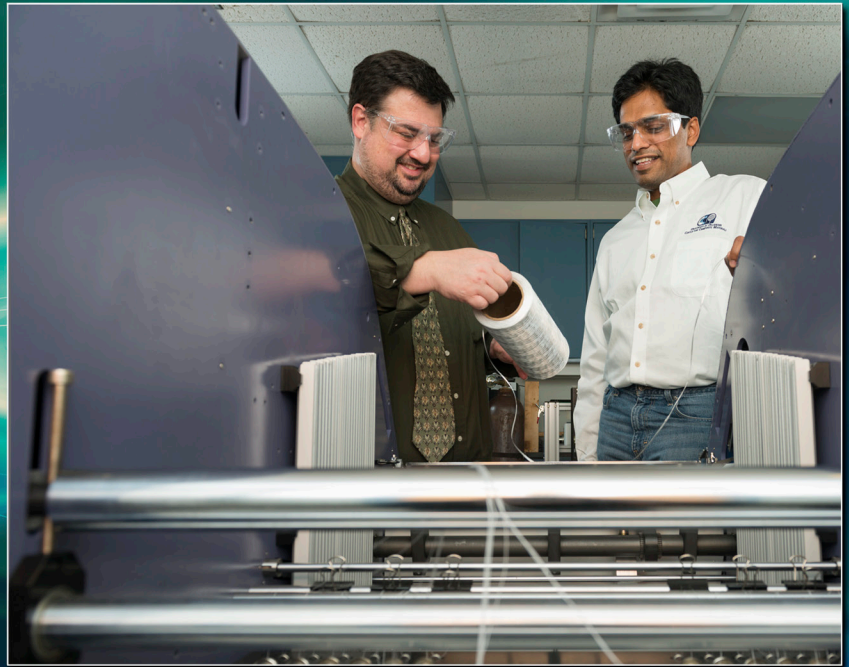




TOP STORY

CCM RESEARCHERS USE SUPERCOMPUTER TO DESIGN MULTIFUNCTIONAL MATERIALS FOR ELECTROMAGNETIC APPLICATIONS

The U.S. Navy envisions the ship of the future having electromagnetic devices such as antennas integrated directly into the load-carrying structure, and researchers at UD-CCM are working to help realize that vision.



Accomplishing the goal will require marrying traditional ship materials, such as structural composites, with radiating antenna elements, frequency selective surfaces, and other electromagnetic (EM)-based components.

It sounds simple, but researchers Mark Mirotznik and Shridhar Yarlagadda are well aware of the challenges. First, the mechanical properties of the materials have to be maintained at the same time that an EM-friendly environment is created.

Second, the constituents of advanced composites—the fibers and matrix—can be combined in a broad array of architectures, setting the stage for almost limitless possibilities, but the researchers have to sift through all of these options to identify the best material for a specific application.

Enter UD-CCM's supercomputer, a Silicon Graphics Altix UV1000, affectionately known to center researchers as Veyron for its speed and power.

TOP STORY

Continued

Phase 1 of the project, which is being carried out in collaboration with the Naval Surface Warfare Center, Carderock Division, focused on developing codes to analyze existing composite structures.



SGI Shared Memory Supercomputer (Veyron)

The Altix UV1000 is the fastest shared-memory supercomputer in the world, according to its manufacturer, Silicon Graphics International.

“We now have efficient models for predicting the electromagnetic and mechanical properties of woven fabric composites over a very wide bandwidth,” says Mirotznik, who is an associate professor in UD’s Department of Electrical and Computer Engineering. “Now, in Phase 2, we’re going in the other direction—we’re developing design tools that will enable hybrid structural fabrics with prescribed properties to be synthesized.”

“This is a much more computationally intense task that involves a lot of intelligent guessing,” he adds. “The supercomputer is ideally suited for the task because it has a massive number of processors, which enables us to run multiple geometries at once, analyze them simultaneously, and then combine the best results to further narrow our search for the best material for a given application.”

Veyron’s capabilities will be complemented by those of a computerized loom in the Composites Manufacturing Science Laboratory at UD, which was purchased by a grant from the Navy.

“The loom enables us to make a broad array of custom composite fabrics,” says Yarlagadda, assistant director for research at UD-CCM and research professor of electrical and computer engineering. “Just about anything we can design, we can make with this piece of equipment.”

“Overall, we believe the tools we’re developing in this project will result in a powerful means of designing useful multifunctional structures, such as radomes, by creating stacks of custom-designed hybrid fabrics.”

Mirotznik, who joined the UD faculty just four years ago from The Catholic University of America, views UD-CCM as a national treasure. “When I travel to give talks, everyone seems to know the composites center and has an appreciation for how good it is,” he says.

“I did this type of work before I came here, but everything I did was on the computer,” he adds. “Now I’m in a place where we can make just about anything we can dream up.”

Article by Diane Kukich

OTHER NEWS

CCM Participates in UD Day in DC

On March 19, 2013, CCM was among the 29 different teams of faculty members, graduate students and researchers who displayed their work inside the Russell Senate Office Building's Kennedy Caucus Room.

The UD Day in DC event presented an opportunity to showcase CCM's federally funded and industrial projects to prominent congressional offices and various federal agencies.

[Click here to read the entire story in UDaily.](#)



Enjoying UD Day in DC are (from left) University President Patrick Harker, U.S. Sen. Chris Coons, U.S. Rep. John Carney and U.S. Sen. Tom Carper.

Photo by Evan Krape



Dr. John J. Tierney, CCM Scientist stands with U.S. Senator Tom Carper

OTHER NEWS

(Continued)

Annual Baltimore/Washington SAMPE Symposium hosted by CCM

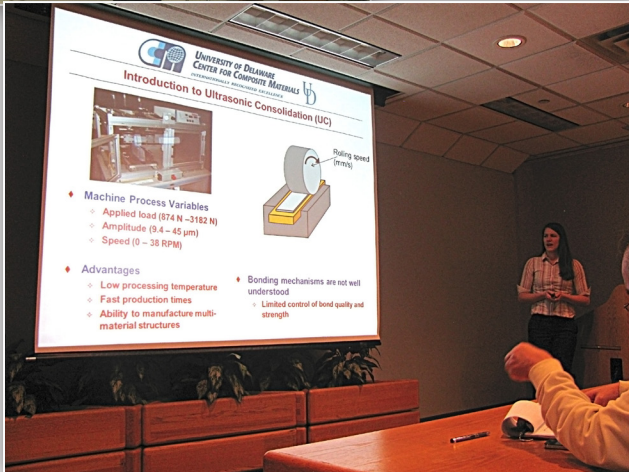
The Center for Composite Materials hosted the annual SAMPE Baltimore/ Washington Chapter University Research Symposium on Wednesday, February 20th 2013. Participants included West Virginia University, University of Maryland College Park, University of Maryland Baltimore County, and the University of Delaware. The

event was an occasion for students to present their research for cash prizes, and the winners have the opportunity to participate in the national competition at the SAMPE 2013 conference in Long Beach California this May.

Jennifer Mueller, a doctoral student co-advised by Dr. John Gillespie, Jr. and Dr. Suresh Advani, won the first place award for her presentation entitled "Diffusion as a Bonding Mechanism for Ultrasonically Consolidated Metal Matrix Composites." In addition to earning a \$500 cash award, she qualified to present her research at the SAMPE Long Beach conference with her travel expenses covered by SAMPE. She will be competing for the grand prize of \$1,000 and sponsorship to present at SAMPE Europe or Japan.



Christine Gregg, senior in the Department of Mechanical Engineering, won the first place prize with her poster.



Jennifer Mueller presents her award-winning research and will have the opportunity to participate in the national competition at the SAMPE 2013 conference

Additionally, Christine Gregg, a senior in Mechanical Engineering and advised by Dr. Erik Thostenson, won the first place with her poster "Nanocomposites: Designing Nano-scale Material Structures for Macroscopic Property Enhancement." She won a cash prize and qualified as a semi-finalist for the national competition in Long Beach. The finalists will be selected based upon the quality of written research papers.

Story by Jennifer Mueller

OTHER
NEWS*Center Participates in Boeing E-Week
University Day Celebration*

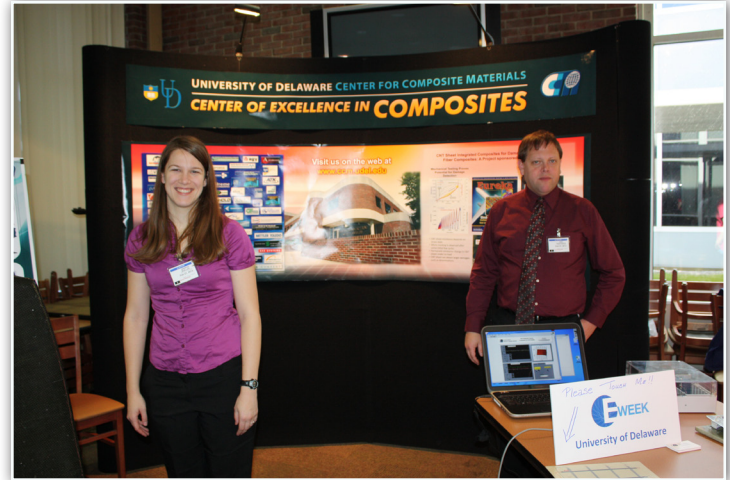
UD-CCM's longstanding relationship with Boeing continued during National Engineers Week in February. Center research and COE educational opportunities were showcased at the company's E-Week University Day Celebration in Philadelphia.

"Feedback from the event has been very positive, and your university's participation made it so," Boeing Senior Manager Robert Beggs wrote in an email. "Please share this note with the students who attended and pass along my personal thanks for their outstanding efforts. Hope to see UD again next year."

According to CCM assistant director Dirk Heider, the display was well attended by Boeing employees, including many CCM alumni. "It was a great opportunity to discuss the Center's projects and meet contacts that could lead to collaborative efforts in the future".

Highlights of CCM's contributions were a sensor skin jointly developed with Boeing to be applied to aircraft for structural health monitoring and a carbon wakeboard fabricated as a project in Prof. Erik Thostenston's 417/617 composites class. The students are continuing to work on the project as an independent study, with input from Antonio Paesano at Boeing.

Jennifer Mueller, one of two student representatives from UD at the event. "After the showcase, we were given a tour of the V-22 Osprey facility. What a great experience."



*Jennifer Mueller, one of two
student representatives from
UD and Prof. Erik
Thostenston*



UD College of Engineering Dean Search

The University of Delaware invites nominations and applications for the position of Dean of the College of Engineering. The Dean provides academic leadership for over 130 faculty members in seven departments that enroll approximately 2000 undergraduate and 800 graduate students. The College of Engineering is home to a wide range of disciplines that support world-class programs and eight research centers. A multi- and inter-disciplinary perspective is important to the College and the University. External funding expenditures in the College through contracts and grants totals more than \$50 million per year. Reporting directly to the Provost, the Dean occupies a key role in the life of the University, is an integral member of the central administrative team, and actively participates in the University's development activities. For more information about the college, please visit www.engr.udel.edu, and www.engr.udel.edu/deansearch

REQUIREMENTS:

The Dean should possess an outstanding academic record consistent with a senior faculty appointment, have experience in recruiting and retaining faculty of excellence and be able to manage a complex academic enterprise. The Dean must provide vision for the college and foster both vigorous research programs and excellent undergraduate and graduate education across the breadth of disciplines within the college. An ability to develop innovative academic programs and to promote the college's interests with internal and external constituencies within the state and at the national level is important for the position. The Dean must be able to set priorities, communicate effectively and mobilize support across the College for achieving goals. The Dean must be committed to interdisciplinary and multicultural education and have a record of promoting diversity among faculty, staff and student populations.

CONTACT:

Review of applications will commence on March 31, 2013, and will be accepted until the position is filled. Nominations and expressions of interest will be held in confidence. Candidates should submit a letter of interest detailing their qualifications and a curriculum vitae to:

Dr. Ilene Nagel and Mirah Horowitz
Russell Reynolds Associates
Consultants to the Search Committee
UDEngineering@russellreynolds.com

The University of Delaware is an equal opportunity employer that encourages applications from minority group members and women.

NEW PUBLICATIONS

Journals

Bogetti, T. A., J. Staniszewski, B. P. Burns, C. P. R. Hoppel, J. W. Gillespie, Jr., and J. Tierney, “[Predicting the Nonlinear Response and Progressive Failure of Composite Laminates under Tri-Axial Loading](#)”, Journal of Composite Materials, DOI: 10.1177/0021998312449889, June 2012; 46 (19-20), September 2012.

Khattra, N. S., Z. Lu, A. M. Karlsson, M. H. Santare., F. C. Busby, and T. Schmiedel, “[Time-Dependent Mechanical Response of a Composite PFSA Membrane](#),” Journal of Power Sources, 228, pp. 256-69, 2013.

Levy, A., D. Heider, J. J. Tierney, and J. W. Gillespie, Jr., “[Inter-layer Thermal Contact Resistance Evolution with the Degree of Intimate Contact in the Processing of Thermoplastic Composite Laminates](#),” Journal of Composite Materials, DOI: 10.1177/0021998313476318, 2013.

Mueller, J., J. W. Gillespie, Jr., and S. Advani, “[Effects of Interaction Volume on X-Ray Line-Scans Across an Ultrasonically Consolidated Aluminum/Copper Interface](#),” Scanning, Submitted September, 2012, doi 10.1002/sca.21071.

Minnicino, M. A. and M. H. Santare, “[Modeling the Progressive Damage of the Microdroplet Test using Contact Surfaces with Cohesive Behavior](#),” Composites Science and Technology, 72 (16) pp. 2024-31, 2012.

Conferences

Abu Obaid, A., G. Pandey, J. W. Gillespie, Jr., D. Heider, E. T. Thostenson, M. J. Deluca, and C. J. Felker, “Characterization of the Mechanical and Electrical Properties of Carbon Nanotube Yarns,” SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Chowdhury, S. C., B. Z. (Gama) Haque, and J. W. Gillespie, Jr., “Study of the Mechanical Properties of the Carbon Nanotubes Junction using Molecular Dynamics Simulation,” SAMPE 2013, Long Beach, CA, May 6-9, 2013.

NEW PUBLICATIONS

(Continued)

Conferences

Chowdhury, S. C., B. Z. (Gama) Haque, and J. W. Gillespie, Jr., "Study of the Stress Wave Propagation in Carbon Nanotubes using Peridynamics Simulation," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Haque (Gama), B. Z., I. Biswas, and J. W. Gillespie, Jr., "Modeling the Depth of Penetration of Very Thick Composites," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Haque (Gama), B. Z., R. J. Stanton, and J. W. Gillespie, Jr., "Perforation Mechanics of Thin Composites," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Khattra, N. S., J. J. Tierney, S. Yarlagadda, N. Shevchenko, J. W. Gillespie, Jr., E. S. Schrank, and S. J. Stanhope, "Carbon Fiber Based Custom Orthoses for Augmenting Net Ankle Moment in Gait," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Mueller, J. E., J. W. Gillespie, Jr., and S. G. Advani, "Diffusion as a Bonding Mechanism for Ultrasonically Consolidated Metal Matrix Composites," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Sockalingam, S., M. Keefe, and J. W. Gillespie, Jr., "Detailed Modeling and Analysis of Single-Fiber Microdroplet Test Using Cohesive Zone Approach," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Walter, M. S., S. E. Boyd, T. A. Bogetti, B. A. (Gama) Haque, S. Yarlagadda, S. Sharma, and J. W. Gillespie, Jr., "Modeling Four Quadrant Low Velocity Impact on Thick-Section Composites With and Without Interlayers," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

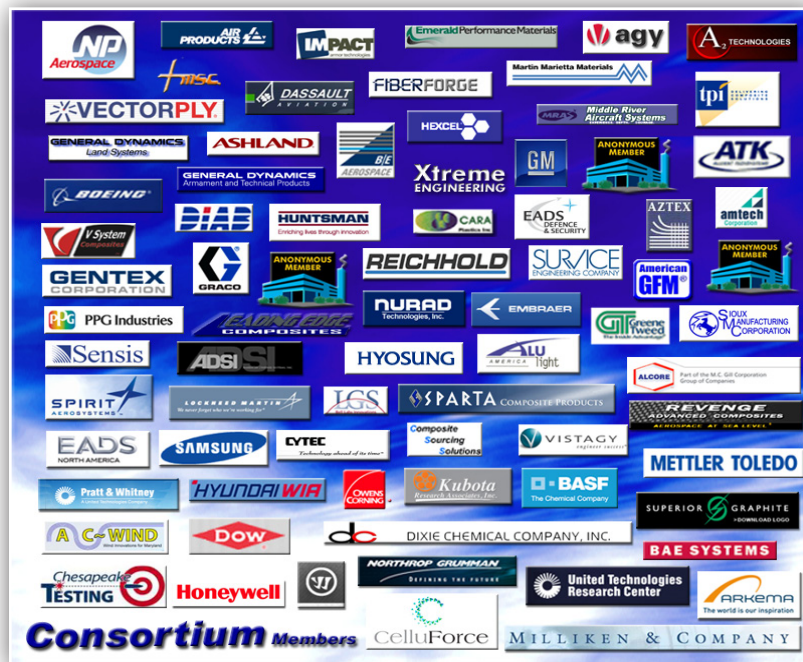
Yarlagadda, S., C. Scott, M. J. Dempah, J. J. Tierney, J. W. Gillespie, Jr., E. Schrank, and S. J. Stanhope, "Rapid Prototyping of Composite Orthoses," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

Zhang, D., D. Heider, S. G. Advani, and J. W. Gillespie, Jr., "Out of Autoclave Consolidation of Voids in Continuous Fiber Reinforced Thermoplastic Composites," SAMPE 2013, Long Beach, CA, May 6-9, 2013.

CONSORTIUM MEMBER NEWS

We would like to thank Superior Graphite, Chicago, Illinois, for the recent renewal of their membership. We also wish to thank our many other consortium members for continuing to participate in CCM's research and development activities.

To learn more about the benefits of becoming a member, please visit us on the web at www.ccm.udel.edu/Consortium/benefits.html



*Celebrating 39 years
of significant
contributions to
composites science
and technology, the
education of students,
and the creation and
transfer of technology
to industry.*

Please visit us on the web at <http://www.ccm.udel.edu>

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