and contest during its recent inaugural symposium, “Advances in Lignocellulosic Processes and Products.”

Read article

Meet Graduate Student Sudhir Sharma

Graduate research assistant Sudhir Sharma, a PhD candidate in Chemical and Biomolecular Engineering, came to visit Georgia Tech in the fall of 2010, and promptly enrolled. His work is focused on the development and characterization of barrier membranes made from nanocellulosic fibers for application as a green, renewable, recyclable, biodegradable packaging material.

Read article

Tyrone Wells Returns from Sweden

PhD candidate Tyrone Wells completes his Gunnar Nicholson Fellowship at Chalmers Institute of Technology, Gothenburg, Sweden, citing many opportunities for collaboration.

Read article
Prateek Verma Wins Honors in Auxetics Conference

PSE PhD student Prateek Verma won second place honors in the poster competition at the Tenth Annual Auxetics Young Researchers Forum, Auxetics 2014 conference, in Poznan, Poland last month.

Read article

Student Applies Technical and Collaborative Skills During Summer Internship at Dow

Jessica Ewbank, a PhD candidate in Chemical and Biomolecular Engineering, spent the summer of 2014 working in the hydrocarbons division at the Freeport, TX operations of Dow Chemical.

Read article

RBI and Dr. Marilyn Brown Host Seminar on Policy Incentives for Biorefining, Products

Dieudonné Batsy, a PhD candidate at Ecole Polytechnique de Montréal, gave a presentation July 30 in the RBI seminar room concerning the ways that policies and policy instruments can influence strategic planning. His analysis is that public policies could foster bioproducts development and biorefinery strategies through financial programs and incentives. He visited RBI and Georgia Tech at the invitation of our colleague, Dr. Marilyn Brown.

From the Museum

Dard Hunter Collection at Robert C. Williams Museum of Papermaking

Most friends of RBI are aware of the Robert C. Williams Museum of Papermaking, a unique treasure trove of the history and technique in papermaking. Visitors have noticed the Dard Hunter Collection, but many guests may not fully appreciate this unique part of the permanent collection.

Read article

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Museum Staff Attend World Congress of Hand Papermakers in Fabriano, Italy

Museum exhibit coordinator Juan Chevere and education curator Virginia Howell traveled to Fabriano, Italy, in July to participate in the 2014 International Association of Hand Papermakers and Paper Artists (IAPMA) World Congress. IAPMA holds a global conference every two years to discuss and share developments in the hand papermaking field.

Read article

Museum Opens Hand Papermaking Exhibit


Read article

Georgia Tech Commences Paper Tricentennial Building Improvements

As part of the transformation of IPST to the Renewable Bioproducts Institute (RBI), the Paper Tricentennial Building will undergo significant improvements and some major lab modifications. One thing is clear: our Paper Tricentennial Building will be significantly improved.

Read article

Calling All Alumni

All alumni of the Institute of Paper Chemistry, Institute of Paper Science and Technology and Georgia Tech’s Paper Science and Engineering program are invited to become members of the Paper Heritage Alumni Foundation.

Read article

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Industry, Research Leaders Share Knowledge, Needs During Inaugural RBI Symposium
Forum gives both sides opportunities to explore collaboration in the future

Private industry leaders, researchers, engineers and other technical experts converged on the Georgia Tech Global Learning Center Oct. 1-2 to exchange ideas on solving the challenges in the renewable bioproducts arena. United States Senator Johnny Isakson led off the event.

“This Institute is a premier institution recognized around the world for its contributions to science and technology,” said Sen. Isakson (R-GA). “This state also possesses a wealth of natural resources that we can use to make great strides in the area of renewable bioproducts. Bringing together the cutting-edge research of Georgia Tech and the industry leaders who face new challenges in their businesses every day in this global economy brings huge opportunities to both sides.”

More than 80 individuals attended the event, Renewable Bioproducts: Advances in Lignocellulosic Processes and Products, hosted by the Renewable Bioproducts Institute. Companies such as Coca-Cola, Algenol, Renmatix and Michelin among others joined many representatives from a number of pulp and paper companies to participate in two days of panels and networking.

“We all have a part in creating a new era of development of renewable, sustainable products that meet the needs of an expanding global marketplace,” commented Marsolan, “That can only be achieved when both industry and research institutions come to the table together and share ideas, knowledge and needs.”

Senator Johnny Isakson

“With new nanomaterials, we are looking at toxicity. We are trying to balance our customers who use the product, our employees who make the product, and, of course, the environment.”

Clay Bohn, senior materials research engineer, Michelin Americas

“At RBI, we are building a culture of commercialization with a cross-disciplinary focus. We are also promoting an efficient, competitive and profitable bioproducts industry based on forest and agricultural raw materials.”

Norman Marsolan, executive director, Renewable Bioproducts Institute

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Continued on next page – Symposium
Earlier this year, Georgia Tech announced a broader research mission, additional resources and a new name for the Institute of Paper Science and Technology (IPST), the Renewable Bioproducts Institute.

Over the last several years, the Institute’s mission has broadened beyond papermaking to include technologies that produce chemicals, biofuels and new materials from forest raw materials. The expanded scope and new name reflect that emerging reality, and position RBI to engage with broader industry partners to create opportunities for industrial and manufacturing arenas, according to Marsolan.

“This event is the first of many that can showcase the economic opportunities that exist through companies’ access to Georgia Tech’s world-class experts in materials science, chemistry and engineering, as well as through access to talented engineering graduates familiar with bioproducts technologies and opportunities,” he observed.

During the two-day session, panels consisted of industry representatives and Georgia Tech leaders. Topics included technology insights and emerging research and opportunities in chemicals and fuels, as well as materials. Experts also shared their insights into multiple areas of cutting-edge research, such as biopolymers, transportation, electronics, biofuels, plastics and specialty products.

Georgia Tech Provost Rafael Bras also addressed the group, emphasizing the important role both Georgia Tech and RBI play in the future of industry as it evolves.

“It’s a dynamic institute (RBI) that is moving onward. It fits our quality enhancement program, our accreditation process, our economic development and industrial strategy,” Bras said.

“There are many exciting things going on with the research being done inside this institute. Biofuels? This will come. No doubt about it. Pharmaceuticals, agriculture, forestry, energy, biology and human health – all of these will be based on renewable bioproducts.”

David Constable, director of the Green Chemistry Institute, closed out the conference, discussing the depleting supply of critical elements and the evolution that must take place in chemistry to meet the needs of a growing and complex market.
“We must follow the sage advice of long ago – avoid the perfect uselessness of knowing the answer to the wrong questions,” he said. “We believe sustainable and green chemistry innovation hold the key to solving most environmental and human health issues facing our world today.”

Marsolan said he looks forward to facilitating more of these roundtable discussions, providing a forum for both industry and academics to share challenges and solutions.

“Moving forward, it will be critical to bring both sides to the table, get to know one another’s processes and practices, learn how best to work together,” he said. “That starts with open dialogue. I believe this is the beginning of more and more exchanges that can bring real benefits to everyone.”

**Senator Johnny Isakson: ‘Peanuts to pine trees’**

*State translates resources into technology*

The state of Georgia has some of the most abundant resources in the world – everything from ‘peanuts to pine trees’ – and is using those resources to not only attract industry, but to develop and refine renewable energy technologies, according to Sen. Johnny Isakson (R-GA).

Isakson was on campus to attend Renewable Bioproducts Institute’s inaugural symposium, “Renewable Bioproducts: Advances in Lignocellulosic Processes and Products,” Oct. 1-2. The senator praised Georgia Tech’s leadership and research faculty for their continued commitment to utilizing the state’s natural resources in seeking out new cutting-edge technology in the energy arena.

“Biomass and renewable energy, both critical to not only the state, but the entire country in looking toward the future,” he said. “Everything is on the table when it comes to energy and this institution has been in the forefront of exploring options to make cleaner, sustainable energy.”

Isakson said it is possible the United States could become a net exporter of energy, a goal the country’s leaders should have in mind as they face the challenges of energy sourcing.

“There is no good reason in the world why a country with such natural resources and brain power isn’t in a better position energy-wise, both here at home and globally,” he said. “From existing methods like fracking and investing in the Keystone pipeline, to finding new technologies in the way we find and
produce energy, there are endless possibilities…. We are sitting on a ham sandwich starving to death. The answers are right in front of us and people like you are ready to take us to those levels, but politics is getting in the way.”

Another issue keeping companies from investing in more energy research and technologies is the U.S. tax code, according to Isakson. He’ll be voting for tax extenders through 2015 because he said he believes they are directly tied to research and development.

“No matter what we do, what kind of incentives we try to put on the table, what kind of top-notch institutes we have, companies will continue to look for inversions because of our backward tax code,” he said. “It is an insult to your intelligence for Congress not to pass these tax extenders. It hits everyone’s pocketbook in some way, including Georgia Tech’s.

“If we don’t do something soon, companies will continue to put their money in the bank and sit on it or they will put their money overseas. Either way, we all lose.”

Provost Rafael Bras: ‘The trajectory of our institution is unequalled’

No other institution has experienced the trajectory in reputation and success Georgia Tech has enjoyed during the past five years and that trajectory looks to continue in multiple areas, including online education, according to Provost Rafael Bras.


“We have an extraordinary story,” he said. “We have taken something that has been very good, something that has had a great impact and moved it forward, evolving along the way, with the strategy of combining education and research.

“During the worst economic downturn in a long time, the quantity and quality of our students have increased and our graduate program is growing. Our students are averaging the highest GPA ever – 3.94. Our engineering college is the largest in the nation and consistently ranked in the Top 4 or 5. As a matter of fact, every one of our programs is in the Top 8, not just engineering. We’ve gone from a regional engineering school to a global power.”
Bras
Continued from last page

The research undertaken by Georgia Tech has also grown by 40 percent to $750 million in a $1.5 billion budget, opening the door to more opportunities to define technology research, not follow the trends, he said, and the Renewable Bioproducts Institute fits that strategic plan.

“It’s a dynamic institute that is moving onward. It fits our quality enhancement program, our accreditation process, our economic development and industrial strategy,” Bras said.

“There are many exciting things going on with the research being done inside this institute. Biofuels? This will come. No doubt about it. Pharmaceuticals, agriculture, forestry, energy, biology and human health – all of these will be based on renewable bioproducts.”

Bras said there could not be a better time for industry to partner with Georgia Tech researchers in developing enhanced and new technologies.

“We want industry engaged. We want to be a partner in economic development,” he said. “Our goal is to reach $1 billion in research monies with one-quarter of that coming from an industrial base. I believe we can do that. I believe we can show you – the leaders in industry – what a valuable partner we can be.”

Coca-Cola Continues to Enhance ‘PlantBottle’ Technology

The success of its PlantBottle has motivated Coca-Cola to set even more aggressive company goals toward sustainable development and seek more outside partners around the world – especially universities and research institutes – to advance technologies for further improvements to the packaging, according to Yu Shi, director Next Generation Materials & Sustainability Research, for Coca-Cola Company, Atlanta.


In 2009, the company rolled out the first fully recyclable PET plastic beverage bottle made partially – up to 30 percent – from plants. The PlantBottle delivers the same performance – shelf life, recyclability, weight, appearance – but it reduces potential carbon dioxide emissions from PET plastic bottles and dependence on fossil fuels, like petroleum, when compared to traditional PET plastic.

“We looked at this from the end user’s perspective,” she said. “We know that more and more of our consumers are concerned about the footprint they and the products they use are leaving behind. The PlantBottle has made a big impact on that footprint.”
The bottle is now in 37 countries – more than 29 billion bottles in the world – and its use has removed more than 190,000 metric tons of carbon dioxide from the air, according to Shi, adding the company has set a 2020 goal of doubling that volume.

In some markets, Coca-Cola is combining materials from plants with recycled PET to enhance the package’s environmental performance. For example, in Denmark, PlantBottle packaging is made with a combination of up to 15 percent materials made from plants and 50 percent recycled materials.

The new packaging uses natural sugars found in plants to make ingredients identical to fossil-based ingredients traditionally used in polyester fibers and resin for bottles. Currently, PlantBottle is made using sugar cane ethanol from Brazil, the only first-generation biofuel widely recognized globally for its unique environmental and social performance.

The success of this project has been directly connected to the partnerships Coca-Cola formed with outside entities.

“We are seeking partners, even today, because there are still challenges – several challenges – we face as we move forward toward our goals for 2020 – offering a carbon neutral, 100 percent renewable, responsibly sourced bottle that is fully recyclable.”

Meeting that goal means looking outside Coca-Cola research labs for institutions that can provide additional minds.

“We did not do this all internally,” Yu Shi said. “We worked with academic researchers and we continue to work with partners to build a supply chain, connecting the dots to improve upon what we have now. We made the decision to include others in order to drive down the costs and get greater benefit. We are also working with our partners to crack the code on plant-based purified terephthalic acid (PTA) – which accounts for the other 70 percent of PET. We’re not there yet, but we can be.”
Activities

**Marsolan Attends Wallenberg Prize Ceremony**

Dr. Marsolan and many others from the TAPPI International Research Management Committee attended the Marcus Wallenberg Prize Ceremony on September 22 in Stockholm (www.mwp.org). This year’s prize went to Professor Magnus Berggren of Linköping University, Sweden. Prof. Berggren’s research enables electronics like sensors, displays and antennas to be printed on paper and cardboard, opening up a new, gigantic global market for forest industry products. According to the committee, “His alternative approach to develop ion-based electrochemical transistors instead of silicon-based is well adapted for printing on paper because they operate at low voltages, do not require extremely thin layers and are easy to apply by traditional printing methods even on rough surfaces such as paper. This paved the way for important potential applications like color switching paper-based displays, smart packages or labels, including different kinds of disposable sensors and testes.”

Berggren provided a presentation in which his vision was for hybrid products in which the roles for paper included printed antenna, battery, simple circuits and printed microfluidic devices in concert with silicon chips for complex computation.

During the symposium on the following day, a recurring message was the “large surface area” in reference to the area of paper & board produced and available as a printed surface. There are no other products with such an extensive manufactured surface available for applications such as printed electronics. The printed plastic films industry measure their products in meters of coverage, whereas papermakers measure their products in tons (of opportunity). In addition, the internet of things (IoT) was mentioned often as an opportunity for paper products in “not just small tags, but in large-area coverage.” One example of the printed electronics mentioned was a supply chain application wherein a head of lettuce would carry information printed on its wrapper. Tracking would easily occur along the supply chain from farm to fork. The presentations from the symposium are available online here: [www.mwp.org/symposium/symposium-2014/](http://www.mwp.org/symposium/symposium-2014/).
Another highlight of the symposium were the five young researchers selected by jury to represent Canada in Sweden at the ceremonies and symposium.

“The purpose of the Prize is to recognize, encourage and stimulate path-breaking scientific achievements which contribute significantly to broadening knowledge and to technical development within the fields of importance to forestry and forest industries.”

**RBI to Host Corrosion Symposium**

RBI is organizing a 2-day symposium "Corrosion in the Pulp and Paper Industry and Biorefineries" November 13-14 at the Paper Tricentennial Building, Georgia Tech, Atlanta. Four sessions will cover a range of topics related to corrosion and its control in different parts of the pulp and paper mills. Speakers include corrosion experts including Sandy Sharp, Max Moskal, Margaret Gorog, Doug Singbeil, Jim Keiser, Preet M. Singh, Paul Glogowski, Chris Davis, Hira Ahluwalia, Dave Whitmore, Jeremy Orr, Peter Gorog, and others. Each session will be followed by a question-answer session where the participants will be able to discuss specific corrosion issues related to their mills and seek expert opinion to mitigate these issues. The main aim of this symposium is to provide a forum for free exchange of the latest information on corrosion control to make the industry more safe, reliable and productive.

There is no registration fee to attend the symposium. Registration is now open at [http://www.bioproducts.gatech.edu/corrosion-symposium](http://www.bioproducts.gatech.edu/corrosion-symposium). Space is limited—so register promptly to reserve your place. For further information, please contact Professor Preet Singh (preet.singh@ipst.gatech.edu).
Students Welcomed Back to RBI with Shrimp Boil

The Fourth Annual Welcome-Back Shrimp Boil brought new and returning students together for a Cajun-flavored confab August 21. A special drawing netted Nexus 7 tablets for three returning students.
Expanding Our Capability

**RBI and IMat Recruit Communications Manager**

The Renewable Bioproducts Institute and the Institute for Materials are delighted to welcome Kelly Smith to the shared position of Marketing Communications Manager, effective October 1. She will assist both interdisciplinary research centers with marketing, internal and external communications, and event planning.

Before joining Georgia Tech, Kelly worked as an independent consultant managing her own firm, Smith Creative Services, based in the Northern Virginia and Washington, D.C. metro area.

Prior to forming Smith Creative Services, she was a founding partner of Ad Astra, LLC, a full service marketing, communications and public relations boutique firm. She gained global experience in the communications field while employed with Veolia Transportation, a private multi-model transportation company headquartered in Paris, France, where she served as Director of Communications for its North American operations, based in Chicago, IL.

**Matthew Realff Appointed Associate Director, RBI**

Dr. Matthew Realff, professor in the School of Chemical and Biomolecular Engineering and David Wang Senior Faculty Fellow, has been appointed associate director of the Renewable Bioproducts Institute to help develop programs in chemicals and fuels. He has been at Georgia Tech since 1993, after completing his Bachelor’s degree at Imperial College London and a Ph.D. in chemical engineering at MIT in 1992. He was National Science Foundation (NSF) program director from 2005-2007 and currently serves as an NSF external expert in resilient infrastructure systems. In December 2013 he was appointed Associate Director of the Georgia Tech Strategic Energy Institute.

He has current research projects in lignocellulosic pretreatment process innovation, carbon dioxide capture from flue gas streams sponsored by the DOE, and in bio-based chemical process design sponsored by NSF. With professor Carsten Sievers, he played a leadership role in organizing the RBI symposium on lignocellulosics opportunities October 1-2 (see related article).
Education

*Professional Master’s Degree Development Gains Momentum*

Georgia Tech is advancing the development of an online professional master’s degree in manufacturing leadership (PMML). Course design is progressing well, and we will reach out to our industry advisors for feedback in the near future. The program core courses will feature production management, manufacturing reliability, lean manufacturing, and economics for decision-making. Elective concentrations will begin with forest biomaterials and chemical process technology. The courses are being designed to be effective for adult learners in an online environment with case studies and leadership lessons embedded in all courses. The plan is to gain approvals, develop materials and admit students for the Fall ’15 cohort. Please contact Norman Marsolan (Norman.Marsolan@rbi.gatech.edu) if you would like to contribute program ideas through the industry advisory group.

Membership

*Georgia Pacific Joins RBI*

RBI welcomes Georgia-Pacific to its family of members. GP is one of the world's leading makers of tissue, pulp, paper, packaging, building products and related chemicals, with household products such as Brawny® paper towels, Quilted Northern® bath tissue and Dixie® cups and tableware. GP also manufactures and distributes construction and engineered lumber products like gypsum panels and other quality building materials.
Research

Graduate Fellowships Awarded in Paper Science and Engineering

The last issue of this newsletter announced the award of twelve graduate fellowships in Paper Science and Engineering. Recently, two more were awarded, to Professor Andrei Federov for “Multimode Micro/Nanoscale Imaging to Enable Enhanced Pulp Washing,” and to Professor Meisha Shofner for “Tensegrity-Inspired Microstructures for Cellulose Nanocrystal Composites in Film and Packaging Applications.” The full list of FY 15 PSE fellowships appears below. Some of these are available for consortium support or individual company sponsorship proprietary augmentation. Those interested should contact Norman Marsolan (Norman.Marsolan@rbi.gatech.edu).

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<td>Protein-assisted Functional Active Packaging for Safety and Security: the Intersection of Cellulosics and Fungal Hydrophobins with Semiconducting Polymers</td>
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<td>Effect of Strain on Repassivation and Corrosion Behavior of Duplex Stainless Steels in Pulp and Paper Mill Environments</td>
<td>Singh, Preet</td>
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Andrei Federov  Meisha Shofner
Georgia Institute of Technology Wins Grant from US Endowment for Forestry and Communities

Georgia Tech professor Kyriaki Kalaitzidou was among nine recipients September 18 of project funding from the U.S. Endowment for Forestry and Communities (Endowment) to advance the commercialization of Cellulosic Nanomaterials (CN). Dr. Kalaitzidou, working with Yamaha Motor Manufacturing Corporation, will develop “cellulose nanomaterials in sheet moulding compounds (SMC) for high-volume automotive applications.” The projects are being funded through P³Nano, a public-private partnership founded by the Endowment and the USDA Forest Service (USFS) with federal matching funds from the Forest Service’s State and Private Forestry and Research and Development branches with the USFS Forest Products Laboratory. The initial projects total more than $3 million in partnership funding.

Robust Membranes Project Moving Forward

Professor Sankar Nair and his team, which includes Drs. Scott Sinquefield and Meisha Shofner, continue to work on the Robust Membranes consortium project to develop new robust membranes that can withstand the harsh environment posed by the black liquors leaving the kraft digester. State-of-the-art technology suggests that half of the required water removal can be accomplished with membrane filtration, thus reducing the evaporation heat load by half.

Engineering the molecular sieving (MS) capabilities and longevity of the membrane will be the key focus of the work. Achieving all of the goals in this project would prepare the technology for integration at the bench scale. A hypothetical Phase II follow-up project would include building a bench-scale unit (i.e., a single two-stage unit) and testing with hot weak black liquor from a kraft mill.

So far, three types of zeolite membranes and two types of carbon molecular sieve (CMS) membranes have been screened for pH stability. Additional CMS membranes are being prioritized for future work. The group targets commencement of operational testing in October. There is limited opportunity for additional subscriptions to this consortium-sponsored research.

Contact Dr. Norman Marsolan for further information (Norman.Marsolan@rbi.gatech.edu).
Corrosion Project Launched

Prof. Preet M. Singh's research group is working on another RBI member-sponsored consortium project, "Corrosion Control in Paper Machines Using Reduced Fresh Water." This project is focused on developing understanding of the corrosion in white water environments. Corrosion performance and limitations of typical alloys as well as new cost-effective Duplex Stainless Steels in closed white waters will be evaluated. The effects of chemical changes on scale formation on machine surfaces will also be studied in this project. The role of chemical changes on corrosion mechanisms in these systems is being studied to develop mitigation strategies for changing paper machine environments. For further information, please contact Dr. Singh (Preet.Singh@rbi.gatech.edu) or Norman Marsolan (Norman.Marsolan@rbi.gatech.edu).

Faculty in the News

Linkun Xie

Linkun Xie, associate professor at the Southwest Forestry University, Kunming City, Yunnan Province, China, will collaborate as a visiting scientist with Dennis Hess and Victor Breedveld for one year. His visit is supported by a fellowship from the China Scholarship Council and is hosted by the Georgia Tech Renewable Bioproducts Institute.

Students in the News

Yi Zhang, Carson Meredith, Sven Behrens’ Work on Cellulosic Particles Is Published

PSE fellowship researcher Yi Zhang and professors Carson Meredith and Sven Behrens, who jointly supervise his work, have discovered a new type of lightweight foam material, in which cellulosic particles can play a central role. The discovery was announced recently and published by several national and international agencies. Funding from RBI was credited in the publications.
The cellulose-based capillary foam is a lightweight and sustainable material. The particles in the foam form a stabilized network with the help of oil bridges. Potential applications include pharmaceuticals and food formulation as well as construction of buildings, automobiles, and airplanes. See [http://www.sciencedaily.com/releases/2014/10/141006113830.htm](http://www.sciencedaily.com/releases/2014/10/141006113830.htm)

[RBI Poster Session Connects Students to Industry](#)

The RBI invited PSE students to participate in a poster session and contest during its recent inaugural symposium, “Advances in Lignocellulosic Processes and Products.” The posters were judged by about 50 guests from the chemical, fuel, materials and pulp and paper industries, faculty, and from national affiliated organizations and laboratories such as the USDA Forest Products Laboratory and the Agenda 2020 industry alliance.

Chad Hume, a PhD candidate in mechanical engineering (advisor: David Rosen), won first place for his poster, “Design and Analysis of Press Fabric Structures for Improved Dewatering.” Cait Meree placed second with “Processing Property Characterization For Cellulosic Nanocomposite Films and Hydrogels Produced via Water-Based Processing Methods;” she is a PhD candidate in Materials Science and Engineering studying with associate professor Meisha Shofner. Xiaodan Zhang’s poster and the poster by Nikita Kevlich and Ketki Sharma tied for third, which was settled by a drawing.

A total of 36 students submitted posters representing their research in a cross-section of schools in four areas: biorefining; novel platforms and applications; novel nanomaterials; and process improvements.

RBI member companies consider the poster session a highlight of the conference, giving them a unique networking opportunity with students.
Meet Graduate Student Sudhir Sharma

Graduate research assistant Sudhir Sharma, a PhD candidate in Chemical and Biomolecular Engineering, came to visit Georgia Tech in the fall of 2010, where he was impressed with the size of ChBE and the many collaborative opportunities available. Upon admission, he worked towards a Master of Science degree in Chemical Engineering specializing in heterogeneous catalysis. Having not yet quenched his thirst for research, he was drawn to an interesting opportunity to work on a new class of materials—cellulose nano-fibers—with his advisor, Dr. Yulin Deng. The challenge was to develop applications that could potentially be industrially applicable in a short period of time. In January, 2012, IPST—now RBI—awarded him a PSE fellowship to work toward his PhD; his thesis title is Green Nanocellulosic Barriers. His work is focused on the development and characterization of barrier membranes made from nanocellulosic fibers for application as a green, renewable, recyclable, biodegradable packaging material.

Sudhir earned his undergraduate degree in Chemical and Materials Engineering from the University of Auckland in New Zealand, graduating in 2009 with first-class honors.

He is no stranger to successful competition. Sudhir was team leader for the ChemECar competition, a worldwide competition to design and build a carefully calibrated car to travel a precise fixed distance under a random given load. His team won the competition in New Zealand, and then second place at the international competition with the fastest car the competition had ever seen. Here at Georgia Tech, he won recognition at the Georgia Tech Research and Innovation Poster Competition in March of this year for “High-Performance Green Barrier Films from Thermal Treatment of Cellulose Nanofibrils.” This award came with a cash prize funded by the Institute of Paper Chemistry Foundation. Sudhir also won the 2013 forest products division award from the American Institute of Chemical Engineers.

Sudhir is a believer in the power of co-curricular activities. While at Auckland, he helped start a chapter of the Petroleum Engineering student association which now has over 100 members. Here, he serves as TAPPI student chapter president. “In this short time, I have been able to interact with many industry representatives and had opportunities to interact with other students,” he observes. “This helped a lot in learning about the research of other students within the chapter and what the current industrial research outlook looks like—most recently, during the visit from Suzano, where Dr. Vinicius explained the company’s research direction and the general outlook of the paper industry as well.”
Sharma
Continued from last page

Sudhir credits his RBI PSE fellowship with expanding his skills and understanding of high-level research and its application to industry. “I had the good fortune of working with many very intelligent, excellent researchers, both domestically and internationally, in the field, which helps expand my knowledge of fields related to my own research,” he comments.

After his expected graduation in Spring of 2015, Sudhir intends to work in industrial bioproducts research, developing next-generation bio/nano materials as viable replacements for petroleum-derived plastics and current polymers used in packaging.

Never one to sit idle, Sudhir played guitar for the chemical engineering grad student band – Particle in a Box—and also enjoys long-distance running and reading.

Tyrone Wells Returns from Sweden

It has been roughly four months since my return from studying abroad in Northern Europe and I am still reeling in gratitude over the experience. First, I want to express my sincere thanks for the acts of kindness and good will shown to me during my stay at Chalmers Institute of Technology. The colleagues and acquaintances I made there soon became some of the greatest friends I have ever had and my life is richer for having the opportunity to know them.

During my time abroad, I was able to work on multiple manuscripts as well as learn valuable biorefinery operational and optimization processes. I spoke at industries and academies as well as at the United States Embassy in Stockholm. And it was a chance to explore a new culture.

Academically, I learned to perform the LignoBoost™ process, a valuable lignin precipitation methodology. I implemented this technique to isolate samples for novel ultrasonic pretreatments designed to improve the chemical nature of lignin as a precursor for carbon fiber development. In addition, I collaborated with two Swedish colleagues and assisted them with NMR characterizations of uniquely treated biomass. For a collaboration with a colleague back in America, I also learned how to measure the pore volumes of lignocellulose powder using a mercury porosimeter. All of these dynamic projects resulted in published scientific articles and a wealth of laboratory experience.

Overall, I had a wonderful experience in Sweden, which would not have been possible without the generosity of many folks at school and in my general neighborhood. Thank you to the shopping clerk
Continued from last page

(Morgan) who patiently endured my first conversation in Swedish. Thanks also to Suss who taught me how to use "behoove" and "traduce" correctly in a sentence and kept pushing me to eat exotic Swedish delicacies—against my better judgment. My thanks to all—it was an academic and cultural pleasure.

Tyrone Wells, Jr is a PhD Graduate Researcher at Georgia Institute of Technology's Renewable Bioproducts Institute. He is graduating December 2014 with a degree in Biochemistry with a minor in Paper Science & Engineering, and is interested in applying his analytical talents and strong public speaking acumen for industry. [https://www.linkedin.com/in/tyronewells](https://www.linkedin.com/in/tyronewells). Tyrone's study abroad was made possible by the Gunnar and Lillian Nicholson Graduate Fellowship and Faculty Exchange Fund.

Prateek Verma Wins Honors in Auxetics Conference

Prateek Verma won second place honors in the poster competition at the Tenth Annual Auxetics Young Researchers Forum, Auxetics 2014 conference, in Poznan, Poland last month. The certificate, awarded to Prateek Verma and collaborators Meisha L. Shofner, Angela Lin and Anselm C. Griffin, recognized their contribution to “Out-of-plane Auxetic Behaviour in Needle-Punched Nonwovens.” Prateek expects to complete his degree in Materials Science and Engineering next summer; his advisors are professors Meisha Shofner and Anselm Griffin.

Student Applies Technical and Collaborative Skills during Summer Internship at Dow

Jessica Ewbank, a PhD candidate in Chemical and Biomolecular Engineering, spent the summer of 2014 working in the hydrocarbons division at the Freeport, TX operations of Dow Chemical. During the internship she worked on proprietary ethylene epoxidation chemistry and applied catalyst testing and characterization skills acquired during her thesis work at RBI.

“In addition to technical skills, the internship required a great deal of teamwork,” she commented. “I am fortunate to have worked in RBI’s collaborative environment to adequately prepare me for this task. Further, the insight I gained to conducting industrial research will be of tremendous value in completing my PhD.” She expects to complete her degree this winter. Professor Carsten Sievers is her advisor.
From the Museum

Dard Hunter Collection at Robert C. Williams Museum of Papermaking

Most friends of RBI are aware of the Robert C. Williams Museum of Papermaking, a unique treasure trove of the history and technique in papermaking. Visitors have noticed the Dard Hunter Collection, but many guests may not fully appreciate this unique part of the permanent collection.

The collection is among the oldest to explore the history of paper. Dard Hunter dedicated decades of his life to acquiring artifacts ranging from the earliest example of mass printing to watermarks to equipment used in hand papermaking. Many of these are one of a kind. In addition to these artifacts, the collection contains works by Hunter himself—completely hand-made books, made in editions of less than 200 copies. The museum’s collection contains Hunter’s personal copies. The size of the collection is extensive—at the time of Hunter’s death, in 1966, more than 10,000 items were in the collection. Since that time, it has been expanded and, while a full inventory has not been performed, estimates reach nearly 100,000 items.

The collection was originally housed at the Massachusetts Institute of Technology. Later, it was acquired by the Institute of Paper Chemistry and moved to Lawrence University in Appleton, WI. Dard Hunter and three moving trucks arrived with the collection in December of 1954 to set up the exhibit. On February 27, 1955 the Dard Hunter Museum held its first Open House in its new home. The collection was described as the “foremost collection of this type in the world…it covers paper-making through its progression throughout the world.” Along with the working in the museum, Dr. Hunter gave a series of lectures and seminars on the history of paper-making. At the Open House, “a sound, colored film” was shown before visitors entered the museum and was said to make the collection “more meaningful”.

Hunter gathered the collection in his years of traveling the world in an effort to understand papermaking from its inception. Pieces in the collection date back to the beginning of papermaking in China from 105 CE and go all the way to the birth of American papermaking. There are specimens of Japanese prayers from 770 that show the world’s first mass printing on paper. The watermarks include the original experiments of Sir William Congreve, who invented the first colored water-mark; George Washington’s personal water-marked paper; and hundreds of others from around the world.

The collection is now housed in the Institute’s new home at Georgia Tech and is the founding collection of the Robert C. Williams Museum of Papermaking. Many of the books and artifacts that Dard Hunter collected in his various travels make up the permanent exhibit and many more are housed in the museum’s Rare Book Room and in the collection storage. Dard Hunter’s tireless efforts to collect, record, and understand papermaking have created a collection unlike any other.
Museum Staff Attend World Congress of Hand Papermakers in Fabriano, Italy

Museum exhibit coordinator Juan Chevere and education curator Virginia Howell traveled to Fabriano, Italy, in July to participate in the 2014 International Association of Hand Papermakers and Paper Artists (IAPMA) World Congress. IAPMA holds a global conference every two years to discuss and share developments in the hand papermaking field.

The conference was hosted by the Museo della Carta e Filligrana. This museum is housed in a former monastery, and provides an extensive history and continuing development of papermaking in Italy. For over a decade, the Museo della Carta e Filligrana and the Robert C. Williams Museum of Papermaking have been “sister” museums, visiting, sharing ideas and research, and encouraging cross-cultural experiences. Fabriano was the first place in Italy to make paper, and thirteenth-century papermakers there are credited with several innovations in papermaking. One of them was the chiaroscuro watermark, or “light and shade” mark. Many beautiful examples are on view in the museum.

One of the highlights of the conference was the gala dinner held on the final night at the Marchese del Grillo. In addition to a large contingency from across the United States, there were paper makers from the United Kingdom, Australia, South Korea, Peru, Spain, Germany, and of course Italy. Many people at the Congress were familiar with the work of the Williams museum, and had visited in the past.

At the end of the Congress, Juan participated in the post-congress tour, a four-day bus journey around the Marche, visiting numerous hand paper mills and printing studios and a Venetian mask-maker’s workshop.

Participation in the Congress provided Juan and Virginia with opportunities to meet many well-known people in the hand papermaking community. Additionally, both returned with numerous ideas for programs, exhibits, and other ways in which the Robert C. Williams Museum of Papermaking can further develop relationships with others interested in hand papermaking.
Museum Opens Hand Papermaking Exhibit


Hand Papermaking Journal produces limited-edition collections of paper art in biannual portfolios. Each portfolio is arranged around a theme, such as paper fibers, calligraphy and handmade paper, pulp painting, or other paper-related art forms. The museum exhibit includes three complete portfolios: “Design and Pattern in Decorated Papers: Wet and Dry Techniques” (1994), “Innovative Printmaking on Handmade Paper” (2004), and “The Art of Pulp Painting” (2006). In September, the Journal’s executive director Tom Bannister gave a talk about the process of producing the portfolios and featured several of the artists. These beautiful works include pieces by some of the best known artists in hand papermaking from the United States and around the world.

The exhibit will be open through December 12, 2014. The museum is open Monday through Friday from 9-5. Admission is free.
Facilities

Georgia Tech Commences Paper Tricentennial Building Improvements

As part of the transformation of IPST to the Renewable Bioproducts Institute (RBI), the Paper Tricentennial Building will undergo significant improvements and some major lab modifications. One thing is clear: our Paper Tricentennial Building will be significantly improved.

The Paper Tricentennial Building has done a superior job supporting the IPST mission over the past 20 years. The RBI mission calls for additional and improved lab space as well as an update of the building from common areas to kitchen to infrastructure.

Georgia Tech hired WSP Group (formerly Smith Carter) to conduct a Transformation/Master Plan and assessment of the building. That report will be available in the next few weeks. It will include cost estimates and form the basis to determine capital priorities. New and improved lab space with additional wet labs, a revised safety hood system, infrastructure and data improvements, as well as a number of cosmetic improvements, will all be part of the project. This work will take place over the next couple of years and facilitate and enhance our new RBI and the outstanding research associated with it.

Alumni

Alumni Welcome to Keep in Touch

All alumni of the Institute of Paper Chemistry, Institute of Paper Science and Technology and Georgia Tech’s Paper Science and Engineering program are invited to become members of the Paper Heritage Alumni Foundation. The alumni foundation’s purpose is to serve alumni by engaging former students in active and effective partnerships with the IPST community and the industry. Governed by alumni, for alumni, the Foundation promotes mutually beneficial interaction between alumni and the current student body and offers the opportunity to build Institute friendships that will last a lifetime.

For further information, go to www.bioproducts.gatech.edu/alumni/ or email Lavon.Harper@ipst.gatech.edu.