It’s been said that acting isn’t a singular profession, but a collaborative one. Undoubtedly, increasing numbers of employers believe the same to be true of engineering. As the work-ready engineering world has changed to mean technically proficient and soft-skills savvy, our mechanical and aerospace engineering undergraduates have seized the opportunity to prove that they are developing the habits of critical thinkers and team builders. From student engineering competitions to community service projects to team experiments and internship experiences, our undergraduates are demonstrating that they are indeed engaged scholars whether inside or outside the classroom.

Ohio State students and an enCORE advisor demonstrate some team spirit before continuing construction on Ohio State’s 2011 Solar Decathlon entry. (see related “enCORE Experience” article inside)
Buckeye Minesweepers See Project as Landmine Detection Solution and Catalyst for Cross Cultural Engineering Discussion

Collaboration that crosses international borders and engineering paths has been the essential component of a relationship forged between a team of students at Ohio State and the American University of Beirut (AUB).

Ohio State Professor Jim Gregory and his self-proclaimed Buckeye Minesweepers are lending their aerospace engineering expertise to a cooperative effort between themselves and a group of mechanical engineering students at AUB for a design project known as the International Collaboration for Aerial Landmine Detection (ICALD). According to the team’s web site, “the cornerstone of this project is the design, construction, and testing of an aerial vehicle for rapid detection of buried landmines.” The two groups of engineering students first discussed the concept for their work via teleconference; then met in person to prove that everyone was on the same page. After a videoconference, we’ll type meeting minutes and send them out to everyone in the group. These obstacles have been overcome by simply taking the time to make sure that we’re all on the same page.

Undetoned landmines continue to be a problem in Lebanon, which has seen a series of conflicts erupt over the past century. Together, the two groups of students hope to locate landmines without putting anyone in potential danger. The AUB students are developing the sensor package and algorithms that will detect buried landmines from the air. For their part, the Buckeye Minesweepers are constructing an air vehicle that will carry the sensor over the ground where landmines are likely buried.

Minesweepers team member Stephanie Watsek reports that the limited ability of the two teams to work together in person proved to be a larger challenge than expected. “Because of the seven hour time difference between Columbus and Beirut, we either meet at very early hours for us or very late hours for them. These obstacles have been overcome by simply taking the time to make sure that we’re all on the same page. After a videoconference, we’ll type meeting minutes and send them out to everyone in the project. That way if anything was left out or misinterpreted, it can be addressed right away. Since we’re unable to video conference that often, we try to send important updates to each other on a regular basis to ensure that everyone is aware of what is going on,” said Watsek.

Funding for the ICALD research is provided through a grant from Battelle Endowment for Technology and Human Affairs. For more information visit www.buckeyeminesweepers.org.

To slip the bounds of the traditional classroom experience often requires some lofty thinking. For junior Stephen Levine it simply required a 120-mile round trip between Ohio State’s main campus and the Air Force Institute of Technology (AFIT) to unleash his interest and participation in a microgravity experiment that was headed for the International Space Station.

Responding to an invitation to assist fellow students and faculty in the pre-launch testing of an experiment that focused on isolating the effect of gravity on the growth of Ceria nanoparticles led to Levine’s participation in the Ohio State research activity. The experiment, which was “packaged” in what might best be described as hollow glow sticks and stored in a CubeLab container, arrived at Destiny (the U.S. National Lab in space) near the end of January. It was carried there by HTV2, an unmanned Japanese space vehicle transporter. Levine’s role was to perform testing at AFIT that would evaluate the ability of some of the experiment apparatus to withstand launch and re-entry accelerations.

“I thought working on this project was an amazing experience. It taught me so many things that I could have never learned in a classroom. Having this real world experience is invaluable, and it gave me a much better understanding of what aerospace engineering is like,” said Levine, who is an aerospace engineering student.

About the experiment

Ceria (CeO2) is used as a support or catalyst in many technologically important reactions, such as high temperature coatings for jet engines, solid oxide fuel cells for next-generation automobiles, and emissions abatement. The experiment will contribute information on whether reduced gravity leads to a higher level of performance for the catalyst.

After Space Station astronauts conduct the final steps of the experiment, the CubeLab is expected to return to Earth aboard a Russian Soyuz spacecraft that is scheduled to depart the Space Station in mid-March. The microgravity experiment will then be returned to Ohio State so that the crystals formed in the 24 Teflon tubes containing various levels of cerium nitrate and sodium hydroxide solutions can be analyzed.

Jim Smith, corporate chief engineer for Belcan, a Cincinnati-based engineering company, and technical advisor and underwriter of the $25,000 cost of the experiment, commented, “This unique opportunity enabled the students to apply what they have learned; work with the launch integrator, NanoRacks, and NASA; and gain valuable, practical experience. This success lays the foundation for future cooperative efforts where we can continue to utilize Belcan’s expertise to enhance the educational experience for the OSU community.”

NanoRacks is the Houston-based company that produces the CubeLab containers. Ohio State Faculty Advisors for the project include Dr. Hayrani Oz and Dr. Umit Ozkan.
Engineering competitions aren’t new to the undergraduate scene, but those that require a multi-year investment of effort may be the most novel and challenging from a student’s perspective. As real-world training goes, they may also be one of the best ways to help students comprehend how commercial engineering projects span R&D, prototype and production planning cycles.

A diverse group of Ohio State students are now in the final, third year of EcoCAR: The NeXt Challenge, a competition sponsored by the U.S. Department of Energy, General Motors Corporation, with the support of many more organizations from the U.S. and Canada. Each of the competing 16 university teams are re-engineering a GM-donated crossover utility vehicle with the goals of improving fuel economy and emissions while maintaining performance, safety, and consumer appeal.

Year one of the competition was focused on developing an alternative-fuel powertrain for the vehicle. In year two, the existing powertrain was removed from the vehicle and the team’s alternative-fuel powertrain was built and installed. This year, the team’s focus is on improving the vehicle’s aerodynamics and optimizing the car’s efficiency through reduction of weight and accessory loads, and refining control strategies.

By the time they transport the car to Washington, D.C. for the final competition in June, the car will be made “show-room ready” with improvements to its interior, exterior, and the driver interface.

The Ohio State EcoCAR team is a mix of graduate and undergraduate students, with 13 team leaders (three of whom are ME undergraduates) and 20 team members (12 of whom are ME undergraduates). One of those team leaders, ME undergraduate Alex Bergman, credits his involvement with the EcoCar project for successfully obtaining a co-op position during tough economic times. Another team leader and ME undergraduate Travis Trippel was motivated to join the team because of his interest in alternative energy, especially in regards to transportation and hybrid vehicles. He also believes that his work on the multi-year EcoCAR project has provided a great opportunity to apply current knowledge while also exposing him to the process of vehicle production.

The hands-on research with leading-edge automotive propulsion, fuels, materials, and emissions-control technologies exposes the students to critical energy and environmental issues.

ME Professor Giorgio Rizzoni, who is also the Director for Ohio State’s Center for Automotive Research, says he has observed that today’s students, like those who participate in team projects such as EcoCAR, exhibit a much greater enthusiasm for environmental and social aspects of technology. “I think students today are very conscious about the societal and environmental implications of what they do. Over the past several years, we’ve seen an increasing number of students visit Ohio State specifically because of their interest in alternative vehicle technology and sustainable transportation.”

Rizzoni believes that the experience garnered through team competition helps students to enter the business world with a lot of confidence and to succeed very quickly. “Their team skills, their leadership skills are phenomenally developed, so the graduates of these programs move very quickly through their career to positions of responsibility.”

As you might expect, there’s a great deal of Buckeye pride in the team’s EcoCAR entry. “The vehicle the students have designed is a marvel of technology. It is a plug-in hybrid electric vehicle. It is a vehicle that has a battery pack capable of giving you a 40-mile range in pure electric mode. It has two different electric machines, an engine that runs on biofuels; its greenhouse emissions are extremely low. It’s just a wonder of technology. It’s a complete remake of what used to be a production vehicle,” added Rizzoni.

The Ohio State EcoCAR was built from a GM crossover utility vehicle that was modified to have two electric motors, one for the rear, the other for the front. The EcoCAR is an extended range electric vehicle. To learn more about the Ohio State EcoCAR team, visit ecocar.osu.edu.
Son Ngo may be the vice president of local projects for Ohio State’s Engineers for Community Service (ECOS) organization, but his interest in volunteerism has carried him well beyond central Ohio on a number of occasions. ECOS is a student organization that promotes social responsibility through local and international service learning projects. After a brief conversation with Ngo, you quickly learn how ECOS students are improving the world around them.

The organization’s projects run the gamut from staffing a homework hotline for middle and high school students to providing the labor to refurbish community buildings on international service trips. This spring, Ngo will join several ECOS members on a trip to Choluteca, Honduras, where they plan to build a sustainable and replicable aquaponic system that can produce fish and vegetables for a typical family in Choluteca. They will also help a vocational school with their computers and evaluate the potential for future service projects there. This will be Ngo’s second trip to Honduras. Last spring, he assisted in a project that was designed to provide better indoor cooling for an orphanage located in Montana de Luz. By applying a water-based acrylic/urethane roof paint, he and his team were able to create a barrier against solar heat gain and lower the indoor temperature of the orphanage by about 14°F. They also added some plant material to the grounds near the building to create additional shade for the structure.

His local work has included the installation of three wheelchair ramps and one electrical lift for individuals whose handicaps necessitated better entry access to their homes. A nearby children’s play and learning center has also benefited from ECOS’s altruism. Ngo believes his ECOS involvement has helped him to understand the obstacles and challenges of the people he assists and as a result he has been able to design and build around their needs.

Clearly an industrious individual, Ngo has further enriched his undergraduate experience with six-month co-ops at Parker Hannifin Corporation and Swagelok. “All of these extracurricular activities have given me the opportunity to experience real-world engineering problems, and that has prepared me for my post-college career,” Ngo said.

For more information, visit ecos.osu.edu.

Like other unfortunate disasters before it, the 2010 “Deepwater Horizon” oil spill in the Gulf of Mexico is now serving as an example of the trial and error learning inherent in the remediation process. And soon a team of Ohio State students will compete to see if their remotely operated vehicle (ROV) is capable of meeting the underwater challenge set forth by the annual Marine Advanced Technology Education (MATE) Center International competition.

“Trouble in the Gulf” is the theme of the 2011 competition and the phrase that’s stuck in the mind of ME undergraduate Emily Gyde. As president of Ohio State’s Underwater Robotics Team, Gyde is focusing on how she and her team will apply their engineering know-how to complete tasks that are meant to simulate the steps that were required to cap the offshore oil well in 2010.

Gyde says the key to winning the competition will be to build and design a superior tethered ROV that will successfully remove a damaged riser pipe, cap a wellhead, and collect water and biological samples. She noted that every year the MATE Center provides a “mission” that is relevant to the science and engineering community’s study of and work in, the world’s oceans and seas.

The annual challenges align perfectly with Gyde’s career aspirations. “I want to build robots, specifically ROVs, and ever since my senior year of high school I have been interested in the underwater field. This project not only gives me hands-on experience with this field, but also offers me the opportunity to connect with the current employers and industry leaders,” she added.

Gyde hopes that her team’s experience will give them an edge in competition. She and several of her teammates participated in the MATE ROV challenge for high school students a few years ago. When the Ohio State team takes their underwater ROV entry to the International competition in June they’ll face other teams from the U.S., Russia, China, Scotland and Canada. Before that event, they’ll compete at a regional contest in April at the Shedd Aquarium in Chicago.

To learn more about the Underwater Robotics team, visit underwaterrov.org.ohio-state.edu

Front Row, L to R: Emily Gyde, Ji Hoon Chun, Jonathon Roan.
Second Row, L to R: Achal Singhal, Collin Pittro, Scott Cline, Joachim Bean, and Zach Imm.
enCORE Experience Engages Solar Decathletes

As a general rule, any artist who leaves the stage at the end of a concert is expected to return for an encore performance. In the world of engineering competitions, however, an encore “performance” is never a given. So, after the Ohio State Solar Decathlon team competed on the national stage, or more precisely the National Mall, in 2009, they were elated to be asked to return to the competition again in 2011.

In consideration of both the invitation to return to Washington, D.C. and the design selected for the 2011 competition, several team members decided that enCORE was the perfect name for Ohio State’s second “solar house” project.

From an architect’s perspective, enCORE aptly describes the essence of the building in which some very green technology exists at the core of the structure. Associate Professor of Mechanical Engineering and team faculty co-advisor Mark Walter is very proud of the fact that Ohio State will be taking another house to the competition in October 2011. Walter noted that in this fifth Solar Decathlon, Ohio State will compete against 16 other colleges or universities located in the U.S. as well as four teams from New Zealand, Belgium, Canada, and China. The top 2011 solar house will be the one that wins the most points awarded based on ten separate decathlon contests that range from best use of modern engineering to home entertainment to affordability.

Returning decathlete and ME undergraduate Ellen Gentry commented, “My favorite part about the Solar Decathlon project is that we get students from many different disciplines involved. We have team members from all over the university, and it is so fun to collaborate with them and learn how they approach a problem differently than I do with my engineering background. We also bring in a lot of contractors who act as mentors to our students, which is extremely beneficial for both sides.”

Getting the perspectives of those who viewed the 2009 house was also valuable to Gentry. “Everyone that visited our house was looking for something different and had questions about different aspects of the house. It really challenged me and taught me how to explain each concept in different ways so that many people could understand. For example, some people needed quantifiable evidence that our house was net-zero, so we would show them the readout from our monitoring systems. Other people wanted to know how they could implement our technologies in their house, so we would talk about retrofitting and the best options that got the shortest payback time. Participating in the Solar Decathlon competition was the most challenging and the most incredibly rewarding experience of my life, which is why I can’t wait to go back for the 2011 competition,” said Gentry.

New team member and ME student Kyle Frye added, “I became interested in enCORE while watching the previous team construct the 2009 Solar House on north campus. The Solar Decathlon project has provided many networking opportunities with our various vendors. This summer, I will be participating in an internship with Owens Corning, one of our main sponsors.”

To learn more about the enCORE team, visit solardecathlon.osu.edu.

During his lifetime, famous American author Napoleon Hill crafted many pearls of wisdom. One of them, “A goal is a dream with a deadline,” seems like a custom-made credo for the teams of students who are participating in this year’s iDream student challenge sponsored by Honda R&D Americas, Inc.

As Ohio State undergraduates head into the “home stretch” of the iDream challenge, they are putting the final touches on the reports they will submit to program jurors in just a few weeks. Fortunately for many, the competition permits science and engineering students to incorporate their senior design project or independent studies work as the creative engineering solution put forward for next-step solutions to everyday challenges in the following five categories of competition: environment; mobility; materials; electronics; and safety.

After piloting its first U.S. student challenge with Ohio State during the previous academic year, Honda opened the competition to four additional universities located in Ohio for its second competition.

“Inspiring new thinking and fostering innovation among the leaders of tomorrow” is the motto of the iDream student challenge and a phrase that has translated into some serious brainstorming by the 19 Ohio State teams that have entered the competition. Last year several ME students competed in the iDream challenge, with three ME students and two occupational therapy students winning the Viewer’s Choice award and a scholarship for the creation of a gait-trainer that was designed to help children with cerebral palsy move with a more normal gait. In addition, two teams of ME students won the first and second place prizes in the Mobility category.

This year, nine of the Ohio State teams competing in the iDream challenge include undergraduate students from the Department of Mechanical and Aerospace Engineering. Amanda Strube reports that her “Enable Me” team will create a transfer device that will enable persons with physical disabilities, mainly those individuals who have suffered spinal cord injuries and have limited lower extremity functionality, to transfer into and out of adaptive adventure sports equipment such as kayaks, sled hockey (adaptive hockey), and mono-skis (adaptive alpine skiing). “Better Measures” is the name of the team formed by Ben Hoffman and three other engineering students. The goal of their project is to assure that the wheelchair fitting process used by clinicians results in a good fit for every client. To achieve this goal, he and his team are designing an evaluation wheelchair with improved adjustability that will allow clients to “test drive” a wheelchair with proper dimensions in a clinical setting before actually purchasing one.

ME senior Joshua Merritt, who is a member of the “Buckeye Mobile - Redesigned Walker” team has high hopes for his team’s device, which is intended to improve a person’s posture and gait while using a walker. Above all, Merritt is thankful for Honda’s commitment to the student scholarship program. “Participating in the Honda iDream competition is really an exciting opportunity for my team and me. To be able to use all we’ve learned up to now about design and compete against so many great teams is amazing,” he said.

Finalists will be invited to attend the iDream Student Challenge Technical Symposium, to be held at Honda R&D in Raymond, Ohio on June 13.

Honda’s iDream Student Challenge Tests Mettle of 19 Ohio State Teams

Engages Solar Decathletes

Four of the five students pictured at left make up the Honda iDream Buckeye Mobile - Redesigned Walker Team. Pictured left to right are Casey Hill, TJ Prewitt, Joshua Merritt, Jospah Maruli, and David Bernard. Maruli is a physical therapy student enrolled in an interdisciplinary capstone course along with the four ME students.
Among the many significant developments that occurred over the course of the current academic year was the merger of the aerospace engineering department with the mechanical engineering department within the College of Engineering at Ohio State. The merger, which was effective July 1, 2010, allows the new mechanical and aerospace engineering department to take advantage of significant academic synergies. The department expects that merging the two disciplines will lead to instructional efficiencies through consolidation of courses that have significant overlap in content and increased flexibility in sharing of teaching duties.

Leading up to the merger was the singular recognition of the former mechanical engineering department’s excellence in undergraduate research, at Ohio State’s annual President’s Salute to Undergraduate Academic Achievement last April. This distinction is one of the highest tributes paid to an undergraduate academic program within the university and represents the first time an engineering program was so recognized at OSU. In addition to the many scholarly achievements of the department’s students in undergraduate research, the heavy involvement of undergraduates in team-oriented projects such as the Buckeye Bullet II, which owns the world record for the fastest electric car, continues to be a point of pride for the department. The projects featured in this publication are in keeping with this fine tradition of students excelling outside the classroom in endeavors exemplifying initiative, collaboration, and relevance.

As we look forward to the future, we expect to spend significant effort in the coming academic year in preparing for our transition from the quarter system to the semester system. We have used this occasion as an opportunity to seek input from our alumni and peers from around the country on the nature of the changes that would best enhance our undergraduate engineering education in the years ahead. Highlights of the agreed-upon changes follow. Unless explicitly stated, the changes are for the mechanical engineering program:

- more design and manufacturing in the curriculum, including a sophomore design course, an expanded year-long capstone design course providing students a full design-build-test experience, and a senior-level manufacturing process course
- improved laboratory experiences including a new, open-ended, capstone laboratory course that will require students to make connections across the curriculum
- better progression in the development of engineering skills in design, computation, experimentation, and open-ended problem solving
- increased elective options for better training in ‘soft’ skills
- a year-long projects laboratory experience has been added to the aeronautical and astronautical engineering program to provide students the opportunity to undertake open-ended projects involving significant planning and experimental design

We look forward to reporting on our experience with these changes in future newsletters.