

Program News

- Christina Johnson, who graduated with a B.S. in engineering science and a B.S. in physics, is a doctoral candidate in mechanical engineering at the University of Virginia.
- Ruthanne Ratliff Bradley, who received a Bachelor of Arts in engineering management, works at TYCO in the radio handset division.
- Sarah Smiley, engineering science major '09, will attend graduate school for engineering management at Dartmouth College.
- We established the first student chapter of American Society of Mechanical Engineers (ASME) at a women's college. ASME provides many leadership and networking opportunities both locally and nationally.

Upcoming Events

- **April 17-18, 2009**, Explore Engineering at Sweet Briar weekend event for high school sophomores, junior, and seniors. Come see what engineering is all about; see our website for more details.
- **Summer 2009**, Explore Engineering at Sweet Briar week-long summer residential camp for rising high school juniors and seniors. Specific dates to be announced; see our website for more details.



First year engineering students attend Society of Women Engineers conference in Baltimore, MD.



Our courses routinely emphasize hands-on projects. Students in this year's dynamics course used their design skills in Autodesk Inventor and their computational and modeling skills in MATLAB to build and successfully model a working trebuchet.

Scholarship Opportunities

For Fall 2009 and Fall 2010

FIRST Robotics/Sweet Briar College scholarships for high school students who have participated in FIRST — For Inspiration and Recognition of Science and Technology, see our website for more details.

Expected for Fall 2010 and Fall 2011

Combined merit and need based scholarships, four years for \$10,000 each year, along with funding for conference attendance and other means of engagement with the engineering community.

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THINK IS FOR GIRLS.sm



Students, Faculty Collaborate on Engineering Research Projects

Over the past year, Sweet Briar students have participated in a number of projects that exemplify the kinds of research opportunities the College's engineering program promises its graduates, including:

Improving efficiency of airfoils

Assistant professor of engineering Dorsa Sanadgol and her students are testing the efficiency and air-flow properties of airfoils using a novel approach. The concept — using electrostatic films to reduce flow separation over airfoils and turbomachinery blades — is a collaboration between Sanadgol and her co-inventor, George T. Gillies from the University of Virginia.

Sanadgol and Gillies have filed for a provisional U.S. patent on a process they believe will make industrial gas compressors more efficient. Industries that could benefit include power generation, oil production and airplane manufacturing.

To test the theory in the Sweet Briar lab, Sanadgol and research assistants Victoria Nilsson '10 and Christina Johnson '08 ran wind tunnel tests on two airfoils that were identical except that one was covered with an electret film. As the researchers had hoped, there was significant reduction of flow separation in the electret-coated airfoil. Katelyn James '11 is working on instrumenting the wind tunnel for more detailed test. The team is continuing testing and with the early promising results, hopes to attract investors to support further development of the process.

Designing and building a robotic research assistant

Assistant professor of engineering Scott Pierce is working with Maxine Emerich '10 and Kaelyn Leake '09 to design and build a six-degrees-of-freedom articulated robotic arm. The robot will be used in associate professor of physics and engineering Hank Yochum's lab to fabricate nanostructured optical devices on glass slides.

The robot is designed to pick up slides and swirl them in liquid reagents in a controlled manner. Emerich has developed computer



Sweet Briar junior Victoria Nilsson (from left), assistant professor of engineering Dorsa Sanadgol and 2008 graduate Christina Johnson set up a wind tunnel to test the effects of adding electrostatic charge to airfoils.

programs that analyze the motion of each link of the robot as its joints rotate, and used the software to design the robot link geometry. She also has designed robotic joints that are composed of drive motors, sensors and structural elements.

Leake has focused her efforts on the design and programming of the robot control systems. She has selected control components and written software that models robot dynamics.

Designing nanostructured optical devices

Yochum and his students are designing, fabricating and testing electrochromic optical devices. The devices, which change color with applied voltage, have many potential applications, including being used as electronic paper.

The project is especially distinctive because it is interdisciplinary, bridging physics, chemistry and materials engineering. It also is a collaboration with researchers at Virginia Tech, and Yochum has been a co-author on work published recently in Applied Physics Letters, the Journal of Applied Physics and Macromolecular Chemistry and Physics.

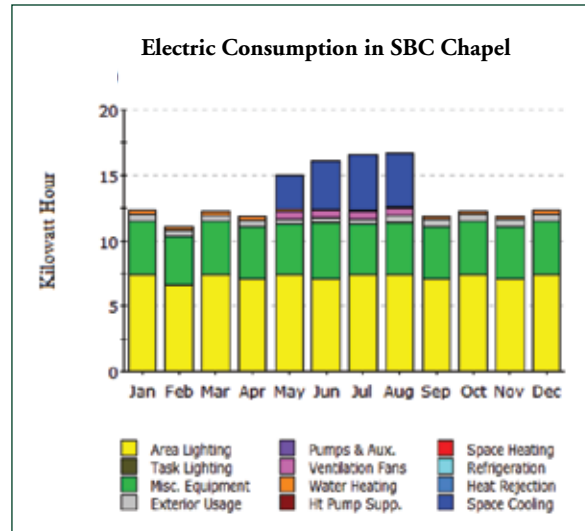
Greening SBC: Team Studies Energy Use in Campus Buildings

A group of Sweet Briar College students conducted an energy audit of the campus for the Presidents Climate Commitment, a pledge by Sweet Briar President Elisabeth Muhlenfeld to become climate neutral. The team's goal was to find ways the College can be more energy efficient and reduce its carbon footprint.

Under the supervision of Sanadgol, associate professor of engineering T.C. Scott and Wiley & Wilson engineer Dave Nardi, the students — Aimee Savage '10, Sara Sheppard '10, MaryAnne Haslow-Hall '11 and Kelly Mauri '10 — completed a preliminary assessment of 20 campus buildings.

Based on heat-load analysis, they identified the four most energy-consuming buildings: Sweet Briar Memorial Chapel, Randolph Residence Hall, Dew Residence Hall and Guion Science Center. The four structures were subjected to in-depth analysis using a software program called eQUEST (electronic Quick Energy Simulation Tool).

The figures above are the eQuest results for the electricity consumption of the chapel. This building is unique in that it is used year round and for about the same number of hours each week. Because of this, the chart has a constant read out all year except for the summer months when air-conditioning is used. The lighting also consumes nearly twice as much energy as anything else in the building.



The same in-depth analysis was performed for Randolph, Dew and Guion. The students found that:

- Lighting is the largest electricity consumer at Sweet Briar College.
- The most effective change will be using higher efficiency light bulbs around campus.
- Sweet Briar loses a great deal of money through thin walls and leaky windows.
- An inexpensive practice could be checking all weather stripping on doors and windows and replacing where needed.
- A more expensive option could be the installation of insulation in attics to prevent air leakage through the building envelope and the replacement of leaky single-pane windows.

The students also prepared a brochure detailing their findings and presented the study at the

annual Mid-Atlantic Regional Conference of Undergraduate Scholarship held at Sweet Briar.

The project definitely impressed the student auditors, who now can't help but notice old, cracked weather stripping and inefficient windows. "I'm never going to walk through a door the same way again," said Savage, an engineering science major from Virginia Beach, Va.

Making Engineering Fun Rolls on at Red Bull Soap Box Derby

On a lark, engineering students Maxine Emerich '09, Katelyn James '11 and MaryAnne Haslow-Hall '11 entered a car in the 2008 Red Bull Soap Box Derby in Philadelphia. They were thrilled when their design — a 7-foot-tall, 175-pound hot pink, stiletto-heeled woman's shoe — was one of the 39 selected for the race from a pool of nearly 250 applications.

Red Bull Race organizers stress originality and personality in the vehicle designs as much as speed. The SBC team, a mix of engineering, biology and art majors, chose the shoe motif to draw attention to their all-women's school.

In a few short weeks, the team designed and built the racer from two-by-fours, bicycle parts and papier-mâché.

The day before the derby, the team and SBC faculty advisor Scott Pierce scouted the race course, some 1,785 feet of road on an intimidating incline known as Manayunk Wall. A tropical storm was expected to arrive in Philadelphia just in time for the first race, but the Red Bull organizers vowed it would go on rain



Sophomore Katelyn James pilots the car during a run on Sweet Briar's campus while junior Maxine Emerich handles the brakes.

or shine. Worried about drivers James and Emerich's safety on a treacherously wet track, Pierce fretted through a sleepless night.

"It was a steep hill. I insisted that they stay on the brakes all the way down," he said, though he'd gone so far as to rig the brakes so they couldn't fully release. "It was funny seeing Katelyn on the Jumbotron yelling at Max to 'go faster, go faster!'"

The morning of the race was reserved for the "People's Choice" segment of the competition. Spectators, who had a few hours to meet the racers, were asked to send text messages to vote for their favorite teams. With the girls — clad in high heels and sundresses — handing out homemade muffins in front of a giant pink shoe-car, the "Team P.I.N.K." booth was a popular stop for the fans, and they finished third in the voting.

Then the rain came. "We should have made an ark instead of a shoe," Pierce said.

All agreed that the event was a lot of fun and that the students learned about using teamwork to finish a big project on a tight deadline.



Students in Sweet Briar's introductory design course build and race boats made of 20 pounds of cardboard and 50 feet of duct tape in the annual regatta.

Sweet Briar Hosts 'Explore Engineering' Weekend for High School Women

Engineering faculty and students hosted 17 high school students from around Virginia for an event aimed at getting girls excited about the creative and exciting work of engineers. The participants stayed in dorms with Sweet Briar students, toured our lab facilities and took part in a nearly daylong engineering project, designing and building stereo speakers from household items.

"I loved it! It's the best," said one participant. "I loved working with the Sweet Briar students!"

The weekend coincided with SBC's Homecoming, giving the high-schoolers the chance to attend homecoming events, including our fifth annual SBC Engineering Cardboard Boat Regatta.

This event is funded by a National Science Foundation STEP award. All of the high school students had a great time and we look forward to our next Explore Engineering Weekend. Check our Web site, <http://www.engineering.sbc.edu/>, for details.

SBC Engineering Helps Local Group Make a Difference for Disabled



Senior Amanda Baker and junior Sara Sheppard design improved manufacturing process.

As part of this spring's Technology and Society course, students and faculty are partnering with Lynchburg Sheltered Industries, a local organization that helps people with disabilities to achieve greater independence and self-esteem through vocational training and employment.

Students are designing and fabricating tools that will improve manufacturing processes for disabled workers. Students will also

take part in the National Scholar Award for Workplace Innovation & Design. This award encourages the development of creative technological solutions for barriers that prevent people with disabilities from entering or advancing in the workplace.

Message from the Director

The engineering program continues to be a dynamic and exciting environment for our students, faculty, and staff. As you can see from this newsletter, we do interesting and important work in our community, in our research labs and in the classroom. Sweet Briar engineering students and faculty strive to make a difference in the world.

Our program offers two degrees, the Bachelor of Science in engineering science and the Bachelor of Arts in engineering management. The engineering science program emphasizes an interdisciplinary blend of mechanical engineering and electrical engineering. The Bachelor of Arts in engineering management offers a blend of engineering, business management and science courses.

The engineering program emphasis is on electromechanical systems, an important and emerging area of engineering. If you think about the number of devices that have both mechanical and electrical elements, from artificial hearts to computer hard drives to autonomous wheelchairs, the training we provide is both specialized and broadly applicable.

We continue to be active in the Central Virginia community and look forward to collaborations with area industry and schools. More information about our program may be found at www.engineering.sbc.edu.

Hank Yochum, Ph.D.
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Student Spotlight

Kaelyn Leake, a senior engineering major, hails from Sebastopol, Calif. Kaelyn is an avid fencer and is the department's best unicyclist. She came to Sweet Briar because of our small size and the many and varied opportunities in and outside the classroom.

While at Sweet Briar she has been to a village in Guatemala to work on a clean water supply system, studied abroad in Ireland and interned at Flowserve here in Central Virginia.

Kaelyn is majoring in physics in addition to engineering. She plans to attend graduate school in mechanical engineering in the fall.

