The deadline for automakers to nearly double fuel efficiency standards inched closer as Dr. Robert Prucka opened the door to a Clemson University lab and began work on an engine that bristled with sensors.

The sensors are providing the data that could help solve some of the auto industry’s toughest engineering challenges. Prucka is sharply focused on one sensor in particular that he said could improve fuel economy by 1 to 2 percent at a relatively low cost to manufacturers. “These changes can sound small, but 1 percent of the fuel used in the country is a lot of fuel,” he said. “It’s a lot of money. It’s a lot of CO\textsubscript{2} emissions.”

The time crunch that automakers face is helping turn the spotlight on Prucka, an assistant professor who shares his passion for automotive engineering in the lab, classroom and beyond.

What drives his research now is the 2025 deadline that automakers face to sell a portfolio of cars and light trucks that average 54.5 miles a gallon. At the same time, the companies are under pressure to give buyers what they have come to expect from their cars: safety, performance, fun and affordability.

When Prucka digs into the wires connected to the engine in the lab, he pays special attention to the EGR sensor. EGR stands for exhaust gas recirculation. The sensor measures how much recycled exhaust gas is mixing with fresh air in the engine. The information is fed into a computer, called the engine controller, which acts as the brains of the car. The computer can then use the data to control the EGR valve, making the engine run more efficiently.

“Fuel economy is the No. 1 driver of our research,” Prucka said. “We’re trying to figure out how to control these complicated engines, so we can gain that extra fuel economy.” The research is funded by Bosch and the U.S. Department of Energy.

Prucka is a faculty member in the Department of Automotive Engineering, which is part of the College of Engineering and Science. He and his team are based at the Clemson University International Center for Automotive Research.

Prucka said that what excites him most is continued on pg 4
Dear Colleagues,

As a faculty member with an active research group, I appreciate the work and commitment required to produce consistently high quality research and scholarly effort. I also understand the value of support in such activities. For this reason, I believe the main role of the office of the Associate Dean for Research and Graduate Studies (ADGRS) is to support and enable the research and scholarly activities of our faculty, post-docs, and students. In this letter, I would like to take this opportunity to share several resources that the hard-working team of the CES Dean’s office, departmental faculty, staff, and students has made available to you.

We encourage large research proposal submissions and two of our resources are focused on this effort. The Transformative Initiative for Generating Extramural Research (TIGER) grants program is a seed program designed to provide financial support for interdisciplinary collaborations to develop competitive large proposals. To date, we have supported 30 teams. We have also recently hired Ms. Meghan Mullaney as a Large Research Proposal Coordinator (see below)

Two new searchable electronic resources are available to faculty and staff as we encourage a collaborative research environment. The CES Expert Database (www.clemson.pure.elsevier.com) is a researcher profile system designed to promote collaborative initiatives, help researchers find partners, and improve research visibility. The CES Equipment Inventory tool is now available (equipment.ces.clemson.edu) and will allow Clemson users to search the inventoried equipment in the College. Special thanks to the lab managers in each department for their invaluable support in refining the equipment inventory.

The ADRGS Seminar Series continues to both bring key speakers to campus from different funding agencies and to identify select CES faculty to share their experiences, and recommendations for working with different agencies. Many thanks to those CES faculty who have taken time to participate in this important activity. The annual CES Research Symposium also continues to provide a platform for faculty across the college to tell their stories and find research partners. Drs. Marcus, Ogale and Powell have provided exemplary leadership in organizing this valuable event. The 2nd annual symposium was held on March 12th.

The CES Post-Doctoral Support Office, enters its second year, providing resources to post-docs in departments across the College. Our post-docs have formed a Post-Doc Association, which is leading efforts in post-doc development at Clemson.

The CES Graduate Studies Office continues to support and coordinate many activities across the college. Specifically, the Dean’s Graduate Scholars program is intended to encourage outstanding scientists and engineers to enroll in any Ph.D. degree program in the College of Engineering and Science. This award amounts to $5K/yr for up to four years for certain students. Resources are made available to fund up to 10 positions for a given year. Please see your department graduate coordinator for details.

The CES Pre- and Post-Award Offices continue to provide their high quality support for your research proposals and funded projects. Each office has a page on the CES Research Website with news, updates, and even proposal templates and examples. With the implementation of the InfoEd electronic proposal submission system, I would like to ask you to be prompt in providing the proposal materials for uploading to the systems, and approving your proposals. In addition, your close oversight of your grant accounts with the Post-Award staff is much appreciated.

I also currently meet monthly with three groups who represent all of our departments and who have helped guide the initiatives above. The CES Research Infrastructure Committee consists of department lab managers and college staff and addresses timely and important topics related to College infrastructure, resources, and health and safety. The ADGRS Advisory Faculty Committee has been providing important support and guidance to me for the functions to the overall college research enterprise. I also meet monthly with the departmental Graduate Coordinators. There have been several beneficial exchanges in the group on the procedures and policies related to our graduate programs. This group has drafted proposals on parental leave and reduced graduate student application fees that are currently under consideration by the Graduate School.

Finally, Convergence, the newsletter you are holding, serves as an important communication to showcase the research and graduate studies activities in the College as we raise awareness across departments.

In my opinion, this list is a testament to the teamwork and support of many people from different corners of the College to create a strong and supportive environment for research and scholarship in the College. I hope, you find these resources instrumental. If you have any questions or suggestions for new ideas, please do not hesitate to send me a message (tkaranf@clemson.edu) or call (864-656-3201). Details about all of these activities can also be found on our website at www.clemson.edu/ces/research. On the behalf of the ADGRS office, I wish you a relaxing, productive and great summer!

Tanju Karanfil
Associate Dean for Research & Graduate Studies

>>News & Updates

CES Hires Large Research Proposal Coordinator

The ADRGS Office is excited to announce that Ms. Meghan Mullaney joined the office, effective April 1st. Ms. Mullaney has been hired as a coordinator of large research proposals and efforts for the College of Engineering and Science. She will be offering coordination and communication support to PI’s of select large collaborative, multi-investigator, multi-unit research proposals. She will also be supporting the activities of the Office of the Associate Dean of Research and Graduate Studies. To contact Meghan, please email: mamulla@clemson.edu
Two CES faculty receive prestigious NSF CAREER awards

Two Clemson University faculty members are receiving a grand total of $1 million in funding as part of the nation’s highest honor for scientists and engineers in the early stages of their research careers.

Drs. Jacob Sorber and Yue “Sophie” Wang are among the honorees in this year’s National Science Foundation’s Faculty Early Career Development (CAREER) Program. They are working on separate projects, and each has been awarded $500,000 for research. Sorber is an assistant professor in the School of Computing, and Wang is an assistant professor in the Department of Mechanical Engineering.

Sorber’s research enables low-cost, low-power sensors to gather data for long periods of time. The sensors would be powered by energy from environmental sources, such as the sun, with no need for batteries or manual recharging. He said the sensors have the potential to transform science and society.

Wang is focusing on two distinctly human attributes—trust and regret—to develop new “control algorithms” and decision-making strategies that would help humans and robots work together to be more productive. She sees big opportunities for humans and robots to collaborate in manufacturing.

Wang also sees high potential for “human supervised mobile sensor networks.” Robots could begin doing low-level simple and repetitive tasks, while humans could be involved in high-level complex tasks, she said.

Dr. Anand Gramopadhye, dean of the College of Engineering and Science, said the awards are a clear testament to the hard work and creative ideas that Sorber and Wang bring to Clemson. “We are very proud of them both,” Gramopadhye said. “The award means that two of the nation’s brightest emerging researchers are here at Clemson. The funding will enable Jacob and Sophie to develop significant programs for maximum impact. “It’s a job well done for both.”

While research is central to the award, winners also must demonstrate excellent teaching. The Awardees have proven themselves exemplary in integrating research and education. Selection for this award is highly competitive.

“The nation’s brightest emerging researchers are here at Clemson”

-Dr. Anand Gramopadhye

These two outstanding researchers bring the total number of current faculty with active NSF CAREER awards in the College of Engineering and Science up to twenty.

Blenner receives award through Air Force Young Investigator Program

Dr. Mark Blenner of Clemson University said that, by engineering one of life’s basic building blocks, it could one day be possible to make clothing that repairs its own tears and a chemical that degrades nerve agents.

And it could all start with the same type of yeast that makes beer. Blenner is involved in synthetic biology, an emerging field of research so cutting-edge that scientists don’t yet agree on a definition. He changes the DNA sequence of bacteria and yeast to make new enzymes that can do things nature has not yet figured out.

Blenner, an assistant professor in the Department of Chemical and Biomolecular Engineering, recently had three years of research funded through a $360,000 award from the Air Force Office of Scientific Research.

“We’re really just scratching the surface in terms of our understanding of how proteins and enzymes work and what their limits are,” Blenner said. “The possibilities are endless.”

It could be a few years before the technology can be used in a product, but Blenner expects by the end of the study to begin applying enzyme models to applications that would be useful to the Air Force.

Blenner was among 57 scientists and engineers across the country to split $16.6 million in grants through this year’s Young Investigator Research Program. The awards are open to U.S. scientists and engineers who received Ph.D. or equivalent degrees in the last five years and who show exceptional ability and promise for conducting basic research.

Contacts:
Jacob Sorber (jsorber@clemson.edu)
Sophie Wang (yue6@clemson.edu)
Mark Blenner (blenner@clemson.edu)
working with the students who will become the next generation of engineers. His passion helps explain why a 1991 Mazda Miata was sitting on a lift without tires near his lab. The car was near the end of its life on the road until it was given to Prucka and his new student autocross team, CU-Racing. They are taking apart the whole vehicle, installing safety features and figuring out how to make it faster.

“Fuel economy is the No.1 driver of our research”

-Dr. Robert Prucka

But it isn’t enough to drop a massive engine under the hood of the compact car. Acceleration and handling win autocross races, which are typically held in parking lots and rarely go over 50 mph according to Prucka. He tries to replicate what students will face in the real world by making them justify big expenses. If they want to put a V8 engine in the Miata, they need to show why it would make the car faster.

They have also brought in business students to help with the marketing.

When Prucka joined Clemson in 2008, the automotive engineering program was two years old. The department has grown to about 200 students and sends 94 percent of its alumni into the automotive industry or academia.

One of those students is Victor Gallas, a Ph.D. student with Prucka. Gallas was on a team of students working with a car strapped to a chassis dynamometer, which is like a treadmill for cars. “At the end, when you start seeing the data on the computer and you start to understand the whole system, that’s pretty cool,” he said. “With a lab like this you can quickly identify problem areas and develop plans to fix them.”

Gallas was in The Transient Emissions and Fuel Economy Laboratory, which does research on emissions and fuel economy in cooperation with the Specialty Equipment Market Association (SEMA). Results from the lab help businesses in the aftermarket industry make high performance auto parts that comply with federal emissions standards.

“It’s a big industry, and we like helping them,” Prucka said. “Customization is an important part of the auto industry as a whole, especially for attracting younger generations to cars.”

Contact: Robert Prucka(rprucka@clemson.edu)
To learn more about the program visit: clemson.edu/ces/research/graduate-studies/low-country.html

The Citadel and the College of Charleston to provide additional courses for engineering programs in the future.

Clemson is planning to continue building up its Charleston program over time, adding one or two classes a semester, Summers said. Two classes will be taught entirely online over the summer, and classes will return to the alternating distance learning format for the fall. The university plans to partner with The Citadel and the College of Charleston to provide additional courses for engineering programs in the future.

To learn more about the program visit: clemson.edu/ces/research/graduate-studies/low-country.html

**Clemson in the Lowcountry Program Kicks Off**

As the aeronautics industry and other engineering businesses continue to grow in the Lowcountry so too do the opportunities for higher education in those fields. Clemson University is the latest institution to support the area’s engineering boom with the launch of graduate-level mechanical engineering courses in the 2015 Spring Semester through a partnership with the Lowcountry Graduate Center.

Clemson started its mechanical engineering program in the Charleston area with one course - advanced strength of materials - offered at the Lowcountry Graduate Center in North Charleston. "We wanted to start with a course that's meant to have broad appeal and be accessible to students no matter what area they go into," said Joshua Summers, graduate coordinator for Clemson's Department of Mechanical Engineering.

This past semester, 29 students across the Charleston and Clemson campuses participated in the class taught by Dr. Gang Li. The class was opened up an entire Creative Inquiry project in the Wetzler lab, with three other students (Will Sharpe, Rebecca Pontius, and Matt Churitch) working under his tutelage.

This work has been submitted to the Journal of the American Chemical Society. Matt plans to graduate this summer and apply to Ph.D. programs in chemistry next year.

Contact: Modi Wetzler (mwetzel@clemson.edu)

**THE OFFICE OF THE ASSOCIATE DEAN FOR RESEARCH AND GRADUATE STUDIES–COLLEGE OF ENGINEERING AND SCIENCE**

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**Matt Wasilewski**

Matt thoroughly investigated a variety of protecting groups. These protecting groups have very diverse behaviors. The original sulfonamide ones from 1974 go on very easily but never want to come off. Another class of protecting groups, called silyl ethers, come off when they interact with water. "You'd think that would be a real advantage, but imagine the difficulty of working with these sensitive groups in the humid South Carolina summers!" said Matt.

In addition to balancing the ease of putting the protecting groups on and removing them, the protecting groups also need to direct the reactivity of the molecule.

It was here they found a breakthrough. Historically chemists thought the problem was a competition between the pieces forming the desired cyclic compounds versus reacting uncontrollably. Since 1974 chemists thought the protecting groups used in the forty-year-old synthesis prevent the polymerization, but because Matt investigated a wide variety of protecting groups very thoroughly he found another process was responsible for the low yields.

"Everyone has been thinking it’s a physical effect, that the large size of the protecting groups was forcing them into a shape that favored forming the macrocycle you want, but instead we discovered it’s an electronic effect and specifically one that is discussed in every first-semester organic chemistry class” said Matt.

"By then accounting for that effect we have been able to take the yields for the cyclization step, which have hovered close to 50% for 40 years, to about 100% for the first time! These advances could make a real impact on human health!"

Matt’s hard work led to an Innovation and Creativity fellowship from the Atlantic Coast Conference, as well as several departmental awards. His initial work also opened up an entire Creative Inquiry project in the Wetzler lab, with three other students (Will Sharpe, Rebecca Pontius, and Matt Churitch) working under his tutelage. This work has been submitted to the Journal of the American Chemical Society. Matt plans to graduate this summer and apply to Ph.D. programs in chemistry next year.

Contact: Modi Wetzler (mwetzel@clemson.edu)
Dr. Julie Martin’s research shows educators play a key role

Engineering courses challenge even the brightest students, but they don’t have to do it alone. Dr. Julie Martin is on a quest to figure out what resources students need to pick the right engineering major and to stick with it until a degree is in hand. Her focus, in particular, is on how students’ social connections to parents, teachers, university officials and others can help them succeed.

And the results of her research might be surprising. She has found that Mom and Dad may not be as important as once thought, particularly once students pick their majors.

Educators play a key role, especially for first-generation college students, Martin and her collaborators found.

In some of her latest research, Martin and her collaborators asked whether first-generation college students have less access to information, resources and opportunities than students from college-educated families.

The researchers found that students from college-educated families had a broader and more tightly-knit network of people to provide workplace tours and other opportunities. But first-generation college students were adept at using weaker connections to educators and other sources.

“The most important takeaway is that the data demonstrate that first-generation college students do in fact access resources,” Martin said.

Middle and high school teachers can be particularly influential to first-generation college students

The results underscored how important it is to adequately fund and staff university engineering programs that help recruit, retain and reach out to students, researchers found. The programs have a greater benefit for first-generation college students but help all students build networks.

“Including parents is still important so they can provide whatever support and resources possible,” Martin said. “All of it helps.”

It is also important to reach students in community college or even earlier, researchers found. Middle- and high-school teachers can be particularly influential to first-generation college students. “Even a small gesture can have a big impact on a student’s future,” Martin said.

Researchers surveyed 1,410 engineering undergraduate students at five U.S. universities. They reported their findings in the International Journal of Engineering Education.

Martin served as the lead author. Matthew K. Miller, also of Clemson, and Denis R. Simmons of Virginia Tech collaborated. Miller is currently a General Engineering instructor at Clemson. Simmons is in a tenure-track position at Virginia Tech.

Dr. Tanju Karanfil, associate dean for research and graduate students in the College of Engineering and Science, said that Martin’s work is shedding light on an important topic.

“It is also important to reach students in community college or even earlier, researchers found. Middle- and high-school teachers can be particularly influential to first-generation college students. “Even a small gesture can have a big impact on a student’s future,” Martin said.

“Even a small gesture can have a big impact on a student’s future”

Julie Martin

“The next generation of engineers will need an education before entering the workforce,” he said. “Dr. Martin’s work is helping us better understand what it takes to recruit and retain them. The state and nation will need them to remain competitive.”

Martin is an assistant professor in the Department of Engineering and Science Education with a joint appointment in the Department of Materials Science and Engineering. She is an NSF CAREER award winner for her research, “Influence of Social Capital on Under-Represented Engineering Students’ Academic and Career Decisions.”

Contacts:
Julie Martin: jtreor@clemson.edu
Paul Alongi: palongi@clemson.edu
Four graduate students receive top college honors

Each year, the College of Engineering and Science names two graduate students as Outstanding Graduate Research Assistants, and two students as Outstanding Graduate Teaching Assistants.

This year’s awards in teaching went to Sarah Anderson, a Ph.D. student in Mathematical Sciences and Christine Duval, a Ph.D. student in Chemical and Biomolecular Engineering. Each of these graduate students has had tremendous impact in the classroom and been recognized by both faculty members and students.

Marharyta “Margo” G. Petukh, Physics and Astronomy, is a 2015 recipient of the Graduate Researcher Award. Since joining the department in 2011, Marharyta has been prolific in her research, publishing eighteen peer-reviewed papers at last count, developing several computational methods, and mentoring many undergraduate and graduate students. In her research, she has collaborated with NIH researchers in developing methods to model and predict the effect of single point mutations on the binding free energy among many other projects.

Her advisor, Dr. Alexis says “Ms. Petukah is the best Ph.D. student I ever had. She is so advanced that currently she is performing at a level of a postdoctoral researcher.” Marharyta will be graduating this year and planning on pursuing a research and teaching career.

Tim Olsen, a Ph.D. student in Bioengineering, also received the 2015 Graduate Researcher Award. According to the awards committee, since starting his Ph.D. in 2012, Tim has maintained a 4.0 GPA while also working on a project generating blood vessels by fusion of magnetically loaded microspheres. Throughout this project, he has had at least eight peer-reviewed publications as well as presented in three oral presentations and several posters.

Dr. Frank Alexis describes him as a ‘leader and example for other students.” Olsen has served as the lab manager of Dr. Alexis’s Laboratory of Nanomedicine and is also involved and engaged in the departmental organizations.

Academic Achievement Award for the best doctoral dissertation. This award includes a $3000 cash prize and will be presented at the annual meeting in Anaheim, California. Selbes’ advisor, Dr. Tanju Karanfil, says “This award is a great honor and truly recognizes the exceptional quality and outstanding effort that Meric put into conducting and reporting his excellent research.”

Meric has recently started working as a consulting engineer at Hazen and Sawyer in Fairfax, Virginia.

Meric Selbes, a recent Environmental Engineering and Earth Sciences Ph.D. graduate was awarded the American Water Works Associate (AWWA) First Place 2015 Academic Achievement Award for the best doctoral dissertation. This award includes a $3000 cash prize and will be presented at the annual meeting in Anaheim, California. Selbes’ advisor, Dr. Tanju Karanfil, says “This award is a great honor and truly recognizes the exceptional quality and outstanding effort that Meric put into conducting and reporting his excellent research.”

Meric has recently started working as a consulting engineer at Hazen and Sawyer in Fairfax, Virginia.

Student to study in Australia

Mr. Ben Fellows, a Materials Science and Engineering graduate student working with Prof. Thompson Mefford, has been selected to receive the prestigious and competitive NSF EAPSI (East Asia and Pacific Summer Institute) Fellowship. This award will allow Ben to conduct part of his research at the University of Western Australia this summer testing next generation metal oxide based MRI contrast agents.

Congratulations to each of these students!

For more graduate student news and awards visit: www.clemson.edu/ces/research/graduate-studies
Making Regenerative Medicine a Reality
Team at Bioengineering’s CUBEInC works toward the future

According to the most recent statistics released by the American Heart Association, approximately 84 million people in this country suffer from some form of cardiovascular disease. Many patients undergo surgery to replace their dysfunctional heart valves, blood vessels or the whole heart.

The goal of Dr. Agneta Simionescu and the Cardiovascular Tissue Engineering and Regenerative Medicine Lab (CTERM Lab) is to de novo generate cardiovascular structures able to substitute for damaged blood vessels and mitral valves, and contribute to the endogenous regeneration and healing of the injured cardiac muscle.

Together with graduate and undergraduate students, Dr. Simionescu develops compact three-dimensional structures to serve as scaffolds capable of directing adult stem cell differentiation into cardiovascular cells; biochemical and physical stimuli are delivered using bioreactors built for each of these specific structures. Indeed, the cellular mechanisms involved in tissue development, regeneration, and repair offer valuable cues that could be leveraged to build strategies applied in cardiovascular regenerative medicine.

It is well known that diabetes and high blood pressure are major risk factors involved in cardiovascular structures’ degeneration; consequently, the long-term goal is to develop tissue engineered blood vessels, mitral valves, and cardiac muscle resistant to the anticipated deteriorations initiated by the harsh diabetic and hypertensive condition.

The ultimate goal of this research is to translate tissue-engineering solutions to the patients; working together with scientists and surgeons involved in CUBEInC research, the mission of the CTERM lab is to demonstrate that regenerative medicine is not something of the future, but it is actually here and now.

Contact: Agneta Simionescu (agneta@clemson.edu)

CU Post-Doc Association Builds Program

Over the past several months, the postdoctoral community at Clemson University has been organizing itself to grow bigger and better. Incorporated on September 15th, 2014 the CUPDA mission is to improve and support the postdoctoral scholar experience at Clemson University.

The postdoctoral workforce has played a key role in the research environment in all fields. In an effort to increase postdoctoral experience at Clemson, Tanju Karanfil, Associate Dean for Research and Graduate studies, started the initiative that resulted in the formation of the CUPDA. The leadership team of the association has worked on planning the activities needed to accomplish the CUPDA mission.

For the first time, the postdoc community participated in the CES Research Symposium that took place in March 12, showcasing the fine work that post-docs conduct at Clemson.

In recognition of postdocs efforts, distinguished postdoctoral and conference travel awards are being established. Each semester three conference travel awards will be granted. Moreover, professional development workshops and social events are being organized and will be announced to the community on our website.

Also, please keep an eye out for the Summer Post-Doc Seminar Series, starting in May. During this summer series, postdoctoral scholars from across campus will present their research activities and scientific advancements.

In an effort to integrate with the national efforts, CUPDA President, Dr. Jorge Rodriguez and Jessica Economy, Assistant Director of Graduate Studies and Post-Doc affairs attended the annual meeting of the National Postdoctoral Association (NPA) in March. This venue was a great networking opportunity and learning experience to further advocate on postdoctoral affairs.

Please send any inquiries to cupostdoc@g.clemson.edu or visit the website on the CES Research page.

Summer Seminar Series Schedule

All Seminars at 12:00 noon in 109 Rhodes Hall. Pizza and sodas will be served.

- May 13th
- May 27th
- June 10th
- June 24th
- July 8th
- July 22nd
- August 5th
Dr. Liang Dong conducts ground-breaking research

Just as the Navy was deploying a laser weapon to the Persian Gulf, a Clemson University researcher already was thinking about how to make it more powerful.

Liang Dong said the laser aboard the USS Ponce has a range of less than three miles, but the Department of Defense would like one that strikes targets more than 60 miles away.

“We’re looking at ‘Where does the next phase of technology need to go?’” Dong said. Dong’s team creates the optical fibers that go into lasers. He said that, while none of his fibers were in the laser aboard the Ponce, his team is working to create an amplifier that could increase the power.

The Navy deployment makes Dong’s work particularly timely, but military lasers are only part of his research. What excites him most are the economic possibilities that come with using lasers in manufacturing.

Lasers can be used to cut, drill, weld and mark a variety of materials in ways that conventional tools cannot. Lasers, for example, are used to cut Gorilla Glass that covers smart phones.

“We see the military application, but there is also this industry revolution going on at the same time,” Dong said. “This is taking machining — cutting and drilling — to a different level.”

The Optical Society’s board of directors recently elected Dong a Fellow in recognition of his contributions to optics and photonics.

Dong is an associate professor of electrical and computer engineering. His research funding comes from a variety of sources, including the Army, Air Force and the Clemson University Research Foundation.

Creating a powerful laser for either the military or industry starts with making highly specialized glass. Dong and his team combine various elements that are formed into a rod and put into a two-story “draw tower.” The tower strings the molten-hot glass into a fiber that looks like fishing line.

As seen through a microscope, cross-sections of the fibers show they have symmetrical patterns, some resembling honeycombs. As many as six different types of glass are embedded within each cross-section.

“It becomes a very complex puzzle to put together,” Dong said. “Everything in it has to be just right so that it will be able to support a very well-defined beam.”

Dong’s work carries on a proud Upstate tradition in lasers. Charles Townes, whose research led to the development of the laser, graduated from Greenville High in 1931 and went on to win a Nobel Prize for Physics in 1964.

In lasers used as weapons, a low-powered laser goes through several amplifiers to increase the power. Dong and his team are developing a “last-stage amplifier,” which does the most demanding work.

In manufacturing, lasers are already surpassing conventional machining tools, Dong said. The global market for lasers used in materials processing grew from 1.7 billion euros to 2.4 billion euros from 2005 to 2012, according to Optech Consulting.

In the same period, the market share of optical fiber lasers grew from 4 percent to 18 percent.

The “Holy Grail” that Dong and other researchers are chasing is using lasers to create a more efficient fuel-injection system in a car engine, he said. A fuel-injection nozzle is a tube drilled with very fine holes. Fuel is pressurized to form a spray into the engine. The finer the spray, the more efficient the engine.

“The key here is to drill those small holes, a large number of them in a production process in a consistent fashion,” Dong said. “If you can do this, you can make billions of dollars.”

Contacts:
Paul Alongi: palongi@clemson.edu
Liang Dong: dong4@clemson.edu

Electrical Engineering Researcher Makes Lasers More Powerful

“*It becomes a very complex puzzle to put together*”

-Liang Dong

In manufacturing, lasers can be used to cut, drill, weld and mark a variety of materials in ways that conventional tools cannot. Lasers, for example, are used to cut Gorilla Glass that covers smart phones.

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Contacts:
Paul Alongi: palongi@clemson.edu
Liang Dong: dong4@clemson.edu
New Faculty Grants and Awards over $100K

July - December 2014

Alexis, Frank, “Controlled Self Assembly of Novel Magnetic Cell Spheroids for the Fabrication and Maturation of Linear Blood Vessels,” AHA $152,406

Alexov, Emil Georgiev, “DelPhi: Software for Electrostatic Modeling of Biomolecules and Objects,” NIH $2,064,424

Apon, Amy W, “Dasein Connector -- NFV Extensions,” Dell Products, LP $107,843

Arya, Dev Priya, “A Rapid Assay for RNA Targeted Drugs”, NUBAD, LLC $263,000


Benson, Lisa C, “Collaborative Research: Intersectionality of Non-normative Identities in the Cultures of Engineering (InIce),” NSF $205,579

Blenner, Mark Alan, “Enhanced Production of Advanced Biofuels through Model Guided Synthetic Biology;” NSF $313,889

Bordia, Rajendra Kumar, “A Novel Intermediate Temperature Bifunctional Ceramic Fuel Cell Energy System,” University of South Carolina $101,998

Bordia, Rajendra Kumar, “Multi-Scale Fundamental Investigation of Sintering Anisotropy,” NSF $299,842

Bordia, Rajendra Kumar, “Precursor Derived Nanostructured Si-C-X Materials for Nuclear Applications,” Battelle $191,693


Brown, Philip J. “Production and characterization of Third Generation Cut Resistant fibers via Acrylic/Copolyaramid Bi-Component Wet Spinning with a Focus on Scaled up Production and Product Enhancement,” US ARMY $176,581

Brown, Philip J, “Collaborative Research: Planning Grant; I/UCRC for the Ceramic, Composite and Optical Materials Center,” NSF $400,000

Chailil Madathil, Kapil, “Accelerate Engineering Program Course Development,” South Carolina Governor’s School for Science and Mathematics $263,087

Chowdhury, Maskhar A, “Operational and Economic Analysis of Access Management,” SC Dept of Transportation $345,301


Christensen, Kenneth A, “Phage Display Selection of Antiangiogenic CMG2 Cyclic Peptide Antagonists,” NIH $214,590

Dean, Brian Christopher, “REU Site: Data-Intensive Computing,” NSF $264,487

Desjardins, John D, “Preventing Infection by Surface Modification of Orthopaedic Fracture Fixation Implants for Improved Limb Salvage Outcomes,” US ARMY $858,860

Devel, Timothy A, “Ultra-Trace-level Quantification of Alpha & Beta emitting Radionuclides with Extractive Scintillating Resin,” Defense Threat Reduction Agency $1,050,001

Dimitrova, Elena, “Collaborative Research: Data Selection for Unique Model Identification,” NSF $100,002

Dong, Liang, “Advanced Optical Fiber Development for kW Fiber Lasers with Sub-GHz Linewidth,” US ARMY $108,000

Dong, Liang, “Novel Fiber Concepts for High Power Single Mode Fiber Lasers,” US ARMY $1,468,000

Dong, Liang, “Optimization of Tm-Doped Phosphosilicate Glass for High Power Fiber Lasers,” US AIR FORCE $100,000

Dooley, R Larry, “2008 Research Infrastructure Improvement Grant (RII),” University of South Carolina $279,797


Fadel, Georges M, “Meta-Materials for Tank Tread Backer Pads,” University of Michigan $118,082


Fralix, Brian H., “New Methods for Studying the Time-Dependent and Steady-State Behavior of Markov Chains,” NSF $242,600

Gao, Xuohong, “AF: Medium:Collaborative Research: Sparse Polynomials, Complexity, and Algorithms,” NSF $166,681

Gao, Zhi, “Microfabricated Coculture Model: Myocyte Rescue by TNT-Transferred Mitochondria,” NIH $384,329


Gilbert, Juan E, “NSF BPC-A: Institute for African-American Mentoring in Computing Sciences (I2AMCS),” NSF $2,000,788

Haque, Imtiaz UI, “GATE Center of Excellence in Sustainable Vehicle Systems,” DOE $934,264

Heister, Timo Johannes, “Geoinformatics: Faculty Support: Computational Infrastructure for Geodynamics,” University of California,Davis $139,817

Hodges, Larry F, “Graduate Research Fellowship - Austen Hayes,” NSF $132,000


Hoover, Adam W, “AoC: Manufacturing Visual Inspection Assistant: Phase 3,” BMW Manufacturing Corporation $163,924


Johnson, Eric Gordon, “Laser Filamentation Science,” University of Central Florida $193,913

Johnson, Eric Gordon, “Single-crystal Fiber Lasers,” Rutgers, the State University of New Jersey $244,000
<table>
<thead>
<tr>
<th>Project Title</th>
<th>Sponsor/Institution</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Solid-State Fundamental Mode Green Laser for Ocean Mine Detection</td>
<td>Lumany LLC</td>
<td>$102,500</td>
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<tr>
<td>Spatial and Spectral Multiplexing of Optical Beams</td>
<td>US Navy</td>
<td>$293,147</td>
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<tr>
<td>EAGER: Novel Photoacoustic Sensor Using Piezoresistive GaN Microcantilever</td>
<td>NSF</td>
<td>$151,149</td>
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<td>Magnetic-field-Assisted Assembly of Multifunctional Ceramic Nanocomposites</td>
<td>US AFRC</td>
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<td>Configuration Management and Planning (Year 2)</td>
<td>BMW Manufacturing Corporation</td>
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<td>South Carolina IDeA Network of Biomedical Research Excellence (SC INBRE)</td>
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<td>Tissue-Engineered Repair of Cranial Facial Muscle</td>
<td>NIH</td>
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<td>Separate growth Environments for Optimization of Nutrient Use in Algal Culturing Systems - Fellowship for Muriel Steele</td>
<td>NSF</td>
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<td>The Role of Field Aligned Ion-Drag in Driving Vertical Winds and Mass Density Enhancements Observed in the CUSP Region of Earth's Upper Thermosphere (Clemson co-I Proposal)</td>
<td>NASA</td>
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<td>Multiscale Molecular Modeling as Guide for Bioactive Polymer Design Optimization</td>
<td>Rutgers, the State University of New Jersey</td>
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<td>Mesosphere-Lower Thermosphere Turbulence Experiment (METEX) (Co-I Proposal Clemson University)</td>
<td>NASA</td>
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<td>BIGDATA: F: DKM: Collaborative Research: PXFS: ParallelX Based Transformative I/O System for Big Data</td>
<td>NSF</td>
<td>$300,000</td>
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<td>R&amp;D Building Reliable Data Transfer Tool</td>
<td>UT-Battelle, LLC</td>
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<td>On a General Class of Count Time Series Models</td>
<td>NSF</td>
<td>$150,000</td>
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<td>Gradient Films from Shape Memory Nanofoams for Waveguide Coating: Topic Per4-F</td>
<td>Defense Threat Reduction Agency</td>
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<td>Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Microplasmas for Elemental, Isotopic and Molecular Detert</td>
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<td>Topics in Algebraic Geometry Codes</td>
<td>NSF</td>
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<td>Fluorescent Polymer Nanoparticles for Nano-Imaging and Sensing</td>
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<td>$326,972</td>
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<td>Assembly Q-Management 1: PROCESS Based Prediction</td>
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<td>Characterizing and Interpreting the In Situ Strain Tensor During Co2 Injection</td>
<td>DOE</td>
<td>$418,651</td>
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<td>Infrastructure to Support Research in Network-Aware Data-Intensive Computing</td>
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<td>Graduate Fellowships in Electrical and Computer Engineering</td>
<td>US DEPARTMENT OF EDUCATION</td>
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<td>Analysis of Short-Term Tidal Perturbations</td>
<td>GAFs, Inc.</td>
<td>$125,778</td>
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<td>STC - Educational Component</td>
<td>University of Tennessee</td>
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<td>Control Oriented Particulate Emissions Reduction</td>
<td>FCA US LLC</td>
<td>$597,175</td>
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<tr>
<td>Development of Innovative Self-Lubricating Polymeric Bearings</td>
<td>Master-PT</td>
<td>$141,161</td>
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<tr>
<td>Radionuclide Waste Disposal: Development of Multi-scale Experimental and Modeling Capabilities</td>
<td>DOE</td>
<td>$1,950,000</td>
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<td>SRR Technical Support Provided by Clemson University</td>
<td>SCUREF</td>
<td>$164,354</td>
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<td>Stabilization of PU Surface Complexes on Mineral Colloids by Natural Organic Matte</td>
<td>Lawrence Livermore National Labs</td>
<td>$109,776</td>
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<td>Thermo-mechanical Response of a Nickel-Base Superalloy</td>
<td>Special Metals Corporation</td>
<td>$181,148</td>
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<td>Predicting the toxicity of Nanomaterials By a Transforming Protein Corona</td>
<td>NIH</td>
<td>$444,826</td>
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<td>Ultrasonic Particle Scrubbing with Drops</td>
<td>NSF</td>
<td>$147,968</td>
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<td>DOE</td>
<td>$1,950,000</td>
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<td>Novel Approach for the Design and Development of Valvar Replacement Biomaterials</td>
<td>University of Texas at Austin</td>
<td>$234,987</td>
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<td>NRI-Small: Long, Thin Continuum Robots for Space Applications</td>
<td>NASA</td>
<td>$319,741</td>
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<td>Flexible Scientific Infrastructure to Support Fundamental Advances in Cloud Architectures and Applications</td>
<td>University of Utah</td>
<td>$1,072,386</td>
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<td>Experimenting with Persistent Live Video Streaming Service</td>
<td>Raytheon BBN Technologies Corp</td>
<td>$140,000</td>
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<td>Label-free RF imaging of cell membrane heterogeneity in liquid</td>
<td>NIH</td>
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<td>Development of a Novel Multi-functional Single Cell Analyzer</td>
<td>University of Missouri</td>
<td>$134,000</td>
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<td>Robust Metal-Ceramic Coaxial Cable Sensors for Distributed Temperature Monitoring in Fossil Energy Power Systems</td>
<td>University of Cincinnati &amp; Missouri University of Science and Technology</td>
<td>$138,000</td>
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<tr>
<td>High Power, Single Frequency, Broad-area Diode Laser Emitters/Arrays and their Applications in Microresonator Based Frequency Combs</td>
<td>US ARMY</td>
<td>$152,000</td>
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</tbody>
</table>
Change to pooled fringe benefit rates for 2015-2016

Please use the following pooled fringe benefit rates for FY2015-2016

<table>
<thead>
<tr>
<th>Employee Type</th>
<th>FY2016</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 month</td>
<td>29.6%</td>
<td>+1.4%</td>
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<tr>
<td>Administrator</td>
<td>36.2%</td>
<td>+2.2%</td>
</tr>
<tr>
<td>Students</td>
<td>7.3%</td>
<td>+2.0%</td>
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<tr>
<td>Part-time/Temporary</td>
<td>16.2%</td>
<td>-6.6%</td>
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</tbody>
</table>

Uniform guidance update

The following are changes included in the new Uniform Guidance:

- **Publication Costs** - Allowable up to 90 days after project end date if included in proposal
- **Administrative & Clerical Costs** - Allowable as a direct cost if all of the following conditions are met:
  1. Services are integral to the project,
  2. Individuals can be specifically identified with the project,
  3. Costs are explicitly included in the budget or have the prior written approval of the Federal awarding agency,
  4. Costs are not also recovered as indirect costs
- **Computing Devices** - Allowable with sponsor approval even if not solely dedicated to project

For complete policies and all updates, please visit www.clemson.edu/research/grants-contracts/policy/

CES Faculty Experts system

www.clemson.pure.elsevier.com

The College of Engineering and Science has purchased a faculty profiling system through Elsevier. The system pulls publications and output from SCOPUS and other databases as well as current research projects to generate a researcher profile. This profile can be used to share research information, identify past and future collaborators and increase the visibility of College of Engineering and Science faculty researchers.

CES Searchable Equipment Inventory

equipment.ces.clemson.edu

The searchable inventory is a tool that catalogs all inventoried equipment in the college. This tool is designed to promote collaborative research efforts across the departments and to increase awareness of the resources already in place. If you have any questions about this project, please contact Phil Landreth at lralph@clemson.edu