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Scholarship Awards

SPE® Announces Winners of the ACCE, Rehkopf Scholarships for 2016-2017 Academic Year

Winners of three annual ***SPE ACCE scholarships*** sponsored by the Michigan Economic Development Corp. (Lansing, Mich., U.S.A.) as well as two new ***Dr. Jackie Rehkopf scholarships*** from an endowed fund that has been set up to honor the long-time SPE ACCE committee member, SPE Automotive Division board member, and automotive composites researcher will be honored during opening ceremonies at the 2016 SPE ACCE.

The two winners of the SPE ACCE graduate scholarships ($2,000 USD each) were **Mr. Lu Wang** of ***University of Maine-Orono*** (Orono, Maine, U.S.A.) and **Mr. Srikanth Raviprasad** of ***University of Illinois at Urbana-Champaign*** (Champaign, Ill., U.S.A.). A third ACCE scholarship (also $2,000 USD) for a student attending a university or college in the U.S. state of Michigan was won by **Ms. Mariana Batista** of ***Michigan State University*** (East Lansing, Mich., U.S.A.). The two Rehkopf scholarships ($5,000 USD each) were won by **Mr. Sebastian Goris** of ***University of Wisconsin-Madison*** (Madison, Wisc., U.S.A.) and **Mr. Robert Hart** of ***University of Iowa*** (Iowa City, Iowa, U.S.A.). ACCE scholarship winners are required to present the results of their research at next year's SPE ACCE show, September 6-8, 2017; Rehkopf scholarship winners are required to either present the results of their research at next year's SPE ACCE or publish them in an SPE journal. Both scholarships are administered as part of the SPE Foundation® (Bethel, Conn., U.S.A.).

Lu Wang won his SPE ACCE graduate scholarship with the topic: *Cellulose Nanofibrils Reinforced Polypropylene by 3D Printing for Lightweighting*. About his project and its potential impact on the automotive composites industry, Wang said, "CNF [cellulose nanofibrils], a type of nano-scale cellulose fibers, have extraordinary potential to be used as a reinforcement in polymers. They are estimated to be as strong as steel, but five-times lighter and with stiffness equivalent to high-performance aramid fibers. Compared to other kinds of reinforcements, CNF has lower density, higher specific strength and modulus, lower cost, worldwide availability, recyclability, and biodegradability. On a related subject, 3D printing has been found to benefit the automobile industry, especially for prototyping design and testing. However, two obstacles exist for 3D printing some semi-crystalline polymers like polypropylene (PP). First, the PP molecule crystallizes during printing, which leads to residual stresses and warpage of the printed layers. Second, the mechanical properties of printed polymers are only 60-80% of their injection molded counterparts because the printing process generates many voids inside parts. Hence the two objectives of my research are to explore the use of CNF in 3D printed PP and to make printed PP parts equally strong as their injection molded counterparts."

Wang holds a B.S. degree from the Department of Wood Science at Central South Forestry University (Changsha, Hunan, China). He continued to study bamboo-based engineering composites at Nanjing Forestry University (Nanjing, Jiangsu, China) and graduated in 2013 with an M.S. degree. He currently is a Ph.D. candidate in Forest Resources at University of Maine working under the supervision of Prof. Douglas Gardner. He has had seven journal articles published and has two more awaiting publication. To date, papers Wang has either authored or co-authored have been published in six journals (including two review articles) and two conference proceedings, and he also has authored a chapter in the book Progress in Adhesion and Adhesives. His work has been featured on posters and presentations given at conferences in the U.S., Canada, and China. He was the winner of a graduate student poster competition for the SPE Polymer Nanocomposites Conference in 2014. He also won the George L. Houston Scholarship (2014) and Blumenstock Family Forest Products Graduate Student of the Year Award (2015) from the School of Forest Resources at University of Maine. In addition, he co-mentored two students from the National Science Foundation-Research Experience for Undergraduate (NSF-REU) program for research on cellulose nanofiber modification and 3D printing. After graduation, Wang plans to continue working in research in the field of polymer nanocomposites at an industrial research center or a university.

Srikanth Raviprasad won his SPE ACCE graduate scholarship with the topic: *Novel Structure-Material System to Resist High Velocity Impacts.* Explaining the significance of his work on the automotive composites industry, Raviprasad said, "My aim is to elevate the current technology for sandwich structures by introducing a novel cellular architecture — triply periodic minimal surface (TPMS) — made of polymers (primarily polyamide) as the core material in order to improve the impact response and increase the energy absorption of composite sandwich structures. The sandwich panel's face sheets will be designed using glass-fiber laminates of different fiber-volume fractions, with its stacking and orientation criteria inspired by examples found in nature — like architectures of armadillo and stomatopod shells — to effectively transfer impact load across the surface rather than through the thickness of the structure. Results from both computations and physical experiments will be compared against those obtained from traditional aluminum-core sandwich structures used today to see if we can achieve a better material response with our novel technology. If we are successful, it could effectively lead to both lighter weight and lower cost components for rough-terrain vehicles that are prone to impact loads from ground, weather, and the other conditions."

Originally from India, Raviprasad earned his Bachelor's degree in Mechanical Engineering from Manipal University (Manipal, Karnataka, India) in 2015 and graduated as his department's Special Achiever for two consecutive years. During his tenure as an undergraduate student, he served as the subsystem head of the Structures Thermals and Mechanisms team for his university's student satellite project where he guided the project through a successful preliminary design review phase with the Indian Space Research Organization. Raviprasad has published over 10 papers in conference proceedings, and journals, was selected as a GE Foundation Scholar-Leader in 2013, and also received a Sir Ratan Tata Travel Grant in 2015. Additionally, he was awarded a Bronze Volunteer certificate for work with the Volunteer Services Organization. As an intern, Raviprasad has worked on diverse projects in the healthcare, aero-structures, composite materials, and aerodynamics industries while at General Electric Co., United Technologies Corp., National Aerospace Laboratories, and the Indian Institute of Science. He currently works as a graduate research assistant and a graduate teaching assistant at the University of Illinois at Urbana-Champaign under Dr. Iwona Jasiuk. He extended his professional experience by interning at Gulfstream Aerospace Corp. this summer and plans to graduate by the end of 2016 with an M.S. degree in Aerospace Engineering. He also is a certified Lean Six-Sigma Green Belt, McKinley Toastmaster, PADI-certified Open Water scuba diver, and a student member of the American Institute of Aeronautics and Astronautics (AIAA).

Scholarship Awards

Mariana Desireé Reale Batista won her SPE ACCE Michigan scholarship with the topic: *Hybrid Cellulose Composites: Lightweight Materials for Automotive Applications*. Describing the research she will do on this project, Batista says, "Lower weight, high strength, and high stiffness are often identified as desirable properties for parts used in both the aerospace and automotive fields. In order to achieve these engineering goals, meet the fuel economy and emissions mandates in many parts of the world, and contribute to global sustainable development, cellulose fibers have attracted considerable attention within the transportation industry. As a class of reinforcing agents for polymer composites, they have been widely studied because of their low cost, low density, high mechanical properties, and considerable environmental benefits. My proposed research is focused on development of hybrid composites combining cellulose fiber with glass fiber, carbon fiber, and talc in matrices of polypropylene or biobased polyamide, and on evaluating the mechanical and thermal properties of the resulting composites for automotive underhood and body interior applications. In this project I am investigating synergetic effects of combining various fibers, looking for the ideal concentration of each constituent, and also qualifying the fiber-matrix interphase. It is worth mentioning that hybrid composites reinforced exclusively with cellulose fibers are less frequently developed, but they also are potentially useful materials with respect to environmental concerns for automotive applications. The hybrid cellulose composites from this research may replace or reduce the use of synthetic fibers in many automotive applications leading to weight and cost savings. Therefore this new approach to the development of eco-friendly and lightweight composite materials should be beneficial to the transportation industry."

Originally from Brazil, Batista graduated *summa cum laude* with a B.S. degree in Mechatronics Engineering in 2011 and received an M.B.A. degree in Administration and Business Management in 2014, both from Universidade Salvador (UNIFACS, Salvador, Brazil). After graduating, she worked at Ford Motor Co. in Camaçari, Brazil as a product development engineer in the powertrain department, where she was awarded a certificate of excellence in 2012 in recognition to her good performance leading manual transmission development for Ford's South American Operations. After several years at Ford, in 2014 Batista received a full-time scholarship from the Brazilian government (CAPES) to pursue a doctorate degree in the U.S. She currently is a doctoral student in Materials Science & Engineering at MSU working under the supervision of Prof. Lawrence Drzal. There, she works in the Composite Materials and Structures Center where her research is focused on carbon fiber-reinforced polymer composites, specifically modification of the fiber-polymer interphase with cellulose nanowhiskers. Batista's work has been featured on posters at conferences in the U.S. During the summer of 2016, she interned at Ford Motor Co. in Dearborn, Mich., U.S.A., where she worked as a visiting scientist in the Sustainable Plastics and Biomaterials Research Group. She has been involved in many organizations as a volunteer, providing assistance in outreach activities and student competitions. After graduation, she plans to work in the automotive industry investigating the development of polymer composites. Batista says she hopes to share her experiences and inspire new students and researchers in the field of sustainable materials.

Sebastian Goris won his Rehkopf scholarship with the topic: *Experimental Evaluation and Numerical Simulation of the Process-Induced Fiber Configuration in LFT Injection Molding*. About his work and its potential impact on the automotive composites industry Goris says, "During moldfilling of LFT [long-fiber thermoplastic] materials, the fiber configuration significantly changes as reflected by fiber attrition, excessive fiber orientation, fiber jamming, and fiber-matrix separation. A major challenge in the field of LFT processing has been and remains the lack of availability of reliable measurement techniques to allow accurate fiber property measurements of sufficiently large samples in a timely manner. The goal of my research is to gain an in-depth understanding of the underlying physics behind fiber motion and the process-induced microstructure of the fibers. As one part of my research, I'm developing novel measurement concepts to evaluate the process-induced fiber microstructure to validate simulation results by

using sophisticated techniques, including micro computed tomography. Additionally, I am working on new simulation approaches and models to better predict changes in fiber configuration during processing — in particular to control and predict the reduction of fiber length in LFT processing, which affects mechanical properties of the resultant part. As we develop expertise in measurement techniques and modeling approaches, we'll be able to apply them to study the relationships between microstructural parameters and unsolved phenomena, such as fiber attrition and fiber agglomeration in injection molded parts. Eventually, the results of my work will translate into an improved understanding of the damage and motion of fibers during injection molding, which is necessary to fully exploit the lightweight advantages of LFT materials."

Originally from Germany, Goris holds a B.S. degree from the Department of Mechanical Engineering at RWTH Aachen University (Aachen, Germany). While completing his undergraduate degree, he focused on polymer processing and worked as a research assistant at the university's Institute of Plastics Processing (IKV). In 2012, he received a full one-year scholarship from the German Academic Exchange Service (DAAD) to attend graduate school at UW-Madison where, under the direction of Prof. Tim Osswald, he completed his M.S. degree in Mechanical Engineering and now is pursuing a doctorate in the same discipline plus a minor in Business Administration. Already Goris has authored or co-authored papers in six conference proceedings as well as a chapter on Composites Manufacturing Processes for the Mechanical Engineering Handbook, 2nd edition. Additionally his work has been featured on posters and presentations given at conferences in the U.S., Germany, and Israel. Besides working as a graduate research assistant, Goris also holds the position of chief engineer at the Polymer Engineering Center (PEC) at UW-Madison. In 2013, his course project placed second in the Ratner Award Competition at UW-Madison. The following year he was a recipient of an SPE ACCE graduate scholarship from the SPE Automotive and Composites Divisions as well as an Academic Achievement Award from the Division of International Studies and International Services at UW-Madison. In 2016, he also won a Dr. Jackie Rehkopf Best Paper award for excellence in technical writing on a topic he will present at the 2016 SPE ACCE. After graduating, Goris plans to work in research on composite materials and processes in the transportation industry.

Robert Hart won his Rehkopf scholarship with the topic: *Multi-Physics Effects in Carbon Fiber Polymer Matrix Composites.* Discussing why his research will be of interest to those working in the transportation composites field, Hart notes that "My project will focus on developing theoretical models for designed optimal composite structures for multifunctional applications. I'll explore the use of new, advanced reinforcement media (e.g. carbon nanotubes, buckypaper, and graphene) that provide optimum combinations of electrical, thermal, and mechanical properties. My areas of interest include damage modeling and the influence of damage on the multi-physics response in advanced composites. This research should eventually lead to the development of "smart structures" with capabilities like real-time damage sensing that will be of interest to manufactures of aerospace as well as ground vehicles."

Currently a doctoral candidate at the College of Engineering at the University of Iowa, Hart also is a U.S. Department of Defense SMART Scholar and works in collaboration with the U.S. Army Tank and Automotive Research and Development Engineering Center (TARDEC). Before starting his Ph.D. study, Hart worked for three years as an R&D and project engineer in the plastics industry for Centro Inc. (North Liberty, Iowa, U.S.A.). In that role he led the design, budget proposal, and construction of an industry-leading laboratory for material testing of cross-linked polymers. He also served as the plastics materials expert on a team that developed a novel fire-retardant, multilayer-composite fuel tank for applications in extreme operating environments. The tank was successfully commercialized and is now the flagship product produced at a new manufacturing facility Centro operates in Brazil. Upon returning to university, Hart served as a graduate teaching assistant for a mixed graduate/undergraduate course on composite materials where he was able to draw on his industry experience to guide students as they developed their own composite design projects. He also served as a guest lecturer when the primary instructor was traveling. He holds both B.S. and M.S. degrees in Mechanical Engineering from the University of Iowa. After graduating with his doctorate in 2017, Hart will work at TARDEC full time and continue to advance composites research in the ground-vehicle sector.