WE’RE ADDING ON
Civil Engineering Program Starts This Fall
THE UNIVERSITY OF ST. THOMAS
An aerial photo of the St. Paul campus with the Minneapolis skyline in the distance. Photo by Mike Ekern ’02
A THOUSAND ANSWERS

We are building something truly special here in Minnesota! Enrollments continue to climb in both our undergraduate and graduate programs. This fall we will start our new civil engineering program to expand our range of offerings. At the same time, we continue to thrive with the normal flow of life in engineering at St. Thomas – a multitude of student research projects with faculty, collaborations with more than 25 industry partners in our Senior Design Clinic, and alumni doing great things in the world, such as Natasha Wright at MIT who was just listed in the Forbes “30 under 30” for technology contributions in the field of energy.

For several years now, mechanical engineering has been the No. 1 selected major for incoming freshmen across the entire university. Our undergraduate and graduate programs are experiencing a nearly decade-long period of annual double-digit growth. Today, nearly one in six students who study at St. Thomas are in the School of Engineering. And as such, engineering has been identified as a space resource priority in the new University of St. Thomas Campus Master Plan.

The vitality of the Minneapolis-St. Paul metro area technical community is what keeps us strong. I don’t think there are many other communities in the U.S. that could so energetically support the growth of a new engineering program such as what we are building here at St. Thomas. We believe in a different kind of engineering educational experience that fosters the skills needed to be an impactful engineer in the 21st century – one in which our students understand that there are virtually a thousand answers to nearly every question.

Our St. Thomas Engineer magazine is just a snapshot of what is going on here. I encourage you to drop us a line or just plan to drop in. We would love to show you the energy of our students, faculty and the business community that surrounds us.

Cheers, Don

Dr. Don Weinkauf
Dean, School of Engineering

UNDERGRADUATE ENGINEERING ENROLLMENT 1999-2017
The University of St. Thomas is an equal opportunity educator and employer. St. Thomas does not unlawfully discriminate, in any of its programs or activities, on the basis of race, color, creed, religion, national origin, sex, sexual orientation, family status, disability, age, marital status, status with regard to public assistance, membership or activity in a local commission, genetic information or any other characteristic protected by applicable law. stthomas.edu/eostatement.
OF ST. THOMAS ENGINEERING SENIORS
HAVE PARTICIPATED IN NCAA DIII ATHLETICS

The Tommies, including mechanical engineering students Jordan Burich and Ryan Boll, show off their trophy following the NCAA Division III men's basketball championship game March 19, 2016.
ENGINEERING
A CAREER TO SERVE

By Theresa J. Malloy ’13, current English M.A. student
Photo by Mike Ekern ’02
Several senior engineering students have known for years where they will be working after graduation in May. They have lined up four-year contracts pursuing career opportunities directly in their field of study. And while they will be spread around the country, all have the same employer: The U.S. Air Force, one of the most high-tech employers in engineering.

St. Thomas’ School of Engineering and the Air Force Reserve Officer Training Corps (ROTC) have been collaborating for several years to prepare students for their engineering duties once they graduate. In recent years, St. Thomas has seen an influx of ROTC students in the School of Engineering.

Of the 15 seniors graduating in the ROTC 2017 class, eight are engineering majors.

We sat down with four of them to talk about combining their engineering education and ROTC experience: Molly Amundson and Joe Allison, who will serve as developmental engineers post-graduation; Nicholas Cox, who plans to become a pilot; and Ben Waterfield, a future space operations officer.

Space, the Final Frontier
Ben Waterfield’s career goal is to work on one of the Mars missions. NASA has sent orbiters, landers and rovers to the planet, hoping to pave the way for future human explorers. Waterfield wants to be part of these discoveries.

“Someday, when I’m watching TV and see a Mars landing, I want to say I was part of that,” he said.

While he still needs to learn a few more skills to reach that point, his engineering and aerospace courses have given him a good foundation for his future career.

Because he likes to build things, his Mechanical Engineering class was especially fun, he said. In the course, students design parts to attach to a robot so it can complete tasks. He and his teammate won the first round in a friendly competition in which the robot’s arm spun a Lazy Susan in a clockwise direction for several rotations and pushed balls into a hole.

“Every class I take I get interested in a different part of engineering,” Waterfield said.

In addition to academics, Waterfield has been enjoying many aspects of college life. He served as vice president of the Society of American Military Engineers, one of the engineering clubs on campus, and was a member of a rock climbing club. His musical talent as a bass has led him from the university’s Chamber Singers, to the Summit Singers and most recently to the Liturgical Choir. He and fellow engineering student Molly Amundson sang with the choir at the 2016 Christmas Eve Mass at the Basilica of St. Peter in the Vatican.

This summer he’ll be on track to fulfill his dream. He will head to Peterson Air Force Base in Colorado Springs, Colorado. As a space operations officer, he’ll learn more about GPS, satellites and space surveillance.

In the Pilot’s Seat
Nicholas Cox also wants to take to the sky, but not into outer space. A mechanical engineering major, he is one of 45 Air Force ROTC cadets selected nationally for the Euro-Nato Joint Jet Pilot Training Program, which prepares pilots for NATO missions. He is set to train at Sheppard Air Force Base in Wichita Falls, Texas, after graduation.

School of Engineering students, clockwise, electrical engineering student Molly Amundson, and mechanical engineering students Joseph Allison, Nicholas Cox and Ben Waterfield are in the Air Force ROTC program, as are the cadets behind them.
Cox was committed to the ROTC program before he selected a school, but said he was drawn to St. Thomas from his home in Rochester, Minnesota, “for the diversity of opportunity.” Through his four years here, he has pursued both his ROTC and engineering passions, while also participating on the men’s swim team.

“My biggest surprise is how much fun I’ve had while accomplishing these things,” he said.

Cox’s college resume includes maintaining a 4.0 GPA, serving as fall 2016 Detachment 410 cadet wing vice commander, and his achievements don’t stop there. He was selected as the Air Force Association’s 2016 Outstanding ROTC Cadet of the Year from a pool of nearly 11,000 candidates.

But Cox said the secret of his success is the camaraderie with his fellow cadets and engineering students. “The engineering school is small enough that we get to know our classmates, professors and instructors well. As we progress through our degree requirements, we continue working with the same group of people,” he said.

**National-Ranking Cadets**
Lt. Col. Charles Musselman, commander of Detachment 410 at St. Thomas, speaks highly of the ROTC students: “Our cadets earned a national ranking of No. 4 out of 145 Air Force ROTC detachments at the end of spring 2016 for both cumulative grade-point average and average physical fitness assessment scores. To be ranked that high in either of those categories is impressive. To be ranked No. 4 in both categories is a phenomenal achievement.”

He credits that ranking to the “partnership with the School of Engineering and the high quality of our engineering students.”

In the past decade, nearly one-third of ROTC students have been engineering majors. Between 2007-2017, 54 out of 172 graduates left St. Thomas to serve with an engineering degree – 39 in mechanical and 15 in electrical.

As engineering and ROTC see more crossover, they are working together to enrich the student experience.

For the first time, this spring the School of Engineering is offering a master’s level class, Aviation Technology and Flight Systems, for both graduate and undergraduate students. It focuses on the field of manned and unmanned aviation. Students enrolled in the course will be ready to take the Federal Aviation Administration ground school exam – the first step in obtaining a pilot’s license.

**Top ROTC Cadet**
Another addition was a joint award between the School of Engineering and Department of Aerospace Studies for the top ROTC cadet at St. Thomas. The first award was conferred to Joe Allison, a mechanical engineering major from Renville, Minnesota.

Allison said he came to St. Thomas because he found people on campus “approachable.” As a sophomore, he decided to give ROTC a try and enrolled.

“I got to know a bunch of people who are in the program, and they had a lot of good things to say about it,” he said. “I was impressed by their character as well. So I decided to try it out, and I loved it.”

**Nicholas Cox**
ENGINEERING STUDENT AND FUTURE PILOT
He also fell in love with the engineering program, which was not a major he had intended to pursue.

“I just knew that I liked physics and fixing things. … I liked the Intro to Engineering class, and as I progressed through it, I would find opportunity after opportunity,” he said.

Some of those opportunities included working as a research assistant and a teaching assistant and serving as a mentor for other engineering students. He also was able to present a paper at the International Mechanical Engineering Exposition in Texas in 2015.

Allison served as the Detachment 410 cadet wing commander in fall 2016. Starting this June, he will serve as a developmental engineer at Edwards Air Force Base, just an hour north of Los Angeles.

Creative and Inventive Developmental Engineer

When Molly Amundson, who is from Sioux Falls, South Dakota, was looking at colleges, she knew she wanted to pursue electrical engineering at a Catholic university with an ROTC program.

“It turned out St. Thomas had all three,” she said. “What a dream!”

Her desire to join ROTC stemmed from her grandfather’s military background.

“I had a strong desire to give back to my country,” she said. “I wanted to be part of something bigger than myself.”

Amundson was inspired by the Intro to Engineering course.

“I loved the whole course. It was really hands-on and encouraged me to engage in my inventive side,” she said. “I have found a lot of passion in studying engineering.”

Amundson will also be stationed at the Edwards Air Force Base where she’ll serve as a developmental engineer and member of the 31 Test and Evaluation Squadron, which helps build top-notch operational systems.

“I feel my engineering studies have prepared me with a technically inclined mind that will assist me in being able to make sound decisions as well as offer creative, inventive solutions to problems facing the Air Force,” Amundson said.

She and her fellow engineering cadets will graduate in May, taking the winning combination of engineering and aerospace knowledge with them to an Air Force base to continue working toward their dreams.
WHY LIBERAL ARTS IS ESSENTIAL TO ENGINEERING

In his 2005 book *The World is Flat*, Thomas Friedman painted a picture of the 21st century economy that made many in the U.S. uncomfortable. He argued that the forces of technology, globalization and rapid information flow would greatly diminish the value of work skills and education that many of us rely on for our livelihoods.
After publishing the book and going on a speaking tour, he frequently was asked by anxious parents in the audience, “Then, what type of education do you recommend for my son or daughter?” The question was so prevalent that Friedman added a new chapter to the book in 2007, and his answer may be surprising to many. Despite the advances in technology and engineering threatening to rewrite the economic playbook for the globe, Friedman argues that a liberal arts education would provide the best preparation to thrive in the economy to come.

Friedman notes that even educators in India and China have “concerns that if math and science are not leavened by art, literature, music and the humanities, their countries will be at a competitive disadvantage as they try to get to the next level of global competition.” The right thinking skills and an understanding of people and societies fostered by a liberal arts education amplify students’ creativity, curiosity and adaptability which are the essential ingredients of innovation.

Nationwide, our engineering education system has not done well in advancing the idea that it will take much more than technological skills to solve our world’s most difficult problems. In 1990, I enrolled in an education course run by well-known engineering educational specialist Dr. Jim Stice at the University of Texas at Austin. One of my classmates took on a project to conduct a Myers-Briggs-like typological assessment of the entire graduate student body in the chemical engineering program. Of the 70-plus respondents, 95 percent self-identified to be grouped in one half of the inventory matrix.

From the literature, students who map into these quadrants are likely to do well in science and logic-based disciplines, “prefer technical tasks, and are less concerned with people and interpersonal aspects.” That’s more than 95 percent of us!

We think that the poor-people-skills stereotype of engineers is forged on our profession by the outside, but the reality is that it is likely manifested from our own internal cognitive processes that have been rewarded and sustained by our nation’s humanities-void engineering educational system.

In his 2008 report “Engineering for a Changing World,” Dr. James Duderstadt, CalTech alumnus and former president of the University of Michigan, argued that engineering programs should place less emphasis on technical training while “stressing the far greater long-term value to the student and our society of a truly liberal education.”

In the vast majority of engineering programs throughout the country, the benefits of a broad liberal arts education are missed entirely. And if Friedman and Duderstadt are correct, then the engineers emerging from those programs start their careers with a competitive disadvantage.

As I explain to students at St. Thomas, a liberal arts education doesn’t just make you a better cocktail party conversationalist. The skills developed in a liberal education are actually quite pragmatic. I often show students the mouse from my computer and ask, “How many designs of this device have you seen?” Invariably, the students shake their heads and say “lots” or “hundreds.” And to that I respond, “And we haven’t even opened it up to look at the inside.” I continue, “So, there are a thousand answers to this design problem,” and then I ask, “What type of experience do you think would prepare you to thrive in an environment where there are 1,000 possible answers to every question: your math class or your philosophy class?”

Being a member of an engineering team, navigating the multitude of decisions that lead to a new design or a problem solved requires far more reliance on the skills developed in a liberal arts education than on a student’s extensive technical training. The engineering educational community has known this for some time but, with the exception of a sliver minority of programs, marginalization of the liberal arts in engineering persists.

In a study published in one of the first Engineering Education journals in 1916 (yes, more than 100 years ago), a survey of nearly 7,000 working engineers were asked to attribute a percentage ranking to various skills and traits necessary to succeed as an engineer. Technical skills and scientific knowledge were shown to account for only 25 percent. Character, good judgment and an understanding of people dominated the responses.

Yes, even in engineering, it is all about people. We have known this for a very long time. And a liberal arts education is a great pathway to address that reality and, in stride, to thrive in this 21st century economy.
Each year, the Engineering Senior Design Clinic immerses students in hands-on design and engineering problems in collaboration with local industry. This two-semester course is a critical component of the St. Thomas engineering curriculum as it requires student teams to engage with real-world design problems and to experience the complete engineering design cycle.

The first semester focuses on defining customer requirements, thoroughly researching the problem and evaluating potential design solutions. During the second semester, teams apply engineering principles to refine the design and construct operational prototypes. Graduating seniors then display their work at a formal design show.

The St. Thomas Senior Design Clinic is a unique educational experience for these young engineers. Projects are selected to span a broad range of student interests, from product design for global sustainability and peace engineering to manufacturing optimization of medical devices. Teams of three to five students undertake each project, with a mix of electrical, mechanical and computer engineering students appropriate for the project content. The interdisciplinary nature of the teams differs from many other universities that have senior design project programs and is an exceptional opportunity for students to experience how multidisciplinary teams collaboratively solve problems in the real world.

One of the most valuable lessons students learn is how to tackle problems that do not have obvious solutions. Unlike textbook questions, which often have a single correct approach and solution, real-world problems possess a high degree of ambiguity. Students must brainstorm potential solutions and apply engineering rigor and sound judgment to select a solution that will best fulfill the unique design parameters for their projects.

Other critical job-related skills that students hone in Senior Design Clinic include project management and professional communication; these skills are necessary for the students to create milestones appropriate for a successful project completion and then communicate that solution in a professional manner to their sponsoring companies.

The Senior Design Clinic industry partnerships provide invaluable networking opportunities for St. Thomas students. Creating connections with local professionals through projects frequently leads to patent disclosures, recommendations and job offers. In addition, many of the industry sponsors are St. Thomas alumni, attesting to the strength of the alumni network and support they provide engineering students.
One Senior Design team worked with 3M, a multinational corporation headquartered in Minnesota with $30 billion in annual revenue. 3M manufactures a wide array of products for health care, safety, electronics and consumer marketplaces.

The 3M Personal Safety Division designs and manufactures equipment for respiratory, hearing and eye protection. One of those products, the Powered Air Purifying Respirator, provides filtered air for personnel working in areas with high concentrations of chemicals or dust. These devices require testing to ensure they achieve the flow rates required by government and customer regulations. Current laboratory flowmeters used for product testing require a pre-filter, creating significant pressure drops that must then be remedied by another complex system.

The St. Thomas team is designing a prototype with an accurate flowmeter with negligible pressure drop to allow direct insertion into the airflow without creating backpressure.

3M flowmeter team members are, from the left, Nathan Osborne (mechanical engineering), Samuel Vilone (electrical engineering), Ben Waterfield (mechanical engineering) and Cody Merrell (mechanical engineering).
Pentair, an industrial company focused on water, fluid and thermal controls, requested that our Senior Design students use a collaborative robot to improve the efficiency in the manufacture of electric heaters.

A Minnesota company, Pentair employs more than 30,000 globally. The Technical Solutions Division designs, manufactures and services heat-management solutions that provide thermal protection to temperature-sensitive fluid and electrical system applications.

The St. Thomas team is working to integrate the robot into an existing manufacturing process flow as well as design a portable base for mounting the robot. The robot will pick and place parts and interact with human operators and industrial equipment in a safe and reliable manner:

The School of Engineering always is searching for new industries and problems to be solved with our Senior Design Clinic. If you are interested in learning more about how your company can get involved, contact us at (651) 962-5750 or engineering@stthomas.edu.

Pentair team members are, from the left, Luis Chavez (mechanical engineering), Claire Dunford (mechanical engineering), Gabriel Swanton (electrical engineering) and Joe Allison (mechanical engineering).
A Good Sport

Meet mechanical engineering major Angel Paucar, who started the St. Thomas Society of Hispanic Professional Engineers chapter with fellow engineer Rey Andrade-Flores. Born in Brooklyn, New York, Paucar moved to south Minneapolis when he was 2.

Me in three words: loyal, respectful, honest

Best thing about the engineering program: I really enjoy the hands-on part. There are a lot of great people and the professors want to help you succeed.

Where you’ll find me on a Sunday afternoon: Exercising – playing soccer or Ecua-volley (a sport from my heritage that’s similar to volleyball)

Something people wouldn’t know about me: I enjoy working with cars. My Dad has a shop.

Favorite St. Thomas class and why: Machine Design. I learned a lot from Dr. Jennifer Holte. We learned how different systems work, and there was a lot of hands-on work.

Why St. Thomas? I applied to 10 schools. There was another school I liked in Michigan but it was farther away from Minneapolis, it is colder there and it was more expensive. I chose St. Thomas as it offered me the most financial aid. I have made great friends and there is a lot of support here.

Advice for other first-generation college students: Meet the other first-generation students on campus, and for me, other minorities on campus. Other first-generation students had very helpful advice. Both of those things helped me make new friends. •
WE’RE ADDING ON: CIVIL ENGINEERING PROGRAM STARTS THIS FALL

By Jordan Osterman ’11

The School of Engineering will begin offering a civil engineering major this fall.

Civil engineering will join mechanical, electrical and computer engineering as major options in the growing School of Engineering, which has grown by nearly 80 percent in credits generated over the last decade.

“The excitement from around the community, the data showing the need for this, mission fit, what students are saying – it all seems to be coming together and pointing in the right direction,” Dean Don Weinkauf said.

Center for Engineering Education Director Deb Besser helped lead a lengthy market and curriculum analysis over the last year-plus, which included developing the curriculum with advisement from a working group of professional engineers from government and private sectors. Weinkauf said meeting with regional CEOs helped solidify the idea that there is a great desire for civil engineering graduates with a St. Thomas education.

“We looked at the market, current degree production, and there’s a pretty good argument for opportunities for our students in the future,” he said, citing Bureau of Labor Statistics data that show strong growth projections and a dearth of projected degrees compared to the number of jobs needed.

Besser will join two newly hired faculty members as the program’s founding teaching core.

Weinkauf said a huge benefit to including a civil engineering major is the strong overlap with the existing mechanical engineering curriculum, so – outside of a freshman survey course – the new curriculum isn’t that different until students reach the end of their sophomore year.

“There won’t be the extensive starting over because it’s so well coupled to mechanical,” Weinkauf said.

The new program will make St. Thomas the only private school in Minnesota offering a B.S. in civil engineering, and it will join Marquette University as the only other private school in the Midwest region.

“The brand that we offer will be pretty distinct in this market,” Weinkauf said. “And with mission fit, if you talk about what civil engineers do, they build the things that people touch and depend on. What better degree is there for a university that is founded on the ability to impact society and improve the community? It’s right in the wheelhouse of our mission.”
CAMILLE GEORGE APPOINTED ASSOCIATE ENGINEERING DEAN
Dr. Camille George, a School of Engineering associate professor, has been appointed associate dean of engineering. In addition to her work with undergraduate students and curriculum management, George will direct the School of Engineering’s collaborative programming in engineering for sustainability and engineering for social impact, as well as its vision for international education and global learning. She will work to coordinate efforts across campus and with various national and international networks, including the Catholic Engineering Colleges, Kern Entrepreneurial Engineering Network (KEEN) and Ashoka exchanges.

An engineering faculty member at St. Thomas since 2002, George was the first program director of mechanical engineering (2009-13) and the associate vice provost for global and local engagement (2015-16).

She has received many honors including being named a Peace Exemplar by the Fetzer Institute for her collaborative work in Haiti.
Wind power provides 20 percent of renewable energy in the United States. Turbines to harvest the wind usually are built in rural or open-water areas to use the wind efficiently and generate the greatest amount of energy; however, reaching and repairing individual wind turbines is time-consuming and expensive. A small cluster of malfunctioning wind turbines may significantly reduce crucial energy output.

In extreme cases, the entire wind turbine may fall off the wind-power generator, causing damage to other expensive equipment and its surroundings. So, there is a great sense of urgency in the wind energy industry to develop predictive models to forecast which components in which wind turbine may fail, or even which repair parts are needed.

Because my research focuses on data mining and machine learning, I was invited by a wind energy consulting firm to develop machine-learning models to predict the failure of wind turbine components. My research team consists of three international students from the Graduate Programs in Software: Kiran Guntupalli from India, Christian Klaue from Germany and Ruogu Wang from China.

Machine-learning methods build predictive models by discovering associations between wind turbine sensor history and wind turbine failure history. Because each wind turbine can have more than 100 sensors attached to it, and each sensor may collect data every 1 to 10 seconds continuously over a very long time period, the data that needs to be processed and “learned” by machines is enormous. In fact, this project has more than 7 terabytes of data that were collected over a three-year period from hundreds of different types of wind turbines.

To speed up these complex machine-learning processes, my team and I plan to use the Amazon cloud computing platform and graphic processing units. Currently, the predictive models we’ve built have achieved about 80 percent accuracy in predicting wind turbine failures.

However, because the operation environment of wind turbines may keep changing (i.e., increasing temperature due to global warming, or gradual deterioration of components), the team is planning to extend its current models so they can update themselves dynamically in real time based on drifting data.
EASY AS ‘TARTA’

Our university motto “All for the Common Good” inspires professors to incorporate the needs of the community into their courses, and Modern and Classical Languages professor Judith Dorin did exactly that with the help of four engineering students.

Dorin wanted to digitally incorporate the services of Xperitas, a Minneapolis nonprofit that provides foreign language training, into her class. Her only obstacle was how - how to gain access to these services without using online platforms like Moodle, Blackboard or D2L, which were not interactive enough for her needs.

Students provided the answer. Graduate Programs in Software students Surbhi Joshi, Yiding Weng, Selvin Sahn and Grant Olson designed a unique online system to host Xperitas Spanish lessons. Their system features a more natural instructional flow and easily allows students to participate in audio labs and record their responses.

IT’S A MATCH

Graduate Programs in Software students Charles Teh, Don Bahls and Dane Aadland designed a volunteer database system for the international organization, Rotary. Rotary connects leaders and problem-solvers around the world with charitable projects to make lasting changes. The 1.2 million Rotary members have a wide array of skills that were previously difficult to match with projects that suited them. With the new system, however, Rotary now can connect volunteers to their ideal projects and managers to better serve the needs of communities.

STUDYING ARCHITECTURE AND ENGINEERING IN ITALY

Each January engineering students travel throughout Italy to study Roman Structures, Engineering and Society, taught by engineering professors Deb Besser, John Walker and Barb Zell.
ST. THOMAS GRADUATE FINDS SUCCESS AT MIT

Safe drinking water is readily available in Minnesota, but in other parts of the world, it’s a different story.

For instance, many rural communities in India drill wells to access groundwater sources that provide water that’s too salty to drink. They purify it by using reverse osmosis, which researcher Natasha Wright ’12 finds wasteful.

“That technology is great, but at the size of scale we’re looking at for remote villages, it requires a lot of energy, which is expensive, and wastes 40 to 70 percent of water,” Wright said.

Wright is in her fifth year at Massachusetts Institute of Technology researching a way to desalinate water that’s economically sustainable for rural Indian villages.

“The technology I’m using is electrodialysis,” Wright said. It pulls salt out of water by using voltage provided by solar panels, which require a lot less energy than reverse osmosis. “It wastes much less water; only 5 to 10 percent,” she said.

“The goal with electrodialysis is to be able to match the price with reverse osmosis off grid, where power is intermittent” she said. “We hope to impact 50 percent of the population in India.”

Wright is a graduate student fellow with MIT’s Tata Center for Technology and Design, which aims to address issues globally and is starting in India because of its water crisis and the availability of local manufacturers to create technologies. In time, she plans to bring the system to arid areas of the United States, such as ranches in New Mexico where well water is frequently too salty for livestock.

Wright, originally from Minnesota, earned her bachelor’s degree in mechanical engineering at the University of St. Thomas, her master’s degree in mechanical engineering at MIT, and is in the third and final year of her Ph.D. work in program machine and product design.

For her research work, Forbes magazine named Wright one of “30 Under 30 in Energy” for 2016.
All students know that what they try out themselves, what they “get their hands dirty” exploring, plays a large role in what they end up learning at a deep level. At the same time, they don’t learn everything on their own, in isolation with just their own hands and thoughts. The interactions between students and other students, between students and teachers, between experimenters and thinkers in the wider community – these all combine, allowing students to benefit from the inventions and insights of others in addition to discovering their own way. In both of these learning modes, hands-on individual and interconnecting, curiosity is what propels us beyond the rote work of training and task completion to seek deeper understanding.

Imagine standing in a vast, dark, unilluminated field. There are likely many paths from your initial standing point that you could conceivably explore, but how will you decide the direction of your first step? Now think of your curiosity as a switch – throwing the switch to ON powers bulbs that light up patches of the geography in the distance, maybe the outlines of a few paths winding toward the horizon. These are the tantalizing views that draw you from your starting point to explore your world, both what it already is and what it can become.

One thing the faculty members of the University of St. Thomas School of Engineering see under the illumination of their curiosity is a constellation of questions: In addition to technical and mathematical skills, what do our students need to learn if they are to become outstanding engineers and highly-valued participants in their communities? How can we support them? What pathways do we want to find or forge with them?

An old saying runs, “If all you have is a hammer, everything looks like a nail.” The tools and techniques of engineering, without the judgment, discretion and commitment to use them artfully, are at risk of becoming just a large assortment of hammers. More than being able to solve engineering problems, more than being able to find and pursue engineering opportunities, there are the essential skills of questioning, reflecting thoughtfully and connecting to individual and shared experience that make it possible to ask, “Are we working on the right problem?” Might this be a skill set we can help our students develop?

Supported by a grant from the Kern Family Foundation KEEN Network, we have been diving in, hands-on, in a series of retreats and workshops that allow us to ask a powerful question, one that demands an open and curious approach, thoughtful reflection and the leveraging of decades of combined experience inside and

---

**83%**  
**OF ST. THOMAS ENGINEERING FACULTY**  
**HAVE ATTENDED KEEN NETWORK WORKSHOPS**

---
outside the classroom: “What real paths – in our individual courses, through our curriculum, by including the community in our co-curriculum – can we discover and create to transform our incoming students into outstanding engineers?”

This question comes from within, grounded in the core approach to creating value that is all for the common good. Just as is the case with an individual learner, however, interactions with others can spur learning at a deeper level. The KEEN Network is helping us draw on the inventions and insights of other engineering partner schools as well as helping us share our discoveries with those partners, magnifying the impact of our work. Both hands-on as a team of faculty, and as an institutional participant in a larger network of engineering programs, we are heeding the very guidance we often give our students. We are taking the time to ask two deceptively simple questions: “Why?” and “What if?”

Doug Dunston collaborates with the School of Engineering as a facilitator and workshop coordinator. He has advanced degrees in music and physics and is professor of humanities at New Mexico Tech, where he teaches the courses Interdisciplinary Problem Solving, Practical Creativity, and Failure, Change, and Integrity.

---

**ELECTRICAL ENGINEERS BECOME ENTREPRENEURS**

The two-person team of electrical engineering students Jessica Bremseth and Emma Koller placed as second runner up in the undergraduate division of the University of St. Thomas Fowler Business Challenge and won $2,500 for their concept, DermaScan. DermaScan would aid individuals in spotting potentially cancerous moles. Their product is a simple at-home device that would allow individuals to track and analyze the development of a mole or a spot on the skin to aid in early skin cancer detection.

The Fowler Business Challenge is held annually in the Schulze School of Entrepreneurship. Participating students develop and submit concepts with the potential to become viable, high-growth businesses. Entries are judged on originality, clear and compelling value proposition, competitive advantage, market opportunity and feasibility.
Engineering a career to serve

In the last decade, nearly one-third of AFROTC students have been engineering majors.