MAKING GREAT STRIDES

LYLE BREAKING NEW GROUND IN PROSTHETICS
MESSAGE from THE DEAN

Impact is measured in so many ways. Here at the Lyle School of Engineering, our goal is to make an impact that will change lives for the better while shaping future engineers to solve the problems of tomorrow. This innovative and world-changing impact can be found throughout our school. In this issue, we share some exciting new research taking place, and celebrate some incredible accomplishments.

Our feature story introduces you to assistant professor of Electrical and Computer Engineering, Dario Villarreal, and the cutting-edge research being done in his NeuroMechatronics Lab in the field of biorobotics and prosthetics. His interdisciplinary work explores connecting current prosthetic technology to the human neuromuscular system for more intuitive control in ambulation.

You’ll also meet Xu Nie, assistant professor in Mechanical Engineering, and learn about the life-saving research his students in the Impact Mechanics Lab are conducting with the U.S. military, working to improve concrete’s ability to withstand hard blows, in an effort to construct safer protective structures and barriers for troops.

This spring, Lyle is celebrating the 20th anniversary of SMU’s Research Center for Advanced Manufacturing (RCAM) and honoring the center’s founder and director, Dr. Radovan (Rado) Kovacevic, professor of Mechanical Engineering and Herman Brown Chair in Engineering. In this issue’s Look@Lyle, you’ll see why RCAM has become one of the top centers for advanced manufacturing and laser-aided manufacturing in the world, as well as a valuable resource for hundreds of research engineers who have passed through its doors.

We’re also excited to demonstrate our continued commitment to advancing engineering education by hosting the first American Society of Civil Engineering (ASCE) Education Summit in almost 25 years. Faculty and staff from Civil and Environmental Engineering, the Caruth Institute for Engineering Education, and SMU’s Master of Arts in Design and Innovation (MADI) program are hard at work planning a conference that will help spark educational initiatives to attract students to the field of engineering to solve some of society’s grand challenges. Find out more about this exciting event, coming to the SMU campus May 28-30, on page 24.

Since 1925, SMU engineers have worked to make people’s lives better, easier and safer. We proudly continue this important work and look forward to the innovative discoveries of the future.

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JESSICA BURNHAM
PROGRAM DIRECTOR
CLINICAL ASSISTANT PROFESSOR
MASTER OF ARTS IN DESIGN AND INNOVATION (MADI)
Jessica Burnham is convinced that she and the MADI program were bound to find one another. Her background includes an undergraduate degree in Communication Design and a master’s in Design Research/Human-Centered Design. She also has a wealth of community outreach experience. Burnham’s thesis project looked at how a community can be built through communication. Those efforts led to creating a business association on Lowest Greenville Avenue called the Lowest Greenville Collective, which eventually led to her role as executive director of the Deep Ellum Foundation in Dallas, Texas. Both of these organizations focus on communication and collaboration between businesses, surrounding neighborhoods and the city of Dallas.

Burnham’s innovative community-based solutions at the Deep Ellum Foundation, including converting an unused side street into a pedestrian plaza, caught the attention of SMU. Kate Canales, founder of the MADI program, reached out to Burnham to serve as Designer-in-Residence (DIR) in the spring of 2017. As a DIR, Burnham’s role was to enrich the curriculum inside and outside the classroom. Duties included ongoing and consistent critique of a MADI class, assisting students with professional development, creating and conducting workshops or seminars, and developing new courses. After serving as DIR, Burnham stayed on as adjunct faculty. Last summer she joined SMU as the MADI program director.

Burnham believes engaging with people in the community pushes the idea of Human-Centered Design forward and translates well in the classroom. “I was already approaching challenges and finding solutions from a Human-Centered Design viewpoint, so it was a natural fit for me to join SMU in the MADI program,” Burnham says.

The MADI program has been offered at Lyle since 2015. It is a multidisciplinary degree based on the concept of Human-Centered Design as an approach to problem-solving, valuable in fields as varied as engineering, business, the arts, advertising and the social sciences.

Coursework and project-based learning experiences teach students to combine the challenges of human needs with limitless solution possibilities, using technology and the economic requirements for business success through design research, idea generation and rapid prototyping. After taking core classes, students can customize electives from across SMU to suit their individual goals.

The MADI program is transforming to a joint degree offered by Lyle and the Meadows School of the Arts, to holistically approach Human-Centered Design from both the engineering and arts perspectives. “The foundation of Human-Centered Design is multidisciplinary and highly collaborative. To have a degree that exemplifies that, coming from two different schools, is rare and unique,” she says. “It can only amplify MADI’s growth and reach.”

Now that Burnham and her team are leading MADI, they are implementing new initiatives to mature the program. To further break down silos between the business world and academia, the program will continue to recruit practicing professionals as DIRs and adjunct faculty. “We want to see what we can learn about the current state of design in the business world so we can keep up, but also how they need to learn and keep up with us,” Burnham says. “It’s a beneficial symbiotic relationship where we’re training future employees with the skills they’ll need for the roles they want to fill.”
MADI engages with the community outside the university through the Design Council, a network of like-minded designers which includes MADI students and practitioners, who come together to share information. It’s a win-win for all involved, giving students direct access to corporate partners, design firms and innovation labs—and vice versa.

Burnham’s connections with several communities in Dallas, including the Deep Ellum Foundation and Opportunity Dallas, provide a tremendous benefit to the program by integrating MADI more fully with the city. Much of the capstone project work for graduating students has come from these connections, including a semester-long project last fall with the Trinity Park Conservancy. The students were able to immerse themselves in an underserved area of West Dallas, conduct research and deliver proposed design solutions for the new Harold Simmons Park, in a way that the local community would embrace.

The MADI program has also grown from within, to become more close-knit and engaging. In an effort for students to get to know each other better, the MADI team started “coffee talks.” Every semester, new students are paired with second-year students and are encouraged to have coffee together regularly.

According to Devon Skerritt, associate director, the MADI program has hired several students as graduate assistants, so they can contribute directly to the program’s direction. “We’ve been broadly soliciting students to inform or even co-create their experience. The result is robust co-curricular programming and wonderful events throughout the year, from an all-program orientation to our Inside the Designer’s Studio public event, to community meetings called MADI Commons, and student reviews and celebrations at the end of each semester,” Skerritt shares.

Burnham says the semester reviews have been very insightful. “We’ve learned what’s resonating with students, so we can adjust or amplify our work based on student feedback,” she says.

Burnham believes that design is everywhere, and most of what we interact with has been designed for us, so it is our responsibility to get to the bottom of what’s missing and help fill those needs. Her mission for every student who graduates from the MADI program is to enable them to apply what they’ve learned to any field. “Our goal for our students is not just new skillsets, but a changed mindset—we want them to use a high sense of curiosity, empathy and context to find design solutions, and be able to communicate and collaborate with others,” Burnham says. “In this fast-paced, high-tech world, if we can get back to the human heart of our needs, we’ll all be better off for it.”
Build the Skills to Succeed in Management

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Xu Nie, assistant professor, Mechanical Engineering, and his Impact Mechanics Lab have discovered why concrete is not as resilient at withstanding hard impacts from explosives and projectiles as researchers once thought. The U.S. military is using his work to better understand concrete’s ability to stand up to hard blows, which could lead to safer protective structures and barriers for troops in dangerous areas.

“This could help save lives,” says Nie. “What work is more rewarding than that?”

A BIG DIFFERENCE

For decades, research measured concrete’s impact-withstanding strength at “peak stress,” or the point where it breaks, which led to overestimating concrete’s ability to stand up to intense impact. One of Nie’s key insights is to measure a material’s impact-resisting strength at the point where a blow first causes damage. The point of impact causes tiny cracks in concrete, and it is only a matter of time before the concrete fails.

Using several improvements in measurements invented by Nie’s research team, they found concrete briefly strengthens by 20 to 30 percent after impact—a far cry from the 100-plus percent that impact mechanics researchers have for decades thought was the case.

While Nie’s team has made big strides, the goal remains to determine why concrete initially strengthens after significant impact. “The answer is hotly debated,” says Colin Loeffler, a Ph.D. student in Nie’s lab. “If we could figure out why, it would vastly improve the material models the military uses.”

When American soldiers are in combat zones, the only thing standing between them and enemy fire is often a slab of concrete, such as bunkers and blast barriers. While the material’s origins date back to 1300 B.C., humans have yet to find a more cost-effective armor for large-scale protective structures than concrete’s simple mix of cement, water and ground-up rock and sand.

A Lyle research team has discovered that concrete is not as resilient at holding up to hard impacts from explosives and projectiles as once thought, and the team is trying to change that. Led by Dr. Xu Nie, the Impact Mechanics Lab has developed more accurate ways to measure what happens to concrete when struck with substantial force.

Through research contracts with the U.S. Army and U.S. Air Force, Nie is providing his data to military scientists, who in turn are crunching numbers to identify the benefits and challenges of using high-strength concrete in protecting military personnel.

These measurements could help the U.S. military develop more cost-effective, new forms of concrete that can stand up better to enemy projectiles. The breakthroughs from Nie’s lab could also improve our understanding of what hard collisions do to everything from armored glass to rubber, or even the human body.
Nie’s work with the military began during his doctoral research, where he learned that armored glass’s strength in resisting impact could be boosted tenfold through chemical treatments that removed tiny defects from the surface. When he began that work in 2005, U.S. personnel were suffering severe injuries in Iraq when roadside bombs shattered windows on military vehicles.

His interest in concrete started with a 2012 inquiry from two investigators he worked with on the glass research, one from the U.S. Army Engineer Research and Development Center, the other from the Air Force Research Laboratory. Nie was soon helping the military researchers address problems they had encountered in measuring concrete’s strength at resisting powerful impacts.

Though the physics are complex, the basics of Nie’s experiments boil down to seeing what happens when a disc of the highest-strength concrete ever made gets blasted with a speeding steel bar. “That form of concrete is about 10 times stronger than conventional concrete, but it’s too expensive for large-scale construction,” Nie explains. “We hope our research will help the military develop concrete of similar fortitude but at much lower expense.”

In a similar vein, using powder-based guns or cannons for full-scale tests would cost several million dollars. Nie’s team employs a technique roughly akin to hitting a ball with a pool cue.

They use air cannons to shoot small steel bars down 30-foot-plus tracks called Kolsky bars, also known as Split Hopkinson Pressure Bars. The small bars then hit larger steel bars, which in turn are sent smashing into the concrete discs. The largest steel bar in Nie’s lab rides on air bearings, which—much like air hockey games of the 1980s—both support the metal’s weight and allow it to move with almost no friction.

Nie’s team assembled three Kolsky bars in his lab on SMU’s East Campus. Kolsky bars, which date to World War II, are an established tool for measuring how materials like concrete respond to being squished or stretched at very fast speeds.

According to Nie, the lab results were initially distorted by concrete’s fickle properties. Concrete can have air bubbles or other weak areas that can distort measurements made with Kolsky bars. Nie solved that problem partly by having the discs cut and ground so their surfaces are exceptionally smooth to the touch.

By placing penny-sized pieces of copper between the steel bars, the team created a way to send triangle-shaped stress waves through the concrete. Those produce more accurate numbers than the square-shaped stress waves that previous experimenters had used.

Nie plans to further expand understanding of the dynamic response and failure of different materials, which is not restricted to concrete. He is pursuing the development of sturdier protective devices and structures for soldiers and civilians alike. “My favorite part of research is designing novel experimental techniques to test material properties in ways that weren’t attainable in the past,” he says. “That is my passion.”
In today’s complex business world, it’s crucial to leverage available data to create rigorous models and help managers make better decisions. A degree in Engineering Management, Information & Systems (EMIS) gives students comprehensive technical instruction along with quantitative business training to perform data analytics, management science and operations research. Lyle EMIS graduates deliver high-impact managerial insights based on advanced analytics and big data in all industries, including logistics, supply chain management, revenue management, healthcare systems engineering, finance and more.

TO LEARN MORE, PLEASE VISIT SMU.EDU/LYLE/EMIS
MAKING GREAT STRIDES

BY JENNIFER WARREN
DARIO VILLARREAL, ASSISTANT PROFESSOR OF ELECTRICAL AND COMPUTER ENGINEERING, AND HIS NEUROMECHATRONICS LAB AT SMU ARE EMPLOYING NOVEL IDEAS AND INTERDISCIPLINARY APPROACHES TO ADVANCE BIOROBOTICS, PROSTHETICS AND EXOSKELETON TECHNOLOGY.

Growing up in the industrial manufacturing city of Saltillo, Mexico, Dario Villarreal was destined to be an engineer. His father and his family before him were engineers. His two brothers straddled the worlds of mechanical and electrical engineering. “There was some pressure to become an engineer, but mostly inspiration,” he recalls.

Villarreal had an early fascination with robotics. This interest stemmed not only from his hometown’s numerous manufacturing plants using automation, but also from pop culture’s portrayal of technology, with its creativity and possibilities. “I wanted to do something more personal and significant to help others,” he recalls. “Artificial limbs, exoskeletons and robotics were a way to help others have a better life.”

Seeking a challenge, Villarreal realized interdisciplinary study was the way forward and decided to pursue an undergraduate degree in Mechatronics Engineering, a hybrid of mechanical, electrical and computer engineering. In 2012, Villarreal was recognized by the School of Engineering, National Autonomous University of Mexico as one of the best engineering students in the country, graduating from Instituto Tecnológico de Saltillo at the top of his class. After earning his Ph.D. in Biomedical Engineering in 2017, Villarreal joined Lyle’s electrical and computer engineering department.

Once he arrived on campus, Villarreal hit the ground running. Armed with his engineering and biorobotics background, he introduced an innovative course called Biomechatronics. The class, merging several bioscience disciplines with mechanics, electronics and robots, motivates students to look more broadly at their engineering degree. Villarreal firmly believes in the interdisciplinary approach to solving real-world problems. “I expose students to both the mechanical and electrical engineering disciplines, which they will need to know when they enter industry, and how they are applied to the medical field,” he explains.

AT THE LAB

Villarreal’s interest in robotics focuses on the “software” side of exoskeletons and prosthetic limbs, and the NeuroMechatronics lab at SMU is bringing his vision to life. As director and lead researcher, Villarreal’s work in the lab seeks to bridge the gap between current robotic exoskeleton technologies and the human neuromuscular system. Students at Lyle, mentored by Villarreal, analyze the human nervous system from a mechatronics perspective and develop technologies that mimic and enhance human motion and sensing. “Right now, people look at this from either the human or robot perspective,” he notes. “We are developing a symbiotic relationship between the two, hence the multiple disciplines—the only way to really approach it.”

Villarreal likens the lab, which opened almost two years ago, to a startup venture. “We are starting from the ground up because the subject matter is novel,” says Villarreal. “Students are integral to the work conducted in the lab, learning to become experts in their field.”
Collaboration is alive in the lab, which is brimming with discovery and promising solutions. Engaged Leadership Fellow Halley Tripp, a mechanical engineering and dance major, is working on a project using smart technologies to reduce lumbar-spine injuries in dancers. Another lab research team, including other SMU Engaged Learning Fellows, is working to develop new sensors that integrate with textiles. The goal is to enable increased flexibility and more portability than prosthetic frames with external wires. For example, a person will wear a sleeve that measures what their muscles are trying to achieve. “You design the electrodes that sense what the person’s muscles want to do,” Villarreal explains. “It starts with the brain, but we are trying to get that information at the last stage, the point at which the muscles are activated.” (He notes that in the future electrodes may be placed in the brain to send signals, but not just yet.)

Wearable technology is a growing trend in the field. Villarreal currently has five undergraduates working on a prototype sleeve, focusing on the software side of human-machine interaction. He mentions that the U.S. government’s Defense Advanced Research Projects Agency (DARPA) has already developed a sleeve to be worn on biceps or triceps to control a prosthetic arm. At King’s College London, researchers developed one single electrode embroidered into sports pants to measure muscle activation. “We are trying to do something more ambitious,” Villarreal offers. “We want to increase the difficulty and integrate multiple motion sensors and a lattice of electrodes throughout compression pants. This will measure the overall motion and surface muscle activation of the user as they walk.”

To learn about advances firsthand, Villarreal visited the Bristol Robotics Lab in the UK. “When traveling, I try to visit labs to see what research is going on,” Villarreal offers. The researcher at Bristol, an expert on the hardware side of prosthetic design, was building a prosthetic leg that mimics natural motion. With Villarreal’s expertise on the software side, together they are developing a robotic knee joint. “Collaboration is important because of differing types of expertise,” says Villarreal. For example, on the software side, called control systems, the software enables the robot (the machine in the prosthetic limb in this case) to understand what action a person is trying to accomplish before it happens.

In Villarreal’s field, global collaboration includes exchanges with young aspiring engineers. As director of the SMU-Mexico Research Initiative, Villarreal promotes cross-cultural exchanges that help strengthen bonds between Mexican research institutions and SMU. Last summer, he invited Mexican students to work in the NeuroMechatronics lab, with some planning to return this summer to finalize their projects. “When students are not exposed to international opportunities, they lack the vision of international collaboration,” Villarreal surmises. “To advance science, partnerships and sharing ideas are important.”

Ultimately, Villarreal says his teams use a more holistic approach to design. “We are looking at more than brain signals,” he explains. “We try to consider the kinesthesiology or motion of the individual person.” Villarreal also tries to keep the research solutions pragmatic, determining what the trade-off is between practicality and benefit, “not research that’s way out there.” He wants discoveries heading straight into clinics: “A person can’t use 1,000 cables that take hours to set up,” he states.
FUTURE OF LOCOMOTION

The SMU lab recently acquired a state-of-the-art robotic exoskeleton that a person with a spinal cord injury would use in a clinical setting. A therapist could use it to deliver individualized gait training. Villarreal notes, “We have the gold standard, the baseline, but need to find ways to improve it.” A robotic prosthetic leg has motors inside the apparatus; an exoskeleton is a structure that has motors outside the leg. For example, an amputee would have a prosthetic leg. “With an exoskeleton, or orthosis, a person has their own limb, but cannot control it,” he explains. “We do not have exoskeletons like in the movies.” Advances in robotics and exoskeletons haven’t reached the level of science-fiction movies just yet.

Villarreal’s work is a reflection of the real, multifaceted world. The subjectivity he observes in the clinical setting, the first line of contact for patients, is surprising to him. “The scientist in me wants data for a more studied approach,” says Villarreal, noting completely different understandings from biological and engineering perspectives. “To develop robotic prosthetic legs and exoskeletons, we have to understand how people walk. A clinician will tell you the biomechanics of how people walk; for example, what muscles are activated to make motion. The engineer looks at dynamics and questions of motion or Newton’s Laws to make a prosthetic limb walk,” Villarreal observes. “The differences in how we walk in an office compared to outside, or to fetch a glass of water, matter greatly in movement.”

In the area of robotics in prosthetic limbs and exoskeletons, Villarreal and his students are advancing the state of the technology. “In the field, we are good at making people walk on a treadmill, a steady state, but not in a practical day-to-day way. We are trying to achieve motion more fluidly,” he says. Few researchers across the globe are making as many strides to achieve this goal as Villarreal and his dedicated team. ■
20 YEARS OF RCAM
RESEARCH CENTER FOR ADVANCED MANUFACTURING

In 2019, Lyle celebrates the 20th anniversary of SMU’s Research Center for Advanced Manufacturing (RCAM), which includes the Center for Laser-Aided Manufacturing (CLAM). Considered one of the best-equipped centers for advanced manufacturing and lasers in the country, the lab has been led from the beginning by founder Dr. Radovan (Rado) Kovacevic, RCAM Director, Professor of Mechanical Engineering and Herman Brown Chair in Engineering. Kovacevic has provided unwavering expertise, guidance and leadership to hundreds of students, visiting professors and industry team members to make RCAM a leading laboratory in the field.

HISTORY

1997
Kovacevic joined SMU as the Herman Brown Chair in Engineering and Professor of Mechanical Engineering with the goal of developing an internationally recognized program in advanced manufacturing.

1999–2000
To respond to industry needs and better educate undergraduate and graduate students in the area of manufacturing engineering, SMU’s Research Center for Advanced Manufacturing (RCAM) was established with Kovacevic named director.
SMU was awarded a National Science Foundation grant to join the Industry/University Co-operative Research Center (I/UCRC) for lasers and plasmas, resulting in the establishment of the Center for Laser-Aided Manufacturing (CLAM) at SMU.

RCAM and CLAM move into 6,500 square feet of lab space in the J. Lindsay Embrey engineering building on SMU’s main campus.

CLAM will be integrated into RCAM.
RCAM BY THE NUMBERS

$20 MILLION
In grants, contracts and R&D programs in advanced manufacturing, funded by state and government agencies as well as industry

$10 MILLION
In total value, including equipment and software

$500 THOUSAND
Annual budget from membership fees and sponsored research projects

SEVEN
Additional spaces, with a well-equipped machine shop, state-of-the-art computing lab, faculty and visitor offices, conference room, kitchen and other functional areas

RCAM/CLAM RESEARCH & DEVELOPMENT AREAS
RCAM includes the following research spaces, with a trend toward future expansion:

- Electron Beam Materials Processing
- Abrasive Waterjet Materials Processing
- R&D in Welding
- Friction Stir Welding
- Modeling, Sensing & Control
- Materials Characterization
- CAD/CAM (computer-aided design and manufacturing)
- Laser Materials Processing
- Additive Manufacturing
- Reverse Engineering
- Hybrid Laser/Arc Welding
- Laser Micro-Machining
INDUSTRY/UNIVERSITY CO-OPERATIVE RESEARCH CENTER (I/UCRC) PARTNERSHIP

Corporations benefit from research conducted at RCAM by becoming industry members. Membership provides full access to the center’s unique facilities and an opportunity to recruit highly qualified graduate students. As part of the membership terms, peer universities are required to maintain at least five industrial partners. Along with SMU, I/UCRC membership has included the following partnerships (*current members):

UNIVERSITY PARTNERS
- University of Illinois at Urbana-Champaign*
- University of Michigan
- University of Virginia*

INDUSTRIAL PARTNERS
- Coherent, Inc.*
- Fruth Innovative Technologies (now FIT Additive Manufacturing Group)
- ESAB Welding and Cutting Products*
- General Motors*
- Halliburton Energy Services
- Lee Laser
- Lockheed Martin Missiles and Fire Control
- National Oilwell Varco*
- Oerlikon Metco*
- Trinity Industries Inc.*
- Trumpf Group*
- U.S. Army Research Laboratory

DISTINCTIONS

Dr. Kovacevic, RCAM Director & Herman Brown Chair and Professor of Mechanical Engineering

- Over 45 years of research and teaching experience in manufacturing processes and materials science
- Advised more than 200 graduate students, including Ph.D. and master’s degree candidates, as well as numerous visiting scholars, industry members and undergraduate interns
- Graduated 41 Ph.D. candidates
- Published and presented more than 620 technical papers, six books; over 12,000 citations to Kovacevic’s publications with a citation index of 55, as per ScholarGoogle.com on Feb. 15, 2019
- Awarded 7 U.S. patents and over 20 invention disclosures
- Fellow, American Society of Mechanical Engineering, American Welding Society, Society of Manufacturing Engineers
- Scholarship recipient, Alexander von Humboldt (Germany), and Carl Duisberg (Germany) Fulbright Foundation
- Numerous honors and awards, including the 2000 Taylor Research Medal by the Society of Manufacturing Engineers for accomplishments in education and research related to manufacturing engineering
Artificial intelligence and ubiquitous computing are changing the way the world lives and consumes goods. To train the next generation of world-class engineers, Lyle is evolving to leverage this movement.

Lyle announces the strategic realignment of two departments

Electrical & Computer Engineering Department (ECE)

With the advancement of the Internet of Things and the prevalent nature of computers, Lyle has combined Computer Engineering with Electrical Engineering. The newly aligned Electrical & Computer Engineering Department provides a holistic view of sensor design, signal processing algorithms, hardware implementations, telecommunications and networking.

Computer Science Department (CS)

Lyle continues to experience explosive enrollment growth in software fields such as cyberscience, artificial intelligence and machine learning. The Computer Science Department is designed to best meet the challenges and opportunities in these critical areas.

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Lyle Centennial Distinguished Chair in Cyber Security
Executive Director, Deason Institute for Cyber Security
Senior Nathan DeVera is a first-generation American who continuously cultivates leadership, inside and outside the classroom. He is double majoring to earn bachelor’s degrees in Mechanical Engineering (ME) and Math, while at the same time completing a master’s degree in ME, concentrating in Design and Dynamic Systems and Controls.

Nathan DeVera, who came to SMU from Las Vegas, Nevada, kept an intensive schedule in high school to participate in two of his favorite extracurriculars — football and musical theater. He saw college as an opportunity to enjoy a variety of activities. “I’ve always been an advocate of being well rounded. I’ve tried to model my life like a Renaissance man, and stay involved in sports, academics and the arts,” he says. “It wasn’t until I toured SMU that I realized I could balance my engineering work and explore different passions.”

As a former high school football player, DeVera was recruited to play for the SMU rugby team, a club sport that offers players a chance to compete against other schools and represent SMU. He never played rugby before, but enjoyed learning a new sport and continues to learn new aspects of the game. Now, DeVera is a four-year starter on the rugby team and has been president, captain and an on-field leader who enjoys mentoring younger players. “I find playing rugby is a great way to relieve stress and foster lifelong friendships,” he shares.

To nurture his musical talent, DeVera has been a member of the Southern Gentlemen acapella group that performs at SMU events and concerts throughout the academic year. “Southern Gents lets me use my right brain and keeps my creative side happy,” he says. “It’s a great way to offset the analytical engineering mindset I use in my studies.”

Perhaps DeVera’s highest achievement in college is serving as SMU student body president. He became interested in student government as soon as he arrived on campus in fall 2015, during orientation at Mustang Corral. DeVera recalls listening to the then-student body president and being impressed. “I saw him up there speaking and remember thinking, ‘That seems pretty cool. Maybe I’ll want to do that one day.’” Right away, DeVera ran for office and won as a first-year senator. During his sophomore year, he served as Lyle senator and parliamentarian on the senate executive committee. After serving as student body vice president his junior year, DeVera decided to take the next logical step. “My involvement in student senate has given me a lot of different experiences and let me get to know a great deal of people. It made sense to run for SMU student body president,” DeVera says.

DeVera models his leadership style after one of his favorite song lyrics: “I’m a man of the people, not above but equal.” He wants students to know he is a team player, always accessible and available to listen. “When I make a decision, I always ask for feedback and work with my team. I also mentor first-year senators and take them under my wing, because I want them to know I’m a leader they can talk to,” DeVera says.

According to DeVera, serving on the SMU Student Senate has not only been an excellent experience for him personally but also for his professional development. “It takes a high level of etiquette for me to meet with SMU President Turner; something I can take with me in the professional world,” he explains.

After spending last summer as a systems engineer intern at Lockheed Martin Space Systems in Sunnyvale, California, DeVera was asked to be an Intern Ambassador for the company. Duties include pre-screening summer intern candidates by reviewing resumes and conducting interviews. He plans to join the company full-time in Denver after graduation and hopes to continue tapping new talent and encouraging young engineers toward a fulfilling career.
When Lauren Melendez, originally from Irvine, California, graduated from the University of Hawaii-Hilo with a bachelor’s degree in Marine Science, she knew she wanted to work at sea, so she joined the U.S. Coast Guard. Toward the end of basic training and graduation, Melendez attended the Training Center in Petaluma, California, to be an electronics technician. Upon completion, she was assigned to the electronic support detachment on Chincoteague Island, located on the Eastern Shore of Virginia. Her unit works on different small boat stations in the area, servicing navigation and communications systems.

As an E-5, Petty Officer Second Class Electronics Technician, Melendez is looking ahead to her career choices after her time in the service. She felt compelled to earn an advanced degree using her military tuition benefits. “I wanted something in environmental engineering and sustainability to be able to bring about a better environment for future generations,” she says.

There was only one problem—the Chincoteague’s Coast Guard station is so remote, there are no universities nearby. Melendez searched the internet for a master’s program in environmental engineering and sustainability that she could complete through distance education. Lyle’s M.A. with a Major in Sustainability and Development was at the top of the list and seemed to be the best fit. “I needed the distance program to be flexible and from a reputable university. I was happy to find that SMU had the degree I was looking for,” Melendez says. “I find SMU’s distance education to be open and accessible, the best you can get, and I’m thankful it’s there.”

With guidance from the SMU military tuition assistance coordinator, she is funding her graduate degree through a combination of the Lyle military distance learning tuition rate, the Coast Guard tuition assistance program, and the GI Bill.

The MASD program, offered within the Civil and Environmental Engineering department, is focused on creative approaches to the design and development of the built environment, including aspects of transportation, energy, natural resources, water, landscape and building infrastructure systems. Students can craft the degree in specific research areas, combining project-based coursework with specialized tools in multiple relevant subjects.

Melendez finds the MASD program offers a personal touch in a variety of ways. “I’ve met other students virtually, attending class via Skype, and can even chat with (program director) Jesse Zarazaga when I have questions,” she shares. Melendez submits projects and video presentations via Canvas, a 24/7 cloud-based learning management system that makes teaching, learning and collaborating easier, from anywhere in the world.

Melendez is about halfway through completing her degree and is beginning work on her capstone project, starting with solving a common problem she’s faced at outlying Coast Guard stations—avoiding electrical power and communications shutdowns when generators stop working. Melendez is designing small wind turbines that can be installed on radio towers to generate enough electricity to power a small cabin. “All boats are plugged into shore for power. The wind turbines could be used full time to supply power to keep boats charged and navigation and communications lines open at a lower cost,” she explains.

Melendez is open to the many career possibilities that await her in the sustainability field. She’s considered working as a contractor in LEED certification, the most renowned green building certification program used worldwide, or conducting geographic information system (GIS) surveys for NASA, even working for the government. “It would be fulfilling if I can help make Coast Guard and federal buildings more energy efficient and sustainable,” she says. With Melendez’ wealth of hands-on experience, there’s no doubt her skills will be in demand anywhere her career takes her.
Looking to advance your skills and career?

MAKE AN EXECUTIVE DECISION TO LEVEL UP

The Executive Format program at Lyle offers busy professionals the opportunity to earn a variety of in-demand Master of Science degrees. Classes take place outside of work hours in a seminar-style, group learning environment with teams working on real-world projects alongside industry-savvy instructors. Select courses are delivered in hybrid format, a mix of classes at centrally located DFW locations and online through our distance education program. Choose a learning format that works best for you or your employees. Ask us about degree offerings, open enrollment groups or customizing a dedicated corporate-sponsored group.

TO REQUEST MORE INFORMATION, CONTACT:

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Feinstein first looked at universities in Houston, where INNOVENTIONS, a leader in computer memory testing equipment and smart scroll technology, is located. His search criteria included some non-negotiables: the school had to be a private, first-class research university, he wanted to pay for his own tuition so as not to compete for financial aid with younger fellow graduate students, and he wanted to learn from the best research advisor. “When I reviewed professor Mitch Thornton’s profile on the SMU Lyle School of Engineering website, I knew he would be the optimal advisor,” Feinstein says. “He is a prolific researcher, deeply involved in cutting-edge science, and he actually had a background in real-world engineering.” Dr. Thornton is the Cecil H. Green Chair of Engineering and a professor with appointments in both the Electrical and Computer Engineering department and the Computer Science department, as well as director of the Darwin Deason Institute for Cyber Security at SMU.
What clinched Lyle for Feinstein was that he could earn almost all of his degree through distance education. For the first two years of coursework, he was able to access the bulk of class materials online and travel several times a month to meet with Thornton and his other professors or to present research papers. Through the learning management tool Canvas, class video recordings and livestreaming lectures, students can participate in a class and give presentations.

Since Feinstein was considered a well-known expert in electronic testing and computer user interface, he chose to focus his Ph.D. research in an emerging technology in 2004, quantum computing. Quantum computing is focused on developing computer technology based on the principles of quantum theory, which explores the nature and behavior of energy and matter at the atomic and subatomic level. It enables computers to be smaller and more powerful, with processors that can work millions of times faster than traditional computer models.

As the head of INNOVENTIONS’ research and development team, Feinstein was keen on doing his evening research on quantum computing that was many years ahead of the state-of-the-art electronics he handled on a day-to-day basis. He believes the research proficiencies he learned at SMU changed his approach to product development. “The engineering skills I learned during my research with professor Thornton improved the overall quality of my engineering work. Now I tend to spend much more time analyzing both the theoretical and practical limits of various projects and technologies before I even start the actual product development. This was not the case in the past,” he attests.

Feinstein has stayed connected to Lyle through research. After graduation, he has been involved in publishing research papers and is exploring potential collaboration between Thornton’s research group and INNOVENTIONS.

As an experienced entrepreneur, Feinstein has advice for the next generation of innovators in today’s knowledge-based economy. “Entrepreneurs should constantly learn new skills, dig deeper for information and monitor relevant new technologies,” he shares. “Rather than focusing all attention on big issues, like profit margins and salaries, startup companies should pay attention to secondary items and recurring expenses that can sink an otherwise good business.”

His best advice is not to pursue copycat products. After 34 years at INNOVENTIONS, Feinstein says the company still exemplifies its original mission and tagline, “innovative products from inventive minds.” Feinstein adds, “We proudly display a poster from 1984, the first year of INNOVENTIONS, right next to all of our patents. It has a crucial message — in a world full of copycats...be an original!”

“ENTREPRENEURS SHOULD CONSTANTLY LEARN NEW SKILLS, DIG DEEPER FOR INFORMATION AND MONITOR RELEVANT NEW TECHNOLOGIES.”

DAVID FEINSTEIN
Founder, President & CTO
INNOVENTIONS, Inc.
For the first time since 1995, the American Society of Civil Engineering (ASCE) will hold an Education Summit to address technological and educational changes that are occurring at ever-increasing rates. The May event at SMU is sponsored by the ASCE Civil Engineering Department Heads Council and is co-hosted by SMU’s Civil and Environmental Engineering (CEE) department and the Caruth Institute for Engineering Education. The conference’s objective is to answer one driving question — how can universities prepare future civil and environmental engineers to solve challenges and adapt to societal needs in the 21st century?

The need for well-educated, highly skilled civil and environmental engineers is at a critical stage. Global infrastructure is deteriorating, and environmental issues are mounting; two challenges, among many, that need to be addressed. At the same time, universities nationwide are striving to meet this demand for highly qualified engineers.

“The responsibility all civil engineering departments share is keeping the pipeline to industry filled. How do we recruit and educate the next generation of civil engineers to take on these challenges?” asks Dr. Barbara Minsker, Civil and Environmental Engineering department chair and Bobby B. Lyle Professor of Leadership and Global Entrepreneurship at SMU. “We need capable engineers to solve these challenges in ways that are cost-effective and constructive, to ensure public safety.”

SMU Lyle is perfect to host the Education Summit, with a nationally renowned science education researcher available to lend his expertise to the conference. Dr. Richard A. Duschl, executive director of the Caruth Institute for Engineering Education and TI Distinguished Chair in Engineering Education, is an expert in developing, delivering and evaluating new and innovative K-16 science, technology, engineering and mathematics (STEM) education programs and curricula.

According to Duschl, civil and environmental engineering frameworks provide tangible, relevant and motivational contexts for project-based STEM learning. “Carefully designed and implemented, CEE immersion units across the K-16 spectrum can leverage the development of core reasoning and knowledge-building practices in the STEM disciplines,”
Duschl notes. “Sorting out the educational design principles for such CEE units is yet another engineering grand challenge.”

Speakers and breakout sessions mapping out steps for advancing civil engineering education will be featured during each day of the Education Summit. Discussion topics will explore how to incorporate entrepreneurial thinking, promote experiential and lifelong learning, adopt multidisciplinary approaches to challenges and integrate technological advances into curriculum.

Education Summit attendees will also hear from faculty innovators who are finding ways to attract more students to civil and environmental engineering, such as Dr. Brett Story, an assistant professor of Civil Engineering at SMU. Story initiated a collaborative partnership between SMU, the Garland Independent School District (GISD) and the city of Garland, Texas, to form the Smart Infrastructure Innovation Initiative (S3i). S3i is a career and technical education program offered by GISD where faculty and students from SMU and Garland High School (GHS) conduct smart infrastructure research. The program is composed of two GHS civil engineering courses, a lab at SMU, and a nearly identical lab at GHS. In the summer, select students, known as GHS research fellows, work in the SMU lab, where they are free to discover the wonders of civil engineering with guidance from Story and SMU civil engineering students.

Another valuable resource to the Education Summit includes a team from SMU’s Master of Arts in Design and Innovation (MADI) program, who will facilitate one afternoon’s breakout sessions using tools from Human-Centered Design—putting human needs at the forefront of design and innovation—to reach consensus. “The MADI team will help participants transform the concepts, ideas and information learned during the conference into plans for achieving the collective vision of civil engineering education through the 21st century,” Minsker says.

Minsker, with the support of peer civil engineering department chairs, believes the Education Summit will produce several positive outcomes. She anticipates initiatives to emerge, task forces to form, and regular meetings to be held. “This is just the beginning—I’m looking forward to many more conversations and implementing ideas that come out of the Education Summit.”

“Carefully designed and implemented, CEE immersion units across the K-16 spectrum can leverage the development of core reasoning and knowledge-building practices in the STEM disciplines.”

DR. RICHARD A. DUSCHL
Executive Director, Caruth Institute for Engineering Education and TI Distinguished Chair in Engineering Education

INTERESTED IN ATTENDING THE ASCE EDUCATION SUMMIT?

Anyone involved in civil engineering education and innovation is welcome to participate, including CEE department chairs, faculty, industry members and ASCE regional student chapter officers.

The Education Summit will take place May 28–30 on the SMU campus in Dallas, Texas.

For convenience, the National ASCE Department Heads Conference follows, May 30–31.

Visit www.asce.org/education-summit/ for more information.
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INTRODUCING THE LINDA AND MITCH HART INSTITUTE FOR TECHNOLOGY, INNOVATION AND ENTREPRENEURSHIP

SMU’s innovative culture empowers bold visionaries to transform big ideas into new products, inventive technology and world-changing solutions.

Thanks to a generous gift from Dallas business leaders Linda and Mitch Hart, SMU will amplify its impact as a powerful engine of regional economic development and job creation. The Harts’ support will build upon SMU’s existing expertise in business and engineering, create a new concept-to-prototype pipeline, and provide the resources, inspiration and guidance students and faculty need to turn their business plans into viable enterprises.

The Linda and Mitch Hart Institute for Technology, Innovation and Entrepreneurship at SMU will combine the innovative forces of SMU’s Lyle School of Engineering with the Cox School of Business. The two schools will integrate their expertise, resources and guidance to develop technology prototypes and create viable business plans.

Linda Hart notes that SMU’s focus on creating new knowledge motivated the gift. “I was inspired to support this institute because I have seen firsthand how technology and innovation have been crucial to my own business endeavors, and they are critical elements needed in solving the world’s challenges,” she shares.

“With a new institute dedicated to guiding and promoting entrepreneurial work, the University will continue its march forward as an innovation leader,” Mitch Hart says. “Providing exposure to forward-thinking mindsets and feeding the enthralling spirit in an academic setting means there is no limit to what can be done. I look forward to the exciting work that will be produced here.”

Lyle Dean Marc P. Christensen believes cross-disciplinary partnerships amplify promising work. “This gift celebrates the powerful pairing of an innovative engineering school and a highly ranked business school, guiding the best and brightest to achieve their dreams while bringing new technology to the marketplace,” he says.

Active in many professional and civic endeavors, Linda and Mitch Hart have founded, supported and enhanced many educational ventures at SMU. In March 2018 they committed a significant gift to the future Gerald J. Ford Research and Innovation Building at SMU that will house the University’s Linda and Mitch Hart eCenter, which includes SMU Guildhall, the world’s top-ranked graduate game design program. The couple have made additional gifts to support the Hart Global Leaders Forum and the Hart Center for Engineering Leadership. They received SMU’s Mustang Award in 2003 in recognition of their exceptional philanthropic support of the University.

LEARN MORE AT SMU.EDU/NEWS
Cox/Lyle Red Zone Football Tailgate Experience

Join us each fall at the Red Zone, our home game tailgating plaza that opens three hours before kickoff. We welcome Cox and Lyle alumni, students, parents, faculty and staff. Mark your calendars for the Fall 2019 home game schedule: Sept. 7, Sept. 14, Oct. 5, Oct. 19, Nov. 9, and Nov. 30. Click here for more information on the Red Zone. See you on The Boulevard!

Deason Innovation Gym

This 24/7 makerspace, located in Lyle’s Caruth Hall, is open to all SMU students. For more information about events, visit thedig.org/calendar or email us at: hello@theDIG.org.

Lyle Lecture Series

DOWNLOAD@LYLE

Join us on the first Wednesday of every month during the academic year for feature presentations on current research and initiatives. Speaker lineup and registration will open approximately two weeks before the date of each event. Click here for more information.

DISTINGUISHED LECTURE SERIES IN ENGINEERING ENTREPRENEURSHIP

Calling all engineering students, faculty, staff, early entrepreneurs, and members of the university community with an entrepreneurial spirit and passion for technological innovation. Events will feature four guest speakers, two in the fall and two in the spring during the academic year. Click here for more information.

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Join industry experts once a semester who discuss the evolving technologies, challenges and opportunities in the industry. Click here for more information.

Hunt Institute

The Hunter & Stephanie Hunt Institute for Engineering & Humanity hosts several events over the academic year. Learn more here or email HuntInstitute@smu.edu.

Lyle Undergraduate Prospective Student Events

The Office of Undergraduate Recruitment and Retention offers special events throughout the year to showcase the variety of opportunities available for engineering students at Lyle. Email enrollment@lyle.smu.edu for more information.

Lyle Graduate Prospective Student Events

Lyle offers graduate programs in delivery formats designed to cater to student needs. If you or your employees are interested in more information or registration for upcoming events, visit the links below or email Lylegrad@smu.edu.

• Domestic Graduate Student Events
• International Graduate Student Events

Lyle Student/Industry Events

Lyle and the Hart Center for Engineering Leadership offer a variety of events for engineering students to interact with industry contacts throughout the year. Click here for more information on how you can participate, or email thehartcenter@smu.edu.
Keep Lyle faculty and students at the forefront of discovery, innovation and industry leadership by supporting the SMU Fund for Lyle. Enable faculty and student research initiatives, critical lab and classroom enhancements, recruitment and retention of world-class faculty, and international research collaboration through travel grants. Resources immediately fuel and launch creative ideas and innovations that can change the world.

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To discuss the many giving options available, contact the SMU Lyle development team at (214)768-4136 or email lylegiving@smu.edu

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SMU is Texas’ first private school to join the National Academy of Engineering’s Grand Challenges Scholarship Program to solve 14 global engineering challenges around health, public welfare and technology. Pictured is the inaugural cohort of scholars from Lyle and Dedman College of Humanities and Sciences.