

Inspiring Greatness in Engineering and Computer Science

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Interns From Cedarville Win Team of the Year Award From NASA

Each year, Cedarville students complete internships with prestigious and respected organizations, where they gain experience and put their classroom training to work. Last summer, Cedarville students Jesse Bierer '11, Michelle Doyle '12, Jimmy Myers '12, and Noah Van Zandt '10 completed a 10-week internship for NASA. The students excelled at their tasks and impressed the professionals there, opening more potential internship opportunities for Cedarville students.

As a result of their top-notch work, they were named the Student Team of the Year for NASA's Lewis' Educational Research and Collaborative Internship Program (LERCIP) out of 180 students in the program. Placed below is the Cedarville students' award nomination, written by their internship mentor, Dr. Richard Rogers '86, of NASA Glenn Research Center.



Michelle Doyle '12, Jesse Bierer '11, Dr. Richard Rogers '86, Noah Van Zandt '10, and Jimmy Myers '12 pose in front of the NASA Glenn Research Center. (photo by Dr. Richard Rogers)

LERCIP Student Team of the Year Award Nomination

This team of Cedarville students deserves to receive the LERCIP Student Team of the Year Award because of their achievements, teamwork, professionalism, and outreach.

The primary work assigned to this team was an ambitious goal of designing, building, and testing two engineering enhancements to a major scientific instrument in the Structures and Materials Division X-ray Diffraction (XRD) Laboratory. This is a key instrument in our laboratory, and it provides crucial data for a number of NASA projects.

The task required a high degree of both engineering skill and creativity. In order to accomplish their goals, the team members laid out schedules and budgets. Then they applied their engineering skills to produce the needed mechanical and electrical designs, identified components for procurement, machined all of their own custom parts, and assembled and tested their projects.

As challenging as these tasks were, this team was also called upon to perform scientific research on top of this engineering work. A week before the

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“ I am blessed with the opportunity to learn from professors who teach us the skills that we need and who integrate a Christian worldview into lectures and assignments. The engineering program presses students to their limits so that they may reach their full potential both as students of the scientific world and disciples of the Kingdom. ”

Michael Dunn '12
Mechanical Engineering
Burton, Ohio

Society of Women Engineers Celebrates Successes

Cedarville University's chapter of Society of Women Engineers (SWE) has much to be proud of this year.

First, the group from Cedarville placed second again among eight other universities in SWE's "Game for Girls" computer programming competition. This was the second consecutive year in which our team took second place in the competition, which required the students to create a computer game targeted for high school girls.

To help cover organization costs, SWE received \$500 from the Ohio Space Grant Consortium.

SWE also recently completed a service activity, helping a local shelter with a compost project, which is now in use.

In May, the group graduated six members, including the first female computer

engineering graduate. This fall, SWE welcomed 10 new female students to the department, bringing enrollment to 37 female students — the largest group to date.



Devin Wicker '12, Kirsten Nicolaisen '12, Stephanie Russell '12, Sarah Norris '12, and Alissa Johnson '11 won second place in SWE's "Game for Girls."
(photo by Dr. Larry Zavodney)



Danielle Scarpone '12, Alissa Johnson '11, and Malia Amling '13 enjoyed spending time with each other on an SWE trip. (photo by Dr. Vicky Fang)



Michelle Doyle '12, Leah Pernicano '12, Kirsten Nicolaisen '12, Devin Wicker '12, and Sharon Grafton '13 helped a local shelter with a compost project.
(photo by Dr. Larry Zavodney)

Cedarville Students Participate in ACM

In August 2010, the department of engineering and computer science founded a student chapter of ACM (Association for Computing Machinery), one of the primary professional organizations for computer scientists and software engineers. The chapter has already grown to more than 20 members. In October, the chapter hosted several researchers from The Air Force Institute of Technology's Center for Cyberspace Research, who introduced students to the field of information assurance.

In fall 2009, two teams of Cedarville students competed in the East Central Regional Competition of the ACM International Collegiate Programming Contest. Cedarville's top team finished in eighth place out of 115 teams at the competition. Cedarville had the top team in Ohio for the third consecutive year and has placed as the top CCCU school in the competition since 2002.

Engineering Online

With the help of Cedarville's Center for Teaching and Learning, Dr. Thomas Thompson, associate professor of mechanical engineering, has formatted the freshman Engineering Graphics course for online delivery.

The online format was introduced in summer 2010 and uses narrated slide illustrations, sketching demonstration videos, and SolidWorks 3-D modeling software demonstration videos to teach the course objectives. Plans have been made to offer the online course in summer 2011. Incoming freshmen may now complete this required engineering course before arriving on campus in the fall. For details on how to enroll in this course or other summer online courses such as Precalculus, contact admissions.

Tau Beta Pi Students Model Excellence

Students from Cedarville's Ohio Nu Chapter of Tau Beta Pi (TBP), the Engineering Honor Society, continue to win recognitions for their outstanding scholarship.

Last fall, mechanical engineering majors Josh Brown '11 and Dan La Croix '11 received the \$300 Secretary's Commendation Scholarship and the matching Dean's Scholarship. La Croix represented the chapter at the 125th Annual Convention at the organization's founding campus, Lehigh University near Valley Forge, Pennsylvania.

Members of Cedarville's TBP chapter helped organize a tour last spring at the National Museum of the United States Air Force and served as judges at a district science fair. Dr. Hardy Hegna, professor of mechanical engineering, is the chapter's advisor.

Visit cedarville.edu/engineering or call 1-800-CEDARVILLE (233-2784) for more information.

Supermileage Team Sets a New Record — Again!

The 2010 Cedarville Supermileage team set new school records this year at the Shell Eco-marathon Americas competition in March. Cedarville has participated in the Shell Eco-marathon (SEM) since Shell began the competition again in America in 2007. Student teams from North and South America are invited to attend.

In the final ranking of U.S. college and university teams competing in the prototype division, Rose-Hulman Institute of Technology took second and third place; Cedarville's red car, named "Gold Lightning," took fourth place (1,433 miles per gallon); California Polytechnic State University placed fifth (1,324 miles per gallon); and Cedarville's blue car, named "Slipstream," took sixth place. Both Cedarville cars broke their previous records. Laval University in Canada placed first with 2,488 miles per gallon.

This year, SEM was held in the city streets of Houston, Texas. An entire city block served as the racetrack. Teams were required to drive 10 laps around the 0.6-mile block in less than 24 minutes. Before the race, officials filled the 100-ml (3.3 oz.) fuel tank with 89 octane Shell gasoline. After the race, they measured how much fuel it took to refill the tank.

Driving on city streets was a new experience for all of the teams, especially since the cars do not have suspension systems to absorb the bumps in the road. With sharp turns at the corners, at least nine teams rolled cars during the race — including Cedarville. This was the first time in the team's 19-year history that Cedarville had ever rolled a car during a race. Since Supermileage cars are designed and built well, featuring roll bars and five-point seatbelts, no one was injured during the accidents. The team spent the evening gluing the crack in the canopy and sanding out the scratches in time for the next day's race.

The team also competed at the SAE Supermileage competition at the Eaton Proving Grounds in Marshall, Michigan, in June. Cedarville entered its two vehicles

in this event, but Slipstream encountered setbacks. One of the bolts that held the starter motor together came loose during the race, preventing the driver from restarting the engine.

When racing, the driver uses a "burn and coast" method. Drivers typically run the engine for 10 seconds to get the car up to 20 mph and then coast down to 10 mph to reach an average of 15 mph, the minimum average speed required for competition. To get the best gas mileage, the driver goes as slowly as possible, starting and stopping the engine about 20 times during a race.

Gold Lightning raced successfully but experienced an issue with the new electronic fuel-injection system the team developed this year.

In the final rankings, Cedarville achieved sixth place in overall points, including points for reports and oral presentations. Gold Lightning achieved the fifth-highest mileage, 1,180 miles per gallon.

Despite some problems at both competitions, Dr. Larry Zavodney, senior professor of mechanical engineering, said he was proud of the students' diligent work and quick thinking to find solutions. Even though the competitions are at times tense, the students do take time to enjoy the event. For example, at the SAE competition in Michigan, the team started a new tradition — "baptizing" the next year's team leader in the hotel swimming pool.

In addition to successful race results, the 2009–10 team accomplished some notable milestones and improvements to the Supermileage vehicles. These include extensive dyno testing and data reduction, a new rear chassis for Gold Lightning, a rear wheel that has an eight-speed internal gear-hub transmission, a new on-board computer, software upgrades, and a wireless communication system, which is connected to a computer in the command center.

The team's new electronic fuel-injection system includes a new throttle body design. This will allow the computer to eventually take over control and drive the car. The student team spent countless hours programming the fuel map and then performing extensive tests.

They also developed a wireless network between the command center computer and the car computer. With this link, the team at the command center can communicate with the driver and the on-board computer and monitor the vehicle.

In September, SAE's *Momentum* magazine cover featured Cedarville's Slipstream Supermileage car going through a tech inspection. This was the first time the Cedarville team has been featured on the cover of the magazine. For more information, including pictures and stories, visit the team's website at jeremiah.cedarville.edu/Supermileage.



The Cedarville Supermileage team poses with Gold Lightning and Slipstream, Cedarville's Supermileage vehicles.

LERCIP Student Team of the Year Award Nomination *continued from page 1*

students' internship started, my lab was chosen to perform all of the XRD work for a high-profile joint research project with NASA Langley, which effectively doubled the already busy summer workload. Since XRD results are crucial to multiple division, center, and agency-wide materials research programs, I needed significant help from these students in order to accomplish this research. All four students rose to the occasion, quickly learning the theoretical fundamentals and practice of a scientific research technique completely outside of their fields of study. They prepared and collected XRD data on 125 samples and performed detailed crystallographic phase identification. These engineering and scientific achievements alone make them worthy of this award, but this is just the beginning of the story.

The teamwork displayed by these students was amazing. All of their efforts were extremely well coordinated. They made very good use of everyone's individual

talents, evenly distributing the work to be done and sharing resources. The students went out of their way to help their teammates with concepts they had not yet learned. Not once did I see even a glimmer of personal ambition rising about their commitment to team success.

In addition, these students were professionals in every way. They treated each other and everyone they met with courtesy, and they treated NASA equipment with care. The NASA technician overseeing the machine shop told me that it was a pleasure to work with the students, that they followed the safety regulations without fail, and that they always cleaned up after themselves. When one of their tasks required additional testing on a colleague's test rig, the students asked if it would be possible to be trained to use the equipment so that they would not monopolize my colleague's time. When a sanding machine malfunctioned, the two students reported this to me immediately. On another occasion, a

student came to me to discuss possible cross-contamination with an XRD sample. Many would have kept quiet, but these students displayed the highest level of integrity by doing the right thing.

It would have been very natural for these students, all from the same university, to form their own clique. But they did just the opposite by drawing other students into their circle both during and after work. Upon learning that another mentor's LERCIP student was celebrating a birthday, one of my students baked cupcakes, and the team held a lunchtime birthday party, including a number of students and mentors.

They also reached out to represent NASA to the general public. The students volunteered to represent NASA by handing out stickers and posters at the Wadsworth Blue Tip Parade. Two of the team members also volunteered to help organize the annual LERCIP picnic. They truly exceeded the standard expectations for LERCIP interns at NASA.

Students Place at Engineering Competition

Four Cedarville University mechanical engineering students recently attended the District B Student Professional Development Conference in Erie, Pennsylvania, accompanied by Dr. Hardy Hegna, professor of mechanical engineering.

The annual conference is sponsored by the American Society of Mechanical Engineers (ASME). Founded in 1880, ASME exists to assist engineers in creating solutions. The professional organization enables development and collaboration in a variety of engineering disciplines in order to advance the role of the engineer in society.

Josh Brown '11, president of Cedarville's ASME chapter, placed second in the Old Guard Poster Competition with a project on heat treating to generate specific material properties in 7075 aluminum.

Andrew Buchheit '10 and Andrew Yoakam '10 competed in the Old Guard

Oral Presentation Competition. Buchheit was awarded fifth place for describing the Aerodesign micro-class airplane that his team designed, built, and flew at the Aero Design West competition. Yoakam placed second for presenting his senior design

team's work to create reasonably priced intramedullary nails for doctors in Africa.

All three presenters also competed in an Impromptu Design Competition, along with Ryan Martz '12.



Josh Brown '11, Andrew Buchheit '10, Andrew Yoakam '10, and Ryan Martz '12 stand alongside Dr. Hardy Hegna, professor of mechanical engineering, after representing well at the District B Student Professional Development Conference in Erie, Pennsylvania.

Bringing Home Trophies Not Plated With Gold

In recent years, the Cedarville University solar boating team has enjoyed great success, bringing home the world championship Solar Splash trophy in five out of six years since 2004. Although they did not bring home the championship this summer, the team brought home many valuable engineering and life lessons.

Comprised of 13 senior mechanical engineering students and two faculty members, the team set high goals to improve upon the performance of their 2009 winning Solar Splash entry. The goals included building a student-designed and student-constructed electric motor, a new power electronic drive system, new custom-designed and custom-machined propellers, and the design and construction of a brand-new boat to compete in another competition, the Frisian Solar Challenge in Europe.

Despite extraordinary efforts by the team members, it became apparent as the Solar Splash race approached that problems existed with the new designs that were going to require more testing and work than time permitted. So, the team decided to rely on the proven drive system from their 2009 boat. While the drive system performed well, earning the team a second-place ranking in the endurance event, another malfunction forced them to rely upon their endurance configuration for the sprint event, an event for which it was not designed. The final results put the team in fifth place in the overall competition.

After the Solar Splash competition, the team had just a few weeks before the

deadline to pack up and ship the new boat to Europe for the Frisian Solar Challenge. As the deadline approached, it again became apparent that although the new boat was operational and handled beautifully, it was not ready for competition. The team made the difficult decision to withdraw from the Frisian Solar Challenge.

Although the results were disappointing, the lessons learned through research, design, manufacturing, testing, communication, and teamwork made the effort worthwhile. Through it all, the team remained committed to each other and their common goal.

Looking back, the team members have identified multiple key factors that

contributed to their successes and struggles. By wading through the rough water and documenting the muddy path, this team not only has taken home golden life applications but has also been able to pass these lessons on to the next team. While they had hoped to win trophies, they agree that sometimes the more valuable trophies are the ones that they can take with them for the rest of their lives.

The engineering and computer science department is proud of the Solar Splash team's accomplishments and congratulates them for all of their hard work, diligence, and character that they developed and displayed throughout the project.



Society of Engineers Aiding Missions Sheds Light

Cedarville's Society of Engineers Aiding Missions (SEAM) exists to educate, equip, and engage engineers in the cause of world missions.

In addition to praying regularly for engineers and computer science graduates serving in missions, the organization is preparing to complete another set of 50 solar-rechargeable

reading lights for Liberian village pastors. The lights were designed by Cedarville faculty and students over the past three years, and more than 100 have already been put into service.

No major source of funding for this project exists, but in 2010, SEAM generated some of the funds by designing and selling T-shirts and conducting a partnership

drive, allowing donors to sponsor lights for pastors. SEAM has also made arrangements to meet with two missionary speakers. One will talk about technical aspects of radio planting in West Africa, and the other will address the use of appropriate technical solutions for facilitating medical ministry in Africa.

Faculty Development and Accomplishments

Dr. Nan Jiang, assistant professor of computer science, wrote and presented two papers in summer 2010. She presented "Post Mining of Non-redundant Association Rules for Sensor Data Estimation" in Shanghai, China. She also presented "Model-Driven Data Cleaning for Signal Processing System in Sensor Networks" in Dalian, China.



Dr. Robert Chasnov, assistant to the chair and professor of engineering, continues to pursue his passion to educate the world about climate change. He gave his fourth presentation in a series at the American Society for Engineering Education annual meeting held in Louisville, Kentucky, in June. Titled "Energy: Properties and Policy Issues," the talk described the design project that Dr. Chasnov developed for his Thermodynamics class in fall 2009. The project required junior mechanical engineering students to consider how alternatives to burning coal for the production of electricity might involve the trade-off between carbon dioxide production and cost.



Dr. Thomas Thompson, associate professor of mechanical engineering, presented a paper at the ASME 2010 International Mechanical Engineering Congress & Exposition in November in Vancouver, British Columbia. The paper is titled "Specification of Prosthetic Knee Kinematic Design Parameters Using a Three-position, Instant-center Specification Approach."



Dr. Keith Shomper, associate professor of computer science, published and presented a paper, "Chameleon: An Adaptable Instructional IDE," at the 2010 Intellectbase International Consortium Academic Conference in October in Atlanta, Georgia. Chameleon was developed with partial support from Cedarville's faculty summer grant program. Chameleon is an integrated development environment for teaching elementary programming concepts to beginning computer science and engineering students.



Dr. Shomper also presented a webinar titled "Cedarville University Package Tracker: How to Create Your Own Low-Cost Package Tracking System" to members of the In-Plant Printing and Mailing Association.

He also recently received the Cedarville University Dean's Service Award. This award honors faculty members for their contributions on departmental, school, and University committees and task teams.

Dr. Larry Zavodney, senior professor of mechanical engineering, recently spoke at the Xenia Rotary about the engineering and computer science department's ongoing humanitarian work in Liberia.



He has also been a featured speaker for numerous other organizations, often presenting about his work with Cedarville students in designing, building, and racing Supermileage vehicles.

Dr. Zavodney serves on the advisory boards for Grove City College's department of mechanical engineering and Shell Oil Company's Eco-marathon Supermileage competition.

Dr. Timothy Tuinstra, associate professor of electrical engineering, recently published "God and Claude Shannon: The Design and Origin of Error Correction Codes in Living Systems." Dr. Tuinstra has taught at Cedarville since 2002.



Leaving Behind a Legacy of Service



Dr. Bill Brown, president of Cedarville University, receives a check from Edward Krupka, Jr., CIO of Burris Logistics. Also pictured (far left) is Dr. Sam SanGregory, chair of the engineering and computer science department and professor of electrical engineering, and (far right) Dr. Stanley Baczek, dean of the school of natural and applied sciences and professor of polymer science and engineering.

On September 9, 2010, the department of engineering and computer science received another generous donation of \$12,000 from Burris Logistics to support academic scholarships in computer science.

Ten days after providing the gift to Cedarville, Robert (Bob) Burris, president of Burris Logistics passed away after a 15-month battle with cancer.

Under his leadership, Burris Logistics has been a valuable partner and friend to Cedarville University. While his leadership, service, and friendship will be missed, Bob leaves behind a legacy of good works.

His gift in September completed the endowment of the scholarship fund, which was first created in 2004. The department would like to express condolences to the Robert Burris family and deep gratitude to Burris Logistics for many years of partnership.

Few universities — Christian or not — offer the modern facilities, extensive hands-on experiences, and one-on-one faculty interaction that characterize Cedarville’s programs. The rigorous classroom experience combined with a campus environment openly committed to Christ prepares our graduates to find jobs in a wide range of engineering and technology fields or to succeed in graduate school.

Faculty

- Stanley Baczek, Ph.D. (Dean)
- Sam SanGregory, Ph.D. (Chair)
- Robert Chasnov, Ph.D. (Assistant to the Chair)
- Gerry Brown, Ph.D.
- Timothy Dewhurst, Ph.D.
- Vicky Fang, Ph.D.
- David Gallagher, Ph.D.
- Hardy Hegna, Ph.D.
- Nan Jiang, Ph.D.
- Jay Kinsinger, M.S.
- Clint Kohl, Ph.D.
- Tim Norman, Ph.D.
- Robert Schumacher, M.S.
- Keith Shomper, Ph.D.
- Jeff Shortt, Ph.D.
- Thomas Thompson, Ph.D.
- Timothy Tuinstra, Ph.D.
- Tim Yao, Ph.D.
- Larry Zavodney, Ph.D.

Majors

- Computer Engineering (B.S.Cp.E.)
- Computer Science (B.S.)
- Electrical Engineering (B.S.E.E.)
- Mechanical Engineering (B.S.M.E.)

Minors

- Biomedical Engineering
- Computer Science

Special Programs

- Cooperative Education Program
- Engineering Honors Program

Internships

Cedarville’s career services staff will help you prepare for your career through discipline-related experiences, or internships. You will have an advantage in a competitive job market because of real-life, hands-on experience. Students in our department have enjoyed internships with organizations including:

- BAE Systems
- Ball Aerospace & Technologies Corp.
- Boeing
- Brookhaven National Laboratory
- Burris Logistics
- Caterpillar
- Cummins
- Dallas Semiconductor
- FBI
- GE
- Hawaii Electric Light Company
- Ingersoll Rand
- ITT Industries
- JPMorgan Chase & Co.
- The John Hopkins University Applied Physics Laboratory
- LexisNexis
- Lexmark International
- Lockheed Martin
- Northrup Gumman
- Otis Elevator Company
- Proctor & Gamble
- Raytheon Company
- Rolls-Royce Motor Cars
- SAIC
- Standard Register
- Westinghouse Electric Company

Department Chair Greeting

Greetings and thank you for your interest in the Elmer W. Engstrom Department of Engineering and Computer Science here at Cedarville University. We rejoice in the Lord for the many ways that He has blessed us again during the 2009–10 academic year and are pleased to share some of our highlights with you.



To quote from our department vision statement, we “seek to honor the Lord Jesus Christ in every endeavor and earnestly desire to cultivate technical professionals who are committed to moral excellence and who are exemplary in character, conduct, and skill.” As you read this newsletter, you will note how

we live out our vision statement every day. Whether we are setting the foundation through lecture or we are putting engineering into practice in design competitions or laboratory exercises, we strive to provide our students with an excellent education founded on biblical principles. The effort put in is clearly paying dividends.

Although most people never give it a thought, it is hard to imagine our world without engineers and computer scientists. It is very easy, for example, to expect the next cell phone to be better, faster, smaller, or “cooler” than the one before it. But we often forget that there is an army of engineers and computer scientists behind the design of every new phone. From the electronics that enable the phone to communicate wirelessly to the software that makes it “cool” to the sliding door that exposes a hidden keypad, each are design masterpieces. Here at Cedarville, we offer majors in electrical, computer, and mechanical engineering and in computer science — the same disciplines that produce many of today’s marvels, including the cell phone.

As you read this newsletter, you will not see our students designing cell phones, but you will see how prepared they are to tackle very difficult problems. From writing winning computer programs to designing and driving cars that achieve over 1,400 miles per gallon, we believe that our students and graduates are some of the best prepared engineers and computer scientists in the country. But don’t take our word for it; discover it for yourself.

Sincerely,

Sam SanGregory, Ph.D.

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cedarville.edu/myapplication

 **Contact**

Admissions
1-800-CEDARVILLE (233-2784)
cedarville.edu/admissions
admiss@cedarville.edu

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Real-World Project Helps Save Lives

*By John Montgomery
Focus Reporter*

By the time Matthew Hollis '09 graduated, he had already influenced lives half a world away.



Matthew Hollis '09 and his team used their capstone project to engineer a device to save lives.

His capstone project at Cedarville involved reverse-engineering and creating steel rods, or bone nails, used to help stabilize and heal broken femur bones.

The process is simple: drill out the central canal of bone, insert a metal rod in the central canal, and secure the rod above and below the fracture point. The rod bears the weight of the body while the bone heals.

"Over the course of a year, the bone will actually regain most of the load," said Hollis, a mechanical engineering graduate. "It allows the bone to heal. If you fracture the femur and you don't get it addressed, the bone marrow can leak into the body, and it can be fatal," he said.

Such treatment is readily available in the U.S., but is more difficult to find and more expensive in third-world countries.

That's where Hollis and his group came in. They contacted Smith & Nephew, the creators of the first bone nail.

"Overall, they were very helpful," said Hollis. "They were more than happy to share information as long as it wasn't a trade secret or confidential," he said.

The work earned Hollis district and international awards from the American Society of Mechanical Engineers.

Plans now call for the the bone nail to be marketed by a nonprofit group specifically for third-world countries.

Hollis and his team shaved the manufacturing costs from \$1,200 per rod down to \$300. Another team is now working to cut that amount down to \$100.

Although the cost has dropped, the safety factor and integrity of the product has not.

"We made sure that we weren't sacrificing the quality or the integrity of the design for cost," Hollis said.

The team has already heard from a surgeon in Kenya who has used the bone nails to help people. The surgeon told them the device is saving and changing lives.

It's that kind of real-world use that Hollis said made the project worthwhile.

"Helping people made the project a lot more fun, but also it gave it more meaning," he said.