



MISSOURI S&T

2015-2016 NEWSLETTER

STUDENT DESIGN AND
EXPERIENTIAL LEARNING
CENTER

FORMULA SAE

new power plant
smaller wheels

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HPER

mach I science fair

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NUCLEAR SCIENCE

nuclear powered in-
terplanetary travel

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DIRECTOR'S CORNER



Partners: alumni supporters, industry, parents, S&T administrators, faculty and staff; looking from afar or up from the trenches – everyone of you has engaged, supported, and become partners with our students. We are *all* design team members.

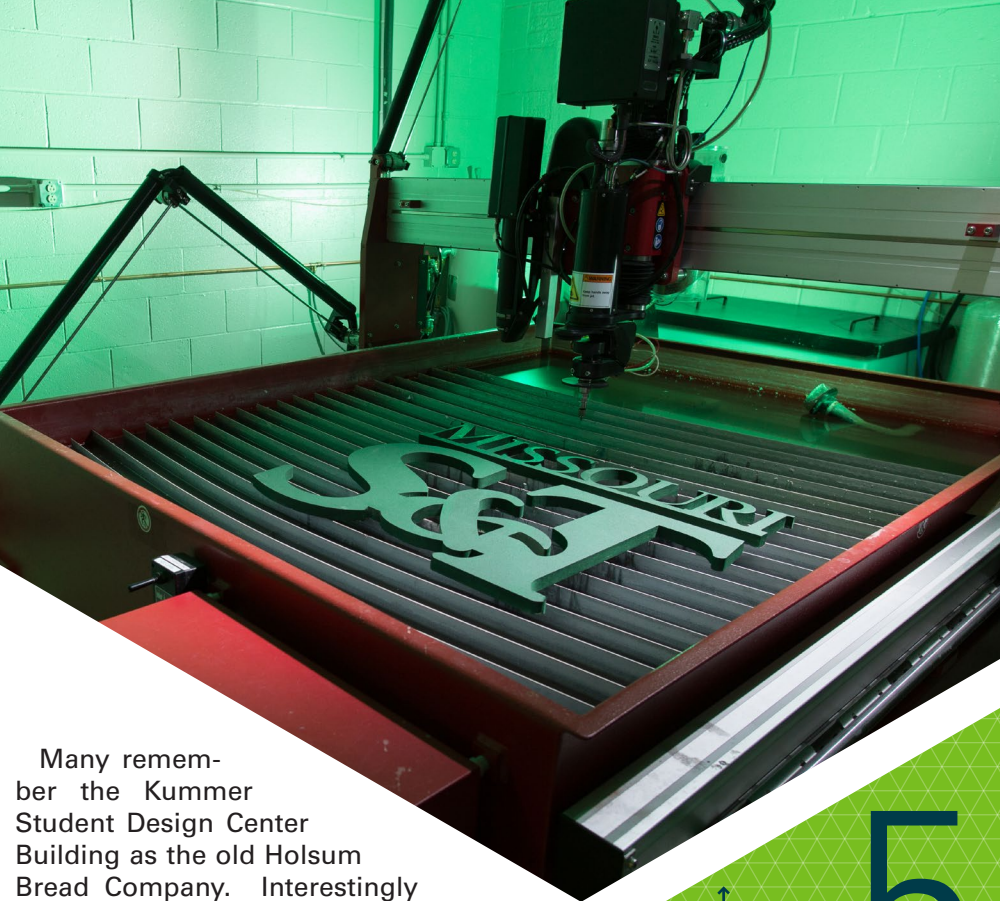
Space, equipment, funds; they seem to always be critical issues at the Design Center. A water jet machine has been at the top of the list for a number of years. It is one of the most valuable machining technologies we needed in our toolbox because it's so heavily used by nearly all of the teams. And yes indeed, it was a critical for the Design Center to have this technology here in house. I'm happy to say that we've recently installed a 5-axis water jet machine which gives us a tremendous boost (I'd say an order of magnitude improvement but that might be an exaggeration) in terms of what our students can design and build. We have capability and access like none before – and at lower cost to the teams to boot.

We have this capability only because of our donors who have joined and partnered with us (that would be you folks), the Omax Corporation, and S&T. Thank you. The students and I are really quite grateful.

Of course, we will always have critical issues. But together, dedicated to our enthusiastic and hardworking students, we will join forces and somehow meet the needs. We've done it before; we will do it again, and again...



Parts cut on our new machine.



Many remember the Kummer Student Design Center Building as the old Holsum Bread Company. Interestingly enough, thanks to the sandwich shop across the hall we still smell fresh bread baking every morning. This facility exists because a few engaged and committed partners identified a critical issue, had a vision, and so many partners joined with us, with them, shoulder-to-shoulder with the teams – and built the best facility possible. I'd say it's the best in the nation. It was built with about 450 students on 10 teams in mind. We have grown. We now have 15 teams with 1,220 students in the queue. Is it overcrowded? You bet it is. Is it difficult and cluttered with projects in various stages of development and build? Of course. Are we going to retreat, hold up, not let any more teams and students join up? Absolutely not. We will find a way to continue to accommodate our students and do what we do - Experiential Learning.

It is without question that we are far beyond capacity. It is without question that we need more space. It is without question we must expand to meet the needs of our students. I am happy to announce that we are in the planning stage for a building expansion, and I wanted to tell you first. Stay tuned as our design takes shape. It's time to build. Let's get to work and do this for our students.

I am, gratefully, your friendly neighborhood Design Center director.

Chris Ramsay, PhD



A SUMMER UNDER THE SUN

Austin, TX - July 2015
Solar Car Team

MINHAZ RASHID

Junior - Mechanical Engineering
St. Louis, MO

Hi!

My name is Minhaz, and I'm the secretary of the Solar Car Team. This was an exciting competition year!

Our team has "recharged," but we're not stopping there: our plans for 2016 are big.

2015 was our best performance in years. In July we competed in the Formula Sun Grand Prix in Austin, Texas. For a blazing hot week we sailed through "scrutineering," prepared our team and car for the race, and hit the asphalt against teams from sixteen other universities. We were leading the race by lap 42 before we sustained considerable damage in a flat-tire-induced spin-out, but it proved we could handle adversity.

When we got back to the garage, we were met by nearly twenty Miner alums, all waiting to see how we would handle the situation. In just 45 minutes we repaired all the damage and sent the car back out on the course. It really felt good to see my team handle a high-stress situation so well. After two more days of racing, we earned a 4th place finish, our best race in nearly a decade.

Our 2016 plans? Simple. We want to go further, faster. The American Solar Challenge has partnered with the National Park Service on an 1800 mile race route that will weave through national parks in the center of the U.S.

We're currently building the car of our dreams. A departure from the Solar Miner series that put S&T on the map, its carbon fiber monocoque chassis is already taking shape in the Design Center. That's just a warm up for 2017 when we'll transition to a four-wheeled design with an eye toward racing in Australia as we did in '99 and '01.

I've observed a lot of cool things in my brief time on the team. We've come a long way in a short time: we are a completely different team than we were just a year ago. There is a new, emerging spirit of innovation and professionalism on our team - an attitude of no compromises in all that we do.

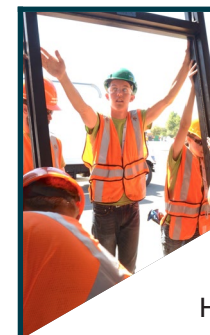
Being a member of the Solar Car Team means more to me than I can put into words. We have clear minds and a clear goal, and nothing is going to stop us.



SOLAR HOUSE

STEVE RUSAKIEWICZ

Senior - Electrical Engineer
Rolla, MO



S&T's Solar Decathlon Nest Home was a crowd favorite and earned 5th place, the highest ranking in the record six times the Miners have competed in the event. But there's more:

Team PR officer Steve Rusakiewicz reports "the unexpected experiences I received while there all related to the human element. Working with the team on the Nest Home over the last two years has shown me the importance of connecting engineering innovation to the human element, or, as I have come to describe it, "humanizing the project." The result was building a home that was as much a work of art as it was engineering prowess. Moreover, we placed our service to the public above even our performance in the competition. We always felt that our message of sustainability was more important than the final standings and were the only team giving 100% interactive public tours 'til the end of the ten-day event. So proud to be a Miner!



IGEM

The International Genetically Engineered Machine Team (IGEM) has been working to design genetically engineered biological systems to help fight White Nose Syndrome, a disease that has devastated Missouri's bat population by preventing them from storing enough fat to survive hibernation.

BAJA

2015 was Baja's toughest year ever as rule changes scrapped their design plans. They made the courageous decision to sit out the SAE competition rather than go unprepared. In doing so they saved thousands of dollars and are focusing on organization, FEA, and documentation.

ROBOTICS

The robotics team recently began competing in NASA's Robotic Mining Competition. The seven-day competition is more mechanically-centered than the team's other programming-heavy events, focusing instead on simulation of mining operations on Mars and other planets.

1200+ S&T DESIGN TEAM STUDENTS

15 DESIGN TEAMS 20 TEAM COMPETITIONS

99 SAFETY CLASSES TAUGHT 69,635 MILES ON DESIGN CENTER VEHICLES TO AND FROM COMPETITION

6,496 MAN-HOURS IN TRAININGS 21 TRAININGS OFFERED

2,251 NUMBER OF STUDENTS ENROLLED IN SAFETY AND SHOP COURSES

20,000 HOURS WORKED ON SOLAR CAR



IGEM

- Bacteria as a tool

IGEM creates biological “machines” that neutralize smoke stack effluent, warn of encroaching contaminated river or fungal disease in bat colonies.

ROBOTICS

- Competes in two events

Robots are designed to perform specific tasks, and this team has its eye(s) on autonomous maneuvers on the earth’s surface as well as mining lunar materials.

FORMULA ELECTRIC

- 5th Place in 2015

This team builds a torque-crazy rocket using the latest battery technology. The group uses modular construction to maximize performance, flexibility and safety while minimizing manufacturing and maintenance costs.



FORMULA SAE

- Downforce - 350lbs

Formula SAE designs and manufactures an autocross style race car with a 0-60 time of just over three seconds. The team spends months tuning everything from suspension to the aerodynamics package to ensure optimum vehicle performance.



BAJA SAE

- Max speed - 45mph

The Miner Baja SAE team builds a prototype off-road vehicle that must stand up to abuse from mud, dust, trees, hills, jumps and even collisions. And do it again the next day. Durability, marketability, presentation, cost and safety all add up to a winning design.



MARS ROVER

- First US team in European Rover Challenge
- Robotic arm has 6 degrees of freedom
- Rover weighs 110 lbs
- Over 150 members

This undergrad team looks to the Red Planet and envisions a new generation of Mars robots, machines that will work in tandem with astronauts to explore earth’s neighbor. The event is a massive effort to figure out which rover designs offer the most potential for an actual manned mission to Mars.



ENGINEERS WITHOUT BORDERS

- 140 Fall 2014 members

EWB saves lives. S&T students evaluate conditions in four “client” communities in South and Central America, and devise engineering systems that improve the residents’ quality of life.



SOLAR CAR

- 4th Place in 2015
- Two National Titles
- Car Weight - 350lbs
- Max Speed - 70mph

The Solar Car team builds and races entirely solar powered vehicles. Vehicles built by the team compete the American Solar Challenge, which is an 1800-mile cross country road race, and the Formula Sun Gran Prix, a three-day track race. Nearly 50 members work year-round to design, build, and test their vehicle. Following a 4th place finish in 2015, the team is currently building a brand new car.



SOLAR HOUSE

A solar house is more than slapping solar panels on your roof. It’s about maximizing every square foot of a home. The 2015 Nest Home was inexpensive, easy to assemble, and a crowd favorite at the 2015 Solar Decathlon.



AAVG & HPER

Two aerospace design teams in one; the air-plane team designs and builds an aircraft that can lift double its own weight, while the High Performance Engineered Rocket side manufactures its own propellant to launch scientific payloads to 10,000 feet.



HUMAN POWERED VEHICLE

- 2015 National Champions

A practical, enclosed human-powered “car” for running neighborhood errands, commuting to work and school, or just for fun. It’s comfortable, weighs less than 50 lbs, and reaches nearly 40 mph.



CONCRETE CANOE

There isn’t much of a market for concrete canoes, but there is a market for young engineers who can adapt a material to fit an unorthodox challenge. Students prove that ultra-light concrete can be light, strong and fun to paddle.



STEEL BRIDGE

“Bid” on your first bridge project while still in school. The faster you can assemble it and the fewer people you need to build it, the lower the bid “price.” Lowest cost means you get the “contract.”



SHADES OF APOLLO 13

Mars Rover Design Team

ALYSSA MCCARTHY

Junior - Engineering Management
Valmeyer, IL

If you have a problem in space, you fix it with what you have on hand, and S&T's Mars Rover Team did just that when their robotic arm jammed in the Utah desert last May. A sand-and-toothpaste grinding compound followed by a liberal application of Cheez-It cracker crumbs cleared the blockage. No duct tape needed, and they earned 5th place to boot.

The University Rover Challenge

(URC) is a test bed for Mars Rover ideas. While NASA develops spacecraft to carry humans to Mars, college students are culling through rover designs to determine which version of R2D2 will eventually be part of America's return to manned space exploration.

Participation in the URC has more than doubled each year, and Mars Society organizers have changed the format to accommodate the surge in entries. Only those teams who survive a qualifying obstacle course get to compete in the primary event.

In September, MRDT made history as the first American team ever to compete in the European Rover Challenge in Poland. We took 10th place of 44



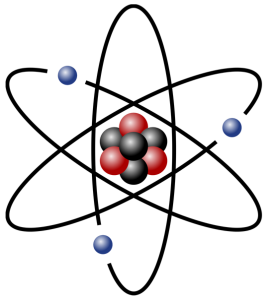
teams, and it was an honor to represent our team, our school, and our country.

We completed our Critical Design Review in November. We've switched to a carbon fiber chassis, started the manufacturing process, and are excited for the year ahead.

NUCLEAR SCIENCE
DESIGN TEAM

WESTUCKER

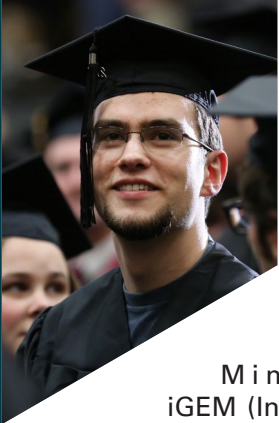
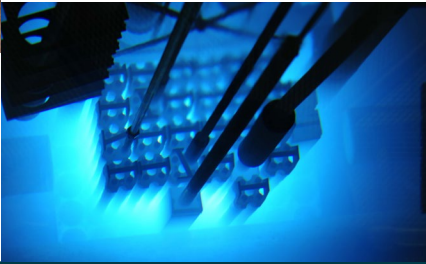
Senior - Nuclear Engineering



We're new. We're different. We're writing a paper on Inertial Electrostatic Confinement (IEC) for the American Nuclear Society Student Design Competition (ANSSDC). IEC fusion holds promise as a possible mode of space propulsion, critical for manned missions beyond the Earth and moon.

We have four in-house groups working on different design approaches to see which one ultimately holds the

most promise. In the meantime we're building a vacuum chamber to house the IEC device and move it to the campus reactor where it'll be a platform for modifications to improve the device's efficiency. We aren't required to actually build the chamber for the competition but it will help validate our design submission and give students the opportunity to explore their passions in the field of nuclear science, all while building teamwork and problem-solving skills.



IGEM

LEVI PALMER

Grad - Biochemical Engineering
Bonne Terre, MO

The Miners' iGEM (International Genetically Engineered Machines) team incorporates genetically-engineered biological systems to help solve a real-world problem, White Nose Syndrome (WNS) that has devastated Missouri's bat population.

If you don't like Missouri mosquitoes you'll realize the value of our work. WNS-afflicted bats can't store enough fat to survive hibernation and those summer pests are a big part of cave-dwell-

ing bats' food supply. That's trouble for Missouri vacationers.

The information we develop is shared in a world-wide data base that other scientists can use to solve similar environmental problems.

My advice? You'll always be busy, so make time for iGEM. It'll help you grow as a person.



HPER ROCKET TEAM

JILL DAVIS

Junior - Aerospace Engineering
Brookline, MO



This year we'll be rocket scientists *and* chemists. New Intercollegiate Rocket Engineering Competition (IREC) rules mean that almost everything has to be built from scratch. We are now making everything from our airframe to our propellant in-house.

We're cooking our own blend of solid rocket propellant at S&T's Experimental Mine, and building the rocket tube out of carbon fiber.

At our first IREC event last year our rocket buried itself in the Utah desert at 400mph when the main parachute failed to deploy, destroying both the vehicle and payload.

Despite this rocket disaster, we took 3rd place in flight

operations.

A shovel will definitely be an essential part of our 2016 competition kit.

We're also offering high school groups the chance to design our next scientific payload. Hopefully we can inspire younger students to attend S&T and be the next generation of rocket scientists.



FORMULA SAE

ALEX MILLS

Senior - Petroleum Engineering
Springfield, MO

SAE has announced two rule changes that will really impact S&T Racing. Aero restrictions will take away the handling advantage we've developed over the last decade, and lower exhaust noise limits will really hurt since we struggle with the decibel threshold every year.

We've already made changes to offset the impact of the restrictions,

moving to a newer Kawasaki ZX6R powerplant after fifteen years with the venerable Yamaha R-6, and altered the aerodynamics package to an un-sprung mounting system allowing for better mechanical grip and stability. Smaller wheels mean we'll redo the suspension to make the best use of the tighter packaging.

We have the largest, most diverse S&T Racing team ever, with 30 project engineers and group leaders onboard. I'm looking forward to a great year for S&T racing!



SUPPORT THE DESIGN CENTER

We can't continue to do these amazing things without your support. Our students will contact you soon during our annual Miner Giving Phonathon. When they call, please talk to them about their experiences and be generous with your support.

Send a check in the envelope below, or donate online at the site below.

Thank you!



Donate Online At:
giving.mst.edu

Donate to any of our 15 design teams, the SDELC itself, or to our Miners By Design Giving Club by following the "Give Now" link on the left side of the page.

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