Student Design & Experiential Learning Center

Summer 2009

A Newsletter for alumni and friends of the Student Design Teams

New Design Center

S&T student design teams have long "lived" in a cramped work area lacking air conditioning, adequate workspace and even bathrooms. The main garage – a 1,500-square-foot structure – gets especially cramped during the spring semester when dozens of S&T students show up to put finishing touches on their projects for upcoming multinational competitions.

This is crunch time for the teams, and tensions can run high. "Toward the middle of the spring semester, when everybody needs to use these machines, we have to stand in line," says Mike Janaske, chief engineer and past secretary for the Human Powered Vehicle Team. "It gets pretty crowded, and all of the teams have to learn how to manage our time effectively." These conditions prompted Dick Arnoldy, CE'69, Bob Brinkmann, CE '71, and Barry Koenemann, CE'70, all construction company CEOs based in St. Louis, to lead efforts to turn an old bakery into a new design center.

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Amber Gomaz

Amber Gomaz is a junior in architectural and civil engineering and student Director of Finances for the Missouri S&T Solar House Team, responsible for helping raise funds for the $500,000 budget and keeping track of all purchases. Amber joined the Show-Me Solar project during her freshman year because she wanted to gain knowledge of solar energy and learn as much as she could about construction. She says "the team and position have been a very big learning experience. I have had to learn to manage my time so that I can spend equal amounts on schoolwork, finances, and construction".

When she graduates Amber plans to get a job working with an architectural engineering firm, because of her love of the building design process. "I love to paint for fun", Amber says with a smile. "I started painting when I was just 13 and have loved it ever since. I also draw in my free time. I even work on the Solar House in my free time because I liked to build things".

More Inside:

Missouri S&T

University of Science & Technology

Experience This

The SDELC manages a design team blog at experiencethis.mst.edu that takes a "lighter look at Missouri S&T design". This is where you'll find the down-in-the-pits stories, photos, and comments about life on a Miner design team. Many of the stories come from team members who take a moment to breathlessly "phone in" some important result, good, bad, or fun-

ny. You can follow your favorite team, post your comments, find links to the teams, and become "part of the action" through stories and videos. Team members who can't participate in competitions due to classes or travel budgets (teams can rarely afford to take their entire crew to competition) can check on their friends' progress.

Goodwin Scholarship

Lisa Battern was named the most recent recipient of the $1,000 Goodwin Scholarship, established to recognize exceptional contributions to a Miner design team member. Lisa has been one of the busiest students on campus, serving as a member of the Solar House Team, the Society of Women Engineers, IEEE, several service and honors organizations, as well as being a teaching assistant. The Goodwin award helped Lisa finish her 'super senior' fifth-year studies at Missouri S&T. Lisa strongly exemplifies the saying, "if you want something done, give it to a busy person."

Solar House

In less than two months the S&T Solar House Team will rejoin the world's biggest instant solar village as one of only two schools to have taken part in all four Department of Energy Solar Decathlon competitions. The team, known as Show-Me Solar since it is Missouri's only decathlon entry, has an underlying theme of "Expanding Horizons" for the educational part of this home's concept.

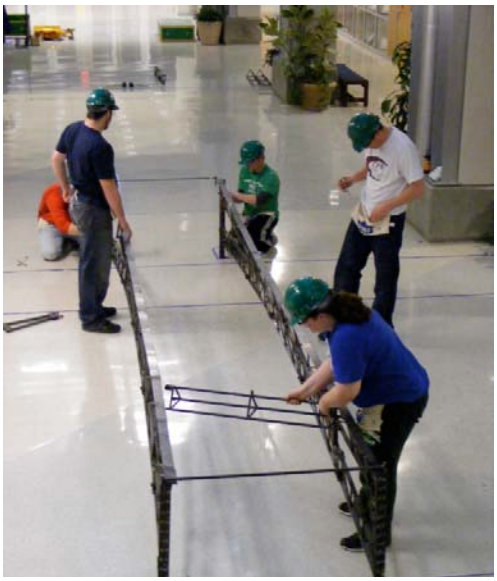
The Show-Me Solar home is a sustainable structure that harvests all of its energy needs directly from the sun. The modern style of the home is governed by a modular three-foot grid on which everything connects, simplifying construction and unifying the interior and exterior with crisp, elegant lines. "Expanding Horizons" is physically expressed in the home through the horizontal louvers, the lines created by the windows on the southern and northern elevations, the consistent nine-foot interior walls, and the main longitudinal axis. S&T's striking one-piece structure will also

save time and money. Time, because it will be faster and easier to load, off-load and reconstruct as a single module, and cheaper, because it will take fewer commercial trucks to move it nearly 1,000 miles to the Washington DC competition site.

The Decathlon is a ten-event competition for student-designed 100% solar-powered homes that covers everything from architecture to innovation, hot water to air conditioning, home office to entertainment, all in compact homes that have an open, spacious feel. In early October nearly twenty homes converge on the National Mall for a two-week competition. The Miners are going to open the home and host a DC-area alumni section reception just after the competition begins.

Steel Bridge

The Steel Bridge Team had a good year with an innovative design that won both the aesthetics or "best looking bridge" event and the display category for their pre-building static product presentation at the Illinois regional competition. They also did well in the assembly stage but the bridge fell just 75 lbs short of the required 2,500-pound load before the structure exceeded the maximum deflection standards.



Concrete Canoe

The Concrete Canoe Team finished in a solid fifth place in the regional competition, scoring well on oral presentation and race, and improving on their '08 finish. The Miners

injected some movie-theme humor into both their presentation and boat, which seemed to be a big hit with the judges. Plans for the next boat aren't too detailed at this point but team leader Mark Ezzell says they may go with another movie theme for the boat this year, since

last year's theme was easy to "sell". Mark says "We were very happy with the shot-crete spray system so I am confident that we will use it again. The only thing I can guarantee is that along with a healthy dose of competition, we will make sure to have a good time while we are out there. With the things that we learned last year and some returning officers I think that we have a decent shot at doing well this year."

To the supporters of S&T student design teams,

The student design experience is a unique opportunity that continues to have a major impact on our students' educational growth. Ten years ago two teams moved into the newly-established student design center facility. Since that time our students have established an international reputation for excellence in design and execution that is the hallmark of an S&T education. The success of those early teams has now attracted nearly 500 students involved with a dozen teams and special projects. Those students have competed worldwide, demonstrating their amazing talent at solving real-world challenges. We all will be dependent on these leaders as they tackle the global challenges impacting society's quality of life for generations to come.

As a student I was fortunate to be a member of S&T's first national championship Solar Car Team in 1999. That team discovered success was not based on just talking about what we would do but proving our innovations against real competition with an actual product, and that performance model has become the benchmark guiding all of our student design teams today. These design team experiences continue to provide our students with a valuable introduction to the challenges and opportunities they'll encounter in their careers.

Today I have the privilege of serving our students as interim director of the Student Design and Experiential Learning Center. This center provides a new generation of Miners the same opportunities that changed my life and lives of so many other design team alumni for more than a decade. Each day I witness the incredible skills that our students develop while attending S&T, and it is through these students and their efforts that I know our global challenges will be met.

Our decade-long expansion now has our small garage facility bursting at the seams. Our current facility is too small to address the demand for our uniquely-applied approach to education. Without proper facilities we will have to turn students away from these valuable learning experiences, depriving future problem solvers this critical educational opportunity.

Thanks in large part to the vision and support of Dick Arnoldy, CE'69, Bob Brinkmann, CE'71, and Barry Koenemann, CE'70 , we are well on our way to providing our future graduates the facilities they deserve. With their combined leadership gift of $1.14 million we know this $2 million project is possible.

As a valued member of the Miner family, please join us in this visionary effort to keep Missouri S&T students where they belong; leading the competition in demonstrating the strength of an S&T education.

Paul Hirtz, EMGT'95
Interim Director
Student Design and Experiential Learning Center

Building Project

The plan is to renovate the university's Miner Rec Building, known around Rolla as the old Holsum Bread Bakery at 10th Street and Bishop Avenue, into a facility that would provide more room for the design teams, showcase the teams' past success and provide a way for teams to earn additional financial support.

More importantly, each team's production area will be larger and more flexible than the existing garage. The new facility would be designed to display winning solar cars, human-powered vehicles and other successful projects (S&T students have won several national design championships). The building would also consolidate the center's operations by co-locating the SDELC's administrative office space currently located on the north end of campus. The university needs $2 million to begin construction. Arnoldy, Brinkmann and Koenemann have already contributed $1.14 million of the $1.15 million raised to date. Now, they're looking to fellow OGS members and other design team boosters to pitch in the remaining $850,000 for the project. It's a worthwhile investment, says Arnoldy, the CEO of ARCO Construction Co. Inc. in St. Louis, Koenemann agrees.

"If anybody's seen the existing design center, they know it's incredible that our teams have been able to achieve the successes they have," says Koenemann, CEO of United Construction Enterprise Co. "We think it's important, as supporters of the university, to help provide the facilities that will help Missouri S&T achieve its goals."

To help the highly-regarded Miner student design teams reach this goal, please contact Tony Arnold in the S&T Development office. Tony can be reached at:

223 Castleman Hall
(573) 341-6088
arnoldab@mst.edu.

EWB

In May the Engineers Without Borders returned to Erquis Sud, Bolivia, a remote community in the hills bordering Paraguay and Argentina, to help install clean water supply systems in the impoverished settlement. "During the dry season the subdivision residents have no nearby water sources and must sacrifice some of what little money they have to get the water they need to survive," related team member Emily Pasch, a senior in mechanical engineering. "During the rainy season, the nearby river is infested with bacteria from animal waste and chemicals from farmers' pesticides that causes health problems for community members".

In 2008, S&T's EWB site assessment team visited the town's newest rural subdivision, being built by Habitat for Humanity (HFH),

to see how they could help. The unanimous request was for water, as HFH builds homes, not utilities. The second phase saw a thirteen-member Miner crew begin construction of a clean, reliable water source and distribution system in the community. Working side-by-side with the residents of Erquis Sud the students successfully built a ferro-cement water storage tank to help the residents through the dry season. In addition to developing their relationship with the community, the team met with local government officials to discuss potential well locations and determine the depth to drill for the required quantity of water.

About the same time a second EWB-S&T Bolivian contingent overcame some severe challenges while working on water systems in the mountain town of Tacachia. When they arrived in the remote region the Miners found

that a main water line had broken and that some of their supplies were incorrectly sized. The team still managed to re-allocate their materials, help the community fix the water line, and adapted their designs to accommodate the materials they couldn't get replaced. They did manage to complete a water tank and install the chapter's first ram pump, a low-maintenance device with only two moving parts that uses the momentum of flowing water to push water into uphill storage tanks.

EWB programs aren't just about hard work. The Miners get global experience working in other languages and business climates. They also get immersed in cultural aspects of the area, taking day trips through the Bolivian wine region and taking part in celebratory cer-

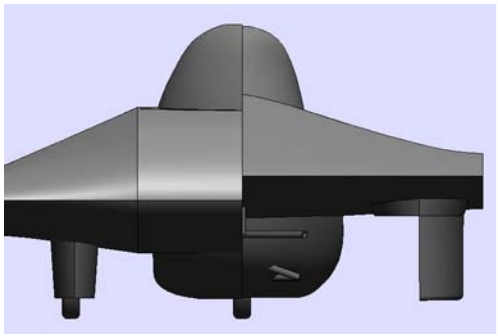
emonies within their partner communities. Sitting it out for the summer are EWB's Guatemala and Honduras projects. The Guatemala team is finalizing designs and seeking funding to build a water well and distribution system over winter break, among other projects. The Honduras trip set for August was postponed due to political concerns following the June presidential coup.

Finally, spring '09 saw the inception of several new fundraisers. The overseas program benefited from a wildly-popular faculty talent show in Leach Theater and a 5K run in St. Louis both of which raised funds and awareness about the projects. With a growing list of supporters and sponsors, Missouri S&T's EWB team continues to grow this critically important program and burnish their reputation as a highly productive and successful chapter.

Solar Car

S&T's famous Solar Car Team is undertaking a new design approach for the 2010 North American Solar Challenge, a strategy centered on economy, simplicity and ruggedness. Solar Miner VII will switch to less-powerful solar

cells, but contest rules allow teams mounting the cheaper array to have a larger usable active area so the Miners think it will even out on the end. More importantly the Miners will save nearly $100,000 by giving up the harder-to-get space-grade cells. Team leader Adam Lewis tells us they'll soon choose between two body designs, one of which requires a suspension redesign but provides substantial aerodynam-



ic advantage, and they'll start construction in the fall. The Miners will also revert to a steel chassis that will add just a few pounds to the car's weight but should pay dividends in ease of manufacture and chassis toughness. Lastly, Kokam America has stepped up to the plate and donated the car's entire $14,000 battery pack with a more stable lithium polymer design, and coupled with a more proven battery protection system, the new car should be free of the gremlins that haunted Solar Miner VI. The Miners are still using Solar Miner VI to practice and train new team members in the fine art of solar car driving.

Engineering 111

Engineering 111 offers a service learning project based in S&T's Residential College learning community. Fifteen S&T students constructed a climbing wall challenge, a group balance board, a "break-out" obstacle course and three low-ropes confidence courses this spring at Boys & Girls Town of Missouri. These new facilities will help build confidence

and self-esteem in children with emotional and behavioral problems. The facility's residents learn to develop positive relationships with their peers and families, and better understand that growth comes from developing teamwork and communication skills.

The Boys and Girls Town officials have been so pleased with the success of the Engineering 111 partnership that they have invited the class to get involved with building more therapeutic facilities.

Design Team Alumni

Preston Carney (CE '02, MS CE '03), a former member of S&T's Steel Bridge Team, has been giving back to Missouri S&T since before he graduated. He became a student member in the Order of the Golden Shillelagh (OGS) while finishing his master's degree and has already become the youngest-ever OGS executive committee board member. Preston, who works as a structural engineer to Wallace Engineering in Tulsa, OK, is president of the Miner Alumni Association Oklahoma Section, serves as an admission ambassador, attended last year's solar car race stage stop at Neosho, Missouri, and actively gives his time and financial support back to S&T. Preston says, "I look back and remember the fun times of building bridges and taking them to competition. Many hours of work and numerous late nights are required to get the job done. It is a lot of work, but in the end you have a final product that you can be proud of and take to competition. Overall, being a member of the Steel Bridge Team was a very rewarding experience. Students are able to apply what is learned in the classroom to a real-life problem and develop their own unique solution. While you may not realize it as a team member, taking part in these activities teaches students many valuable lessons, such as leadership and work ethic."

Preston goes on to say "The impact of the Student Design and Experiential Learning Center goes beyond current students. It has a key role in recruiting efforts and provides points of visibility for the university, both of which contribute to the success of Missouri S&T as a whole. It is for these reasons that I choose to support these programs, and I encourage others to do the same".

AAVG

AAVG has two separate design groups, the traditional heavy-lift airplane and a newer high-flying rocket. The airplane squad overcame

two years of frustration and earned top U.S. honors and third place overall in the Marietta, Georgia SAE Aero fly-off, lifting off just inches before the end of the runway and completing several successful cargo flights.

At the NASA-sponsored University Student

Launch Initiative the rocket crew's 12-ft-tall projectile flew an instrument package nearly a mile high, and was voted "Best Looking Rocket" by their peer schools.

The Miners placed 7th out of nineteen university teams and also won the Best Team Spirit award. NASA's competition judges then evaluate each team's rocket design, flight data and final written report about payload results and overall experience.

Formula SAE

The Missouri S&T Formula SAE racing team just completed its best year ever! Fresh from a top-ten world ranking the Miners won their first-ever SAE race when they dominated the SAE season's inaugural race with top-level performances in autocross, design, presentation and endurance.

This victory marked the team's 20-year an-

niversary of experiential learning and set the stage for some incredible events at the big race, when over 100 international race crews descended on the Michigan International Speedway (MIS) for the world's biggest Formula SAE event. S&T reached the design semifinals and posted strong showings in autocross and acceleration, then charged to near the top of the pack in the all-important endurance race. Cold, wet weather played havoc with teams' strategies as schools gambled on running rain tires or slicks, but the S&T pit crew played it perfectly and # 8 blistered the track, rallying to nearly crack the top-three tier, and had the crowd cheering.

SAE California wrapped up the Miner's ambitious racing season, where S&T and perennial power RIT turned it into a two-car race, decided only when a broken weld forced the S&T car to withdraw.

S&T FSAE continues to race year round, training drivers and testing and improving designs, and they plan to run in Toronto next month on a wide-open road course that mirrors the big Grand Prix events.

Human Powered Vehicle

S&T's Human Powered Vehicle Team continues to be top-tier competitors in one of education's more unusual design events. Outgoing team leader Whittney Metcalf dominated the women's sprint events, winning both east and west coast events. The Miners narrowly missed taking the east coast races, settling for second place in Philadelphia's unexpectedly modified program. Just two weeks later at the Portland, Oregon west coast ASME competition the Miner men were pushing so hard they sheared a transmission component, but S&T still managed to hold on to 3rd place in a nip-and-tuck battle decided only by the endurance race final standings.

Robotics

The '09 Intelligent Ground Vehicle Competition (IGVC) was such a tough event that not one university team managed to complete the event. The Miners scored well in the design presentation, and fought through a rain and lightning-plagued event with an excellent mechanical robot platform that seemed to lack just one facet of its control systems. That

"missing link" kept the group from qualifying for the autonomous course, but the students will bring back Aluminator next year with a re-vamped control program that they hope will finally guide them across the finish line

Baja

The S&T Baja team moved up more than 20 places over last year's finish and ended the year on solid financial ground. Just as important the "Mud" Miners dramatically improved their race performance, moving up more than 20 places in the SAE Baja race from the previous year, and that credit goes to a sharply-

focused core of students led by Casey Boyer. In the all-important four-hour endurance race S&T Baja overcame a broken drive chain, clawed their way back near the front of the pack, and still finished the grueling course that claimed nearly 50% of the other vehicles. Had the chain not broken it would have been the best finish in the Miners' four-year team history.

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Name: _____
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Name to appear on Donation if different:
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Team Support $_____
Center Endowment $_____
Building Fund $_____
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In the comment section below, please list any specific instructions or identify which teams(s) you would like to support with your donation.

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112 ERL
500 W 16th St
Rolla, MO 65409-1410

Comments:_____

SDELC Staff

Interim Director	Dr. Paul Hirtz
Manager	Bob Phelan
Admin. Asst.	Susan Robison
Newsletter	Mike Janaske

Main Team Advisors

AAVG	Dr. Fathi Finaish
Baja SAE	Mr. Randall Lewis
Concrete Canoe	Dr. John Meyers
EWB	Dr. Richard Stephenson
Formula SAE	Dr. Hank Pernicka
HPV	Dr. Keith Nisbett
Robotics	Dr. Donald Wunsch
Solar Car	Dr. Ray Luechtefeld
Solar House	Dr. Katie Grantham-Lough
Steel Bridge	Dr. Roger LaBoube

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MISSOURI S&T

Advanced Aero Vehicle Group

SAE Aero Design East	3rd (top us team)
Design	2nd
Payload	3rd
NASA USLI	7th
Best looking rocket	
Team Spirit	

Human Powered Vehicle

East Coast Competition	2nd overall
Design	2nd
Sprint (F/M)	1st / 2nd
Drag race	3rd
West Coast Competition	3rd overall
Design	3rd
Sprint (F/M)	1st / 3rd
Endurance	3rd

Engineers Without Borders

Engineers Without Borders completed several assessment and implementation trips this year in Honduras and Bolivia. For more information see their article on page 4.

Formula SAE

Formula SAE Virginia	1st overall
Presentation	3rd
Endurance	1st
Autocross	1st
Formula SAE Michigan	6th overall
Design	3rd
Autocross	8th
Formula SAE California	14th overall
Autocross	3rd

Concrete Canoe

Regional Competition	5th

Steel Bridge

Aesthetics Award

Best Presentation

Robotics

IGVC results have not yet been published.

Design Semifinalist

Baja SAE

Baja SAE Alabama	44th

500 W 16th St
Missouri University of Science and Technology
Rolla, MO 65409-1410
Phone: (573) 341-7546
design.mst.edu

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