



Student Design and Experiential Learning Center Summer 2010 Newsletter

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SOLAR CAR

In the 20th anniversary of U.S. solar car racing, *Solar Miner VII* took 5th place in the 2010 American Solar Challenge, two places higher than their 2008 finish. Head mechanical engineer Andrew Sourk changed many elements of earlier Solar Miners and built a slender steel chassis lighter, yet stronger than the aluminum frames that carried S&T to two



prior championships. The design strengthened critical stress points, emphasized reliability, and helped simplify many of the car's systems, moves that paid off handsomely. *Solar Miner VII* took 3rd place in one race stage and ran strong with other top teams through most of the competition. The 1,200-mile race that twisted from Oklahoma to near Chicago covered sections of previous solar car races, and was a much

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ENGINEERS WITHOUT BORDERS

Missouri S&T students made three separate assessment and implementation trips this year to Central and South America.

Nahualate, Guatemala

In January, six EWB Miners gathered survey data for a well/tank/pipeline system that will provide clean water for the first time ever to the town's approximately 5,000 residents. They also took community health surveys,



and met with the local water distribution committee and potential contractors so they could return to the U.S. and coordinate the help with fundraising partners. Grad student Alex Tyson said "we spent the majority of the time surveying paths, roads, and homes for

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ROBOTICS

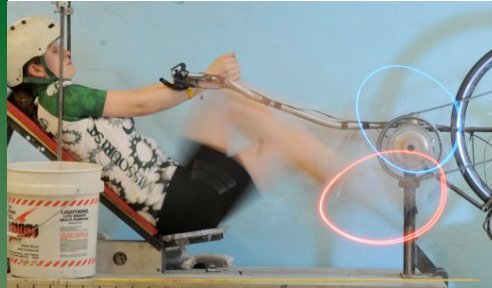
2010 was the best year ever for S&T's Robotics Competition Team. The Miners earned the top design score in their group, 6th in overall design, qualified for the autonomous challenge and tied for 11th out of 48 international teams at the Intelligent Ground Vehicle Competition (IGVC) near Detroit.

The team stuck to a tough design and testing regimen while building a new platform for next year. Except during changing light conditions *Aluminator's* artificial intelligence (AI) programs worked well. They overcame that glitch but ran the batteries so low they missed the chance to climb into the top ten.

Incoming team leader Miriah Anderson says "testing throughout the year definitely helped us qualify. Next year we'll have a new, more responsive chassis, and enough testing to have a full day to compete and receive the best score yet. Qualifying showed us that our vision and AI systems finally worked."

WORLD SPEED CHALLENGE

Whittney Metcalf and David Long are deep into physical training to ride *MinerDetails*, S&T's new straight-line pedal-powered machine.. In mid-September they'll be in Battle Mountain, Nevada where David will try to break the 61 mph men's collegiate muscle-powered speed record, while Whittney will set a baseline speed for other college women to chase.



The new machine resembles the bikes the Miner HPVC Team has raced to success over the past decade, but it also borrows some of the strength and mechanical designs from S&T's 2007 *StreaMiner* that first showed the world S&T's new name back when Jerrod Bouchard just missed the record.

MINER PRIDE BY DESIGN

SDEL student design teams owe a huge *THANKS!* to Elaine Russell and the staff of the Miner Alumni Association,



who have been busy this spring organizing alumni section events at many student competition sites.

Alums open their homes to our students, prepare great meals, and even take students to amazing places not open to the public. In turn the design teams show their engineering "feats" to their educational predecessors, keep our alums connected to the campus, and cement their shared pride in being a Missouri S&T Miner. Go to <http://alumni.mst.edu/events/sectionevents> to get more info on alumni get-togethers and find out when S&T design teams will be in your area.

GO MINERS!

ADVANCED AERO VEHICLE GROUP

The Aero Miners '2010 season ended with a split decision. The rocket squad's ambitious two-stage projectile, *Zephyrus*, was built to carry instruments a mile high. The two launch stages separated every time, but the recovery systems failed. The upper "sustainer" portion had small angled fins for spin-stabilized flight, but the rotational stresses apparently damaged internal electronics on both test flights. The students couldn't recover the critical sustainer element to analyze what went wrong, and bad weather prevented more launches. Since NASA requires a 100% verified flight prior to competition the Miners didn't make it to Huntsville.

The airplane team fared much better at the SAE Aero competition near Fort Worth, Texas. S&T's battery-powered *Pluto* took 3rd place in the micro-class event while *Favonius*, the Miners' heavy-lift freight aircraft, had to contend with new design requirements.



Each unlimited-class aircraft had to record its own take-off distance to be counted for a valid flight, and that's where the trouble was. The Miners' plane flew several cargo loads but recorded no data, so the sorties didn't count. They gambled that if they flew the heaviest payload and got good data they'd win the entire competition, but a broken nose wheel kept *Favonius* on the ground and left S&T in 5th place.

EWB From Page 1

the estimated six miles of pipeline that will eventually be installed. On a later trip we'll work side by side with the residents to build the system."

Santiago, Honduras

The Miners understand that helping provide a clean water systems is only half the battle against disease. S&T students worked with local elected

officials, health officers, and water committees to put together an education day in hopes that when the population understands

the value of maintaining the systems, the water project will be more sustainable. In the meantime the EWB members plan to distribute another twenty household-sized bio-sand filters and conduct health surveys to determine need and the team's impact on the community.



Tacachia, Bolivia

During the cold Missouri winter another EWB crew used their semester break to return to Bolivia and split their efforts between two projects, clean water and a pedestrian bridge to end the village's seasonal isolation. The students serviced the ram water pump installed on a previous trip, made plans to install a second unit, checked on the existing water lines and distributed sand filters to households in the region.

The next Tacachia trip is geared toward building a footbridge so residents can cross the seasonal floods that cut the town off from nearby villages. Long-term plans call for a traffic bridge to help improve the town's economic situation.

SUPPORT OUR STUDENTS

Please join Bob CE '71 and Kim Brinkmann on September 18th for an Old-fashioned French Country Picnic in St. Albans, Missouri. 2010 marks the 7th year that Bob and Kim have graciously hosted an annual dinner party and auction to support the SDEL design teams and S&T summer camp programs.

New this year is a special raffle for one of two dream vacations. The winner will choose between a four-day, three-night fishing trip for two with round-trip airfare, first class accommodations and exquisite cuisine at La Reserve Beauchene in Quebec, Canada, or a five-night stay and round-trip airfare for two to Le Cordon Bleu in Paris, France. Take delight in culinary demonstrations and enjoy your



stay at the four-star Hyatt Regency, just three blocks northwest of the Church of Madeleine. Raffle tickets for these exciting trips are available for \$100 each from student design team members or through Kim Johnson at (573)341-6359 or at kaj@mst.edu.

Besides the many delightful live- and silent-auction items, raffle tickets are available for three new Apple iPads with Wi-fi + 3G at \$25 each or five for \$100. There will be more surprises for the evening's guests, so please come out and support Missouri S&T students.

Proceeds from this fun evening support the ten SDEL design teams and summer programs at Missouri S&T.

Thank you for your support.

ALUMNI HIGHLIGHT

Brian Jones AE '02 was an active member of S&T's Human Powered Vehicle Competition (HPVC) Team from '99 to '02 when the Miners were laying the groundwork for their powerhouse teams of the last eight years.

Brian, a senior aircraft performance engineer for Hawker Beechcraft Corporation in Wichita, Kansas, has been an HPVC judge for the past two years, and next year he'll move up to the chief judge slot, which means he'll have a strong voice in keeping this intercollegiate design event safe, fun, and technically challenging.

Brian says his design team experience "taught me to work as part of a team to accomplish common goals. The most valuable lessons can come from someone you least expect, so listen closely to everyone, from the most senior to the freshman who just walked in. Even in a 'dumb' idea there could be that small fragment of information that could make all the difference. And always respect your team members."

"What I learned at Rolla was that sometimes what works for one design may not be the best thing for another."

"I also learned that eventually all two-wheeled recumbent bikes *will* crash."



BAJA SAE

The off-road Miners stepped it up a notch by building their own transmission housing to save weight. The new Baja car was based on all the things they'd learned about strength, weight, handling and durability since the team was founded five years ago, but they had to cut their ambitious two-race schedule in half when they didn't hold to their production schedule. Running in just one event, the Baja SAE West outside of Bellingham, Washington, gave them time to finish the car and keep their travel budget in the black.

The Miners tied for 13th in presentation and placed 19th in design, their best-ever static scores. One judge praised the crew as the "best presenters" of the dozen or so teams he had evaluated, a huge improvement for the team. The new gearbox performed well in the early dynamic events, but as the tests wore



on the transmission began to fail and no amount of work could make it perform as designed. Without a working drive system S&T had to sit out most of the dynamic events, ending in 73rd place overall.

Carl Lacy said "despite that problem, 2010 was a huge advancement for the team. We were lighter (by a good 85

pounds), had better ergonomics, more in-house fabrication, and earned our highest scores ever in the static events. Sometimes things happen, but I don't think we're worse off for it."



"Our 2011 plan is to tweak and reuse the existing car, and design the '12 car at the same time. This two-year approach should lead to more time spent on design, better planning and most importantly, better results. There is no reason that S&T's Baja Team can't be in the top ten each of the next two years."

"We just have to spend a lot more time in the shop."

EXPERIENCE THIS

The SDELIC's award-winning blog at <http://experiencethis.mst.edu> is a great way to keep up with your favorite student design team. Stories, photos, commentary, and some occasional fun help you understand how hard these students work, share design ideas with their competitors, and *learn*. Team members better understand systems and project management, conflict resolution, engineering, and how industry professionals conduct themselves in the business world.

NEW DESIGN CENTER

Work has already begun to convert the "ugliest building in Rolla" to the sparkling new Kummer Design Center, which honors the generous support of Fred CE '55 and June Kummer. Brinkmann Constructors won the design/build contract due to the tremendous value and flexibility the St. Louis-based firm's plans provided the student design teams.

The firm's founder, Bob Brinkmann CE '71, and his wife Kim, have been some of the Kummer Design Center's most vocal supporters. Bob and Kim have been watching S&T design teams for years and well understand the students' needs. The January 1st completion date is less than five months away, so follow the progress at experiencethis.mst.edu

CONCRETE CANOE

S&T's Concrete Canoe Team had its best season in recent memory, earning top-five rankings in every event but one. The Miners overcame problems with the concrete spray system by building the boat with just their bare hands. Before the boat was even built, Eddie Noonan started an intensive paddling training



program that paid huge dividends for the Miners. S&T men and women took 2nd place in their respective sprints, the team took 3rd place overall in the races

despite cold, brutal winds that swamped several other boats, and 6th place overall in the regional competition.

Team leader Arch Creasy said “now that we saw what our hard work accomplished, we have a much better idea of what it takes to win this event and go on to the nationals for the first time ever! We were mostly a rookie team that raced against against some tough Midwest schools who put extreme emphasis on paddling, but our inexperience sure wasn’t apparent at competition. I am extremely proud of what we did!”

The canoe team’s professionalism earned S&T the “Spirit of Competition Award” that they shared with Miners’ Steel Bridge Team.

HUMAN POWERED VEHICLE COMPETITION

S&T’s powerhouse female and male riders swept every speed-class event en route to winning both east- and west-coast speed-class competitions, earning the Miners their second national championship in four years. They dominated the always-tough ASME West event in California, winning design, male and female sprints, and taking the two-and-a-half hour endurance race by a wide margin. Just two weeks later and nearly 3,000 miles farther east at Stafford,



Connecticut, the Miners overcame cold temperatures, thunderstorms, high winds and several crashes to again sweep the

speed-class event.

SOLAR HOUSE

The 2009 S&T solar house that drew over 20,000 visitors on the National



Mall is now the newest home in the Missouri S&T Solar Village.

The university moved the house from on-campus storage, across I-44 and onto its new foundation in just a few hours.



The one-piece structure will include a small basement office from which all four houses can be monitored for research and maintenance. Once the fourth house is fully operational the solar village’s permanent landscaping plan will be wrapped up and the community will be complete. The village continues



to be an excellent public outreach asset, a growing research facility, and rental housing for several lucky S&T students.

GOODWIN SCHOLARSHIP

Whitney Metcalf, a senior in petroleum engineering, has been chosen as the 2010 Goodwin Scholarship recipient.

Whitney is the former leader of the Human Powered Vehicle Team, and is presently project manager of the World Speed



Challenge Team where she plans to set the women’s collegiate human-powered speed record later this year. She has already won nearly every human-powered vehicle race she’s entered, and is near completing her degree. Whitney also serves as the first-ever student representative on the SDELC advisory board.

FACEBOOK



You can “friend” the S&T Student Design and Experiential Learning Center at <http://www.facebook.com/SandT-Design>. Get quick updates on what S&T design teams are doing, and write your own comments in support of the Miners.

Solar Car from page 1

more spectator-friendly event. Race officials planned overnight stage stops every 2nd day where teams could rest, repair their cars, and interact with the public. Well over 1,000 people turned out at the June 23rd Rolla stage stop to cheer on the Miners and their competitors.

FORMULA SAE

The S&T Formula SAE Team's world ranking took a hit this year when two small incidents knocked them out of the Michigan and California endurance races. The Miners earned



3rd in skid pad, 5th in autocross and made the Michigan design finals, but the car's front wing collapsed in the endurance race, wrecking the car's handling and forcing them to withdraw, and left them 31st overall.

Incoming team leader Zach Lagrone reported "despite an electrical fire, broken clutch and various other catastrophes we made large gains in transient handling, acceleration, reliability and fuel economy to get ready for California." S&T was untouchable, setting the unofficial SAE skid-pad record (before a cone penalty invalidated the run), but Derek Denliger still won the event with the Miners' second-fastest time. S&T also took the autocross title and was turning in endurance lap times no other team could touch, but a rushed driver change damaged their electrical system and killed the car. That cost them 40% of the total event score and pushed them out of the top slot. Despite that heart breaker the Miners' earlier performance was so good they still managed a 10th-place finish.

Now Zach says "we have some really brilliant people right now and have already started welding the new chassis. If this pace keeps up, we'll be driving before Christmas, and we'll get that top-ten world ranking back."

STEEL BRIDGE

The Missouri S&T Steel Bridge Team received high praise for its lightweight and ethereal structure at the 2010 ASCE regional competition in Norman, Oklahoma. Some of the compliments thrown their way included "great imagination", "very creative", and "thinking out of the box". The Miners' bridge, at only 162 lbs, weighed less than half of some other student-designed structures, and S&T's time of 19.44 minutes earned S&T fifth place in the construction speed contest. Their startling design cleared the lateral deflection test, but couldn't quite manage the vertical deflection standard, bending too much just before the last of the 2,500 lbs of steel was loaded. That failure disqualified the Miners' project and wiped away all of their preliminary scores.



The S&T Steel Bridge Team did share the coveted "Spirit of the Competition Award" with our Concrete Canoe Team.

DIRECTOR'S LETTER

2010 has been an exciting year for the Missouri S&T Student Design and Experiential Learning Center. In April the center celebrated its 10th anniversary providing a quality home for our inter-



nationally-recognized student teams. Now we are less than a year from moving into a larger, newly-renovated facility.

Construction has already begun on the Kummer Design Center, named for Fred, CE'55, and June Kummer, whose generous \$1.25 million gift capped a multi-year campaign to provide our students with the facilities they earned through their success. The work will continue throughout the fall semester with a target completion of January, 2011, and our highly-regarded design teams will move in next semester.

On behalf of our student design teams I want to thank all the donors who helped make this new facility possible. In addition to the Kummings I want to especially recognize the leadership of Dick Arnoldy, CE '69, Bob Brinkmann, CE '71, Barry Koenemann, CE '70, Mike Bytnar, ME '68, and the Sunderland Foundation for advancing the experiences that S&T students will carry into the next decade and beyond.

During the center's first decade we provided over a thousand S&T students with the facilities, equipment, funding, and administrative and marketing support to be successful. The SDELCC's student teams have completed well over 125 engineering design competitions and service-based projects, all quality experiences that take classroom learning into the real-world of engineering innovation. These rich experiences and newly-learned leadership skills will make our graduates worthy successors to the generations of Miners who preceded them.

Paul D. Hirtz, Ph.D.
Interim Director
Student Design and Experiential
Learning Center

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In the comment section below, please list any specific instructions or identify which team you would like to support with your donation.

Comments: _____

Meet these students on September 18th. See "Support Our Students" on page 3 for more details.



Jennifer Hoffman: "Engineers Without Borders has given me the chance to experience real-life engineering projects in some very different cultures. I am so thankful for the leadership skills it has given me."



Clinton Guenther: "Being part of a design team has taught me how to deal with many stressful situations that I wouldn't face in every day classes. I have not only become a better leader, but have found new ways to resolve arguments. Communication is the key for a successful team."



Trent Lauer: "Although I spent more hours in the design shop than I got sleep, getting a national championship made it all worth it. I've never been part of a group with as much passion as the Human Powered Vehicle Team."



Amanda Wyatt: "The Steel Bridge team has taught me to use the skills I learn in the classroom in a real situation, and it was thrilling to see our calculations become reality at competition."



Arch Creasy: "My time with the concrete canoe team has been exciting to say the least. It has provided me an environment that demands not only ingenuity but also professionalism. I believe the Design Center is a great medium for teaching these concepts."

Find 2010 competition results at design.mst.edu

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