University *of* New Haven

TCoE Trends

Newsletter of the Tagliatela College of Engineering, University of New Haven Winter 2018

Dean's Remarks

Some late-breaking news ...

In previous newsletters, we have reported on our tremendous success in sharing with other institutions our e-learning modules designed to develop an entrepreneurial mindset in students. To date, 55 faculty from 43 other universities and colleges have integrated our modules in their courses. In December 2017, the CTNext Higher Education Initiative and The Kern Family Foundation funded our proposal to further share our modules with Connecticut State Colleges and Universities with the goal of developing entrepreneurial talent for Connecticut. The Kern Family Foundation also funded an additional year of our successful mini-grant program, and we expect another 25 faculty at other institutions to deploy our modules in 2018-19.

Ibrahim (Abe) Baggili, associate professor of computer science and founder of the Cyber Forensics Laboratory, was named by *Connecticut Magazine* as one of 2018's 40 Under 40 in the state — people under the age of 40 who are excelling in their fields, leading and influencing others, and making a difference. Abe is a pioneer in the field of cyber forensics and is making significant contributions to advance the area.

Four students, Jillian Jacques, Matthew Sheehy, Austin Thomas and Dan Woronick, were inducted into the prestigious University Innovation Fellows (UIF) program this year. They will continue the momentum developed by our two previous UIFs and promote an entrepreneurial ecosystem at the University.

Maria-Isabel Carnasciali, associate professor of mechanical engineering, and I have been working closely with architects to design and equip the Innovation and Design Makerspace that will be a cornerstone of the new Bergami Center for Science, Technology, and Innovation. Ground breaking is expected this spring. The new building will be connected to the current engineering building, thereby providing an exciting collaborative environment to our students.

RBHarichandran

Ron Harichandran, Dean

Ravi Gorthala Wins $1.2 Million Grant to Make Commercial Buildings More Energy Efficient

Ravi Gorthala

Commercial buildings expend almost 20 percent of the nation's energy, and experts say a large percentage of that is wasted, but Dr. Ravi Gorthala, Associate Professor of Mechanical Engineering, and a team of five graduate and undergraduate students are at work on an ambitious three-year U.S. Department of Energy (DOE) project that aims to make commercial businesses' heating, cooling, ventilation, and refrigeration systems operate efficiently.

The $1.2 million dollar grant is funded by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), with cost sharing by United Illuminating and Eversource through funds from Energize CT.

The project is titled "Bringing Fault Detection and Diagnosis (FDD) Tools into the Mainstream: Retro Commissioning and Continuous Commissioning of HVAC and Refrigeration Systems," and Jesus Amado, an undergraduate mechanical engineer at work on the project, explained it this way: "Think of the check engine light or tire pressure icon in a car. They light up when there may be an engine problem or the tire pressure is low; newer cars actually show the oil level."

Added Gorthala, "A rooftop air conditioning unit could be cooling a building, but the owner might not have any idea what it is costing them in terms of energy use due to faults, and some faults could be catastrophic and result in costly equipment failures. Commercially available fault detection and diagnosis (FDD) tools can be used to detect faults and let the owners or HVAC contractors know so they can look at the units, fix them, and achieve significant energy savings."

Under this DOE project, these FDD devices and the performance monitoring systems for independent verification put together by the project team will be installed on at least 10 buildings in the state. When faults are discovered, the grant provides up to $2,000 so that the owners of the commercial buildings can fix the problems.

The team includes three graduate mechanical engineering students, Malak Souissi, a Fulbright Scholar from Morocco, Annika Hacker '17, who is the student team project

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manager, Jaykishan Ramani, and undergraduates Jesus Amado and Amanda Rimkunas. They are collaborating with two subcontractors on the project — the United Technologies Research Center and the UTC Institute for Advanced Systems Engineering at the University of Connecticut.

"It is a sprawling, three-pronged project," Gorthala said, "focusing on stakeholder education, outreach, and workforce development. At work since October 2017, the students have developed project management strategies, outlined tasks and milestones, and had a kickoff meeting with UConn and UTRC at the UTC Research Center," Gorthala said.

The students are doing instrument data collection, data analysis, and research, as they explore FDD tools that exist on the market and those just coming to market. They will be surveying businesses in the state to find out why, if these products exist, they aren't yet really commercially viable.

They've gathered around worktables testing dozens of sensors and constructed their own monitoring system so they can confirm the findings of the FDD tools. And they've been up on the rooftops of buildings working with technicians on a separate pilot FDD demonstration project funded by United Illuminating and Eversource under Energize CT to install the FDD tools and monitoring systems.

In a U.S. Department of Energy statement, David Nemtzow, director of the DOE's Building Technologies Office, said the work aims to "improve our nation's commercial building stock and cut energy bills for American businesses." One of five leading-edge national projects to "improve the efficiency of the nation's commercial buildings," Nemtzow called the work "an excellent partnership among U.S. businesses, universities, and the Department of Energy."

Malak Souissi installing sensors and FDD on rooftop AC unit

"It even stretches us beyond engineering," Rimkunas said, noting that they are also fast becoming marketers. She was busy building the project website, and other team members are planning a major outreach event at the Energize CT Center to involve HVAC companies, the Connecticut Business and Industry Association, the Connecticut Retail Merchants Association, and the Greater New Haven Chamber of Commerce to encourage owners/managers of major corporations, supermarkets, and businesses large and small to take part in the program.

"There is a lot of planning that needs to be done, and having to plan out every detail is very intense," Hacker said. "Doing the product research is another experience. Prior to buying or ordering anything, we need to become 'experts' in what we are doing and what we need, which takes a lot of time, dedication, and research. It definitely gives insight on how long it actually takes to complete a project when working for a large company."

Souissi said they have become quite a team, in sync in the lab and out at work in the field. "When we face a problem, we get to brainstorm and solve it logically, then settle on a solution," he said.

Added Hacker, "We definitely are a unique group, with different backgrounds and knowledge which allows us to get various points of view," she said. "We are not afraid to take charge and take the initiative to learn something new."

Once all of the companies are on board and all the sensors and systems are in place, much of their work will focus on gathering and analyzing data. "That's where our skills come in, doing lots of calculations to check performance," Souissi said.

Later, they will write papers and present their findings at conferences and share information with other universities who can replicate the project and develop similar partnerships in other states. "The experience we are gaining is incredible," said Amado.

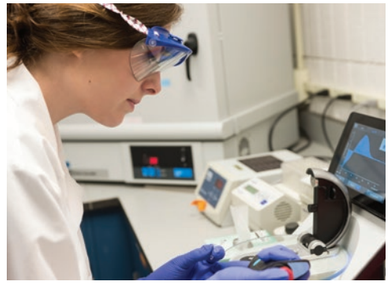
"The end result — helping owners of commercial buildings decrease energy use — is of utmost importance," Gorthala said.

A 2016 piece by Richard Gerbe in *Energy Manager Today* stated that commercial building operations account for 36 percent of the electricity used in the U.S. annually at a cost of $190 billion a year. He wrote, "Commercial buildings are incredibly inefficient, resulting in massive amounts of wasted energy, resources and expenditures."

Gorthala said they hope the project "will create pathways and commercialization strategies to achieve widespread U.S. adoption of this technology by bringing together all stakeholders — manufacturers, utilities, and HVAC contractors — for strategic development."

"Energy is everything. If we don't have energy, we don't exist," Gorthala said. "Renewable energy resources are the future and very important. But before we tap into them, the first thing we have to do is to make our existing systems energy efficient so we use less energy."

Biomedical Engineering Program Continues to Grow: Students from Around the Globe Collaborate on Groundbreaking Research



What began last year as a new program with six students has grown into a bustling Biomedical Engineering master's program with 27 students from around the world.

"They've come from China, Nigeria, India, Turkey, Iran, and Myanmar, from California, Connecticut, and New Jersey for the chance to pursue an exciting program and do groundbreaking biomedical research that, for a small lab, has already had striking results," said Kagya Amoako, Assistant Professor and Program Coordinator of Biomedical Engineering.

That research began in earnest last year when Rana Gbyli MS '17, then a student in the University's Cellular and Molecular Biology program, became Amoako's research assistant. Amoako and Gbyli worked to solve a puzzle the National Institutes of Health (NIH) has been trying to solve for years — how to stop the spread of infections associated with implanted medical devices like catheters, stents, and artificial lungs.

With over 200 million implantable devices used in patients in the U.S. alone, and a four percent infection rate, infection is a major health problem affecting more than eight million people each year.

"The NIH is very interested in catheter-related blood infections; it's a very big problem, and they have worked for a long time to find a solution," said Amoako, who is seeking funding from the NIH to do the research to help solve the catheter-related infections.

The lab's first major breakthrough came last year when they found that polymer-bound nitric oxide can also effectively inhibit the growth of bacteria. "The release of nitric oxide (NO) messes up sticky proteins that bacteria use to adhere themselves onto surfaces and thus prevents them from attaching to the medical device," Amoako said. "The bacteria DNA is also modified by NO, and this affects their replication. What we figured out was how much nitric oxide you need to release to inhibit strains of three bacteria associated with hospital acquired infections." They also wanted to see whether nitric oxide hurt the cells around it — damaging their viability — and, according to their initial studies, it did not.

Now the students are working to see if the nitric oxide can kill bacteria, trying to develop new polymer formulations that release NO over two months to give the product a long shelf life and a release span that would cover the time frame during which an infection usually takes hold. "There's a lot of chemistry that goes into this research work," Amoako said. University faculty members in the program and across engineering and biology disciplines are very engaged in research which allows the Biomedical Engineering master's students to do research they wouldn't typically be able to do at most universities until the Ph.D. level, Amoako said.

Saleem Haj Ibrahim likes collaborating in the Biomaterials Lab with students from so many different cultures and academic backgrounds. Amoako and faculty members Saion Sinha and Eva Kirkor invited everyone in the program to a barbecue "to help us know each other more, and we had a lot of fun," he said. "We played soccer, and we talked a lot about our different countries." Originally from Chicago, Ibrahim lived for a while in Kuwait and did his undergraduate work in Jordan. He was drawn to the program because of the opportunity to do research, "because of the high ranking of the University's engineering program" and its proximity to biomedical firms, as he plans to work in the field after graduating.

Gybli said the research work with Amoako and with Christina Zito, Assistant Professor of Biology and Environmental Science, proved invaluable to her career. "I was involved in many projects, had the opportunity to present my research at many conferences, learned what it means to actually run a lab, and had publications, which is very important for a researcher," Gybli said.

Today, Gbyli is a post-graduate associate at Yale School of Medicine's Yale Cancer Center, the Halene Lab, which is working to understand the role of splicing factor mutations in myeloid malignancies and develops efficient clinical models to study blood cancers, such as leukemia, and she is an adjunct instructor in biology at the University of New Haven. "At the same time, I am still working with Dr. Amoako on publishing my thesis research work," she said. "I am grateful to Dr. Amoako and to my professors in the Cellular And Molecular Biology program, who gave me an amazing opportunity to be a biology adjunct and teach at the University of New Haven."

Amoako said their first paper was accepted and will be published in the *Advanced Material Interfaces Journal*. Their book chapter was accepted, and they are submitting a second paper for publication. "That is an extraordinary accomplishment for a master's student," Amoako said.

This year, students are interning at firms including Medtronic and presented their research at the Biomedical Engineering Society, American Society for Artificial Internal Organs, New England Science Symposium, and the Northeast Bioengineering conferences.

"Our students and faculty are highly motivated," Amoako said. "We want to make an impact and do something meaningful for the world. The work we do here is important, and I believe that is what draws students to us."

Sikorsky Funding Helps Support University Makerspace: A Place for Innovation and Experimentation

It's a place to tinker and experiment, a place where first-year engineering students use 3D printers to create puzzle prototypes; graphic design students practice their drafting and milling skills; and industrial engineering graduate students role play the work that unfolds on a 21st century factory floor in a simulated Toyota assembly line.

Students in Erdil's class collaborate in the Makerspace

This year, use of the University's Innovation and Design Makerspace has ramped up.

"In the past, students were always tinkering, taking things apart, examining them, and putting them back together, but with so much time spent working with computers, that's changed," said Maria-Isabel Carnasciali, Associate Professor of Mechanical Engineering. "It is important that students have a space where they have the chance to create, where they can try out ideas and learn from mistakes. That's all part of innovating."

With $31,000 in funding from Sikorsky Aircraft, TCoE hired students as teaching assistants to staff the Makerspace and teach students how to use the high-tech equipment and tools. "Sikorsky's funding has allowed us to hire student workers who can be mentors to other students and to have supplies and replacement materials and equipment," Carnasciali said.

"The University Makerspace provides the physical space, state-of-the-art resources, and an intellectually-stimulating environment that inspires a culture of innovation and exploration," Woody Woodyard, Vice President, Communications at Sikorsky's Rotary and Mission Systems, said. "Our hope is the Makerspace will inspire students to stretch their imagination and motivate them to consider careers in science, technology, engineering, and math."

"When students take advantage of the Makerspace and challenge themselves with demanding assignments, they position themselves to be very competitive as they enter the workforce," Woodyard added. "At Sikorsky and Lockheed Martin, we look for students who embrace the spirit of innovation and have a commitment to excellence."

Open from 8:00 a.m. to 10:00 p.m., the Makerspace, with its 3D printers, moveable work tables, milling and edging machines, and a wall full of tools of the old-school variety — hammers, screwdrivers, and pliers — invites creativity. TA Christopher Hill '17, a graduate student in mechanical engineering, likes "the elbow room the space provides." "It allows us to get messy when it is needed and not be constrained by the limited space that a normal desk would give us," he said.

Hill is developing "simple and fun workshops to pull in creative students" from across all colleges at the University so they can learn new skills, discuss ideas, and possibly start collaborations with other students.

At a "Reverse Engineering" event in the Makerspace sponsored by Psi Tau Sigma, the Mechanical Engineering Honor Society, 16 students disassembled a Dyson D-39 vacuum with 15 attachment heads and then collaborated to reassemble it. Jesus Amado, a mechanical engineering undergraduate who organized the event, said students enjoyed "being able to use tools to take apart a component of a well-engineered vacuum such as Dyson... and see for themselves how things work to make a component, the gears, brushes, and materials."

In Nadiye Erdil's Quality Analysis graduate class, the Makerspace became a factory floor where students role-played the assembly of cars using different manufacturing strategies. The simulation ended with the Toyota production system, "the one that laid the foundation for lean manufacturing," said Erdil, Assistant Professor of Industrial and Systems Engineering.

"The space and the flexible furniture in the Makerspace allowed us to run this hands-on simulation smoothly and let us focus on the learning objectives as opposed to spending time on figuring out how to make it work in a small space with fixed equipment," she said.

Erdil said the simulation helped students understand practical applications of theoretical concepts, like discovering characteristics of different manufacturing strategies (batch and queue, continuous flow, push system, pull system) and analyzing the effects of different manufacturing strategies on the system components and the system output.

Javier Viramontes, a lecturer in the Visual and Performing Arts, said the University Makerspace allows for a beautiful blending of the very oldest and newest technologies.

"Typography is a prerequisite to civilization, and as such, there is a constant interaction between the alphabet and the technology of the time," he said. "The Makerspace will give Graphic Design students the opportunity to visibly experience this intersection, one between creative impulse and today's technology."

Students in his typography course made a printed accordion book, "a synthesis of the knowledge they have gained throughout the semester, using the Makerspace and various tools to create it," Viramontes said. "The book's production employed a wide range of tools and processes, which began through traditional analog means. Sketching and manipulating typographic anatomy were translated into a precisely drafted vector graphic which will be routed onto linoleum printing blocks. These books are, in a sense, a culmination of a very ancient chain of thought."

Thinking like Thoreau: Pausing to Observe the Project Environment in a Course in the Inaugural Civil Engineering Master's Program

One of the first texts Clifford J. Schexnayder had students read in his Introduction to Construction Management course was *Walden* by Henry David Thoreau.

As the first students in the TCoE's new graduate program in Civil Engineering, they were very quickly out in the field with Schexnayder, working in teams. "To be a good engineer you must take time to observe the environment of your project, the physical environment and the social/community environment." Early in the course, Dr. Schexnayder took his students to the Walsh Construction Co. pump station project in Middletown. He wanted to get them out in the mud and give them an opportunity to talk with the engineers on a real project.

Observing tunnel boring at pump station project in Middletown, CT

"I required a report on the site visit, and then in class we talked about what was observed. They all wrote about what the project was about, but most failed on this first visit to the field to carefully note machine and labor production. How long did it take to push a micro pile into the ground? Back in the classroom, we discussed things we should be observing."

Before they charge into the mechanical tasks of their work, Schexnayder said, he wants students to look around a while at the project site and think about the impact their work will have on the environment and how that environment will affect their work, the selected materials, and overall costs. "You are working in England," he asks them. "How does the weather affect your production?"

Schexnayder is part of the multidisciplinary team of professors teaching in the new Civil Engineering graduate program launched in the fall of 2017. The program features courses in civil engineering, including construction management, sustainability, structural engineering, and environmental engineering.

Dr. Byungik Chang, Program Coordinator and Associate Professor of Civil Engineering, said the new master's program is a blend of theory and hands-on applications. Students in the master's program spend time in classes and out in the field and will have the chance to do collaborative research with professors across engineering disciplines and program areas.

Graduate students have the option to take courses in four focus areas: Sustainability, Environmental Engineering, Structural Engineering, or Construction Management. Chang said graduates can go on to work for Departments of Transportation, the Federal Highway Administration, the EPA, or they can pursue work in general civil engineering, urban planning, or consulting firms. "We are very excited to have our first students in the program," Chang said.

Chang said Schexnayder brings decades of experience teaching and working in construction engineering. Dr. Schexnayder is an Eminent Scholar Emeritus, at the School of Construction at Arizona State University, has been a Fulbright Lecturer/Research Scholar at the Universidad de Piura, Piura, Peru, and a Dibner Library Resident Scholar at the Smithsonian Institute Libraries in Washington, D.C. He taught engineering at the U.S. Army Engineer School, Fort Leonard Wood, Missouri and is co-author of the textbooks *Construction Management Fundamentals* and *Construction Equipment and Methods*.

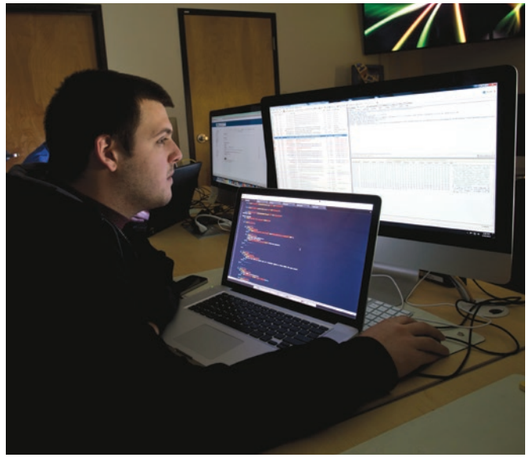
"For those students in other specialties, this will be their only construction course, but it will serve them well," he said. "Engineering and construction have lots of specialties, but we all need to know something about how the other players on the team work."

With a median starting salary of $83,500 and with the U.S. Department of Labor's Bureau of Labor Statistics projecting 11 percent growth in civil engineering jobs over the next 10 years, civil engineering is a field rich with opportunities, Chang said.

The Labor Bureau reports that "as infrastructure continues to age, civil engineers will be needed to manage projects to rebuild, repair, maintain, and upgrade bridges, roads, levees, dams, airports, buildings, and structures of all types." Chang said research also shows that the demand for master's degree programs across the country has grown by eight percent, "and the need for a graduate program in this region is strong."

"Civil Engineering never dies," Chang said. "It will move forward until the end of the earth's life because we need to develop the earth and maintain the earth."

Cybersecurity and Networks



"What's in a name?" Shakespeare famously asked in *Romeo and Juliet.* ("What's in a name? That which we call a rose/By any other name would smell as sweet.")

Actually, there is a lot in a name, said Ibrahim "Abe" Baggili, the Elder Family Endowed Chair and Associate Professor of Computer Science, particularly when it comes to a groundbreaking program like Cybersecurity and Networks. That's the new name for the BS and MS programs formerly called Cyber Systems.

"The change reflects our core teaching and research areas in cybersecurity, cyber forensics, and networking," Baggili said. "People understand the importance and impact of cybersecurity, and that is exactly what we are pioneering in our program."

It's a program that continues to be very much on the forefront in the field and in the news. "We received National Science Foundation funding to be the first group to study the security and forensics of Virtual Reality, as well as its impact on education," Baggili said.

The program also launched the Artifact Genome Project (AGP), an archive of digital forensic evidence where investigators from around the world can share and find digital evidence. Baggilli said AGP already has users from 134 organizations, from 16 countries.

Exploring Space — Four TCoE Students Receive NASA CTSGC Grants for Aerospace Research

Four TCoE students were awarded highly competitive NASA CT Space Grant Consortium (CTSGC) fellowships to do space and aerospace related research. Jordan Rippe received the Student Project Award of $1,000, Alexandra Goriounova received a $5,000 research fellowship, and Leah Landsdowne and Jonathan Stanford received $5,000 scholarships.

"This was a high point for our students who were competing for grants and scholarships among their peers from academic institutions including UConn, Yale, and the University of Hartford and others," said Dequan Xiao, Assistant Professor of Chemistry and Chemical Engineering.

NASA CTSGC is a federally mandated grant, internship, and scholarship program that is funded as a part of NASA Education. There are Space Grant Consortia in all 50 states, Washington D.C., and Puerto Rico. Formed in 1991 by Trinity College, the University of Connecticut, and the University of New Haven with the University of Hartford as the lead institution, CTSGC encourages broader involvement in NASA research programs.

In October, the TCoE faculty, the Dean's office, and the University's American Chemical Society Student Chapter organized "Chemistry and Space Science," a forum held at the Orange campus. It featured more than 40 student and faculty participants, including two keynote speakers from Yale, four University faculty speakers, and one Wesleyan postdoctoral speaker. "The forum stimulated students' interest to think about frontier scientific and engineering problems related to NASA's missions," Xiao said.

"The trend of increasing participation and competitiveness of TCoE's students for the NASA CTSGC grants results from the relentless pursuit of research and education in engineering and applied science at the TCoE," Xiao said. "This certainly benefits students in their career development."

Donning that Black Hat and Thinking Like a Hacker: TCoE Hacking Team Makes Name for Itself at National and Regional Competitions

It was like the two-minute warning in a tight football game. "The best players are out on the field, and everything is on the line," Tyler Balon '17 said. "There's this incredible adrenaline rush."

But this action wasn't happening on Ralph F. Dellacamera Field. TCoE's Hacking Team members were gathered around computers for a national hacking competition in a room at the Rochester Institute of Technology.

They were hyper focused and coffee fueled.

Balon and team members Justin Grannis, Chris Meffert, Matt Topor, Rob Schmicker, and Corbin White formed a simulated corporation, Gotham Elections, and by the next morning wrote a report and presented it to the simulated team of corporate directors.

They used what they learned in their Ethical Hacking, Reverse Engineering, and Digital Forensics classes and leaned on the hours of practice, so many hours, in fact, that Buckman 101 has long since become a home away from home.

"The Hacking Team, just a few years old, has had an incredibly impressive run this year," said Frank Breitinger, Assistant Professor of Computer Science and Cyber Systems, the team's adviser. The team — three graduate and three undergraduate Computer Science majors — placed second and won a prize of $7,500 at a Capture the Flag competition at the University of Connecticut. They placed third at the regionals, beating teams from Drexel, Penn State, and Carnegie Mellon, considered one of the top universities in the world in computer science, and made it to the nationals in November.

While they didn't place in the top three at the nationals, they aim to next time, Balon said. "We worked better as a team than we ever had," he said. "We found some very interesting vulnerabilities and reversed code. Ultimately, it all came down to execution; we were not able to outperform universities like Stanford, who placed first, and HackUCF (University of Central Florida), who placed second, but we will continue to develop our program into something much bigger."

They'll have that chance this spring as they head to the Collegiate Cyber Defense Competition in New Hampshire and a Capture the Flag Competition at MIT. "They've earned the respect of everyone," Breitinger said. "They've made a name for themselves and now when they show up, the big teams say, 'Hey, New Haven, how's it going?'"

The secret to their success? "We have excellent students here who are really motivated," Breitinger said. "They organize themselves; they meet; they practice all the time. In turn, they motivate us as faculty to create more courses like Offensive Security. It's been very exciting."

Tyler Balon, Justin Grannis, Christopher Meffert, Robert Schmicker, Corbin White, and Mateusz Topor

Using their skills to make their way into a system is a thrill, Grannis said. "There's something almost taboo about it, going to a place you are not supposed to be and having to use your head to think of a very meticulous method to get there," he said. "It's a very complex puzzle you are trying to solve."

It's also a way to network and get on the radar of staff from major corporations, startups, banks, and cybersecurity firms — Uber and Amazon among them — who sponsor events and often recruit students for positions with starting salaries of $95,000. "One Texas-based security firm offered a job to a University of New Haven student who hadn't graduated yet," Breitinger said. "This is very complex work that not everyone can do," he said. "So companies are very impressed with what they see."

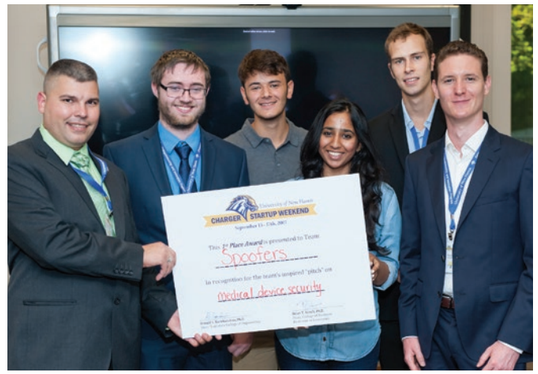
The work is purposeful, Balon and Grannis said. If they can learn to "think like the black hats," they can find ways to outmaneuver them and also find ways to educate a public that they said often does not realize just how vulnerable to a hacking attack they are. "You could be on public Wi-Fi and someone sitting next to you or someone from Antarctica or anywhere can access your system," Grannis said.

So, as winter becomes spring, the team members can be found at Buckman honing their craft, prepping for the next competitions. "There is no doubt in my mind with weekly meetings, extensive practice, and competing regularly that we can beat some of these teams with 100+ students in their hacking clubs," Balon said. "We may be the smaller University/team, but we have a huge future."

Building a Wall to Keep Hackers from Penetrating Medical Devices

On any given morning, you might decide to start the coffeemaker from another room, turn the heat down in the house from three cities away, or have the GPS find a way to navigate around a sudden, snarling traffic jam, all thanks to the connected nature of the Internet of Things.

But a team of University students — Max Theokritoff, Tejna Nagaraj, Jonathan Ramirez, Benjamin Miles, Benjamin Klemme, and John Bobish — who won last fall's Charger Startup Weekend Competition organized by the Entrepreneurship and Innovation Program — warn that ease can come at a cost.



Jim Johnson, Benjamin Klemme, Jonathan Ramirez, Tejna Nagaraj, Benjamin Miles, and Max Theokritoff.

"Consider all the millions of medical devices that rely on Bluetooth for connectivity," Theokritoff said. "You could be sitting in Starbucks, accessing their Wi-Fi and detect all the Bluetooth devices nearby. With no authorization needed, you could connect to a device," Nagaraj said. "Some of those could be smartphones, but others could be pacemakers or another medical device," she said.

"Or you could go to a hospital and the nurse could place a pulse oximeter on your finger to check your blood oxygen level. And it's wireless," Ramirez said. "So that device is connected to many other devices in the hospital. What if someone wanted to intercept that, to hack in and use that way in to get at patient data? There is the chance people could do something malicious to people's medical devices."

So the team set out to essentially build a wall to keep hackers from penetrating medical devices.

Their solution? Apply authentication, identification, and data protection cryptography to life critical/connected medical devices to defend against hackers. "Implanted medical devices rely on Bluetooth or other connectivity standards to provide better healthcare to patients," Theokritoff said. "Unfortunately, connectivity security is limited on these devices as they are small. We're working on low energy technology to drastically improve implanted medical device security."

Ramirez said they are using existing SecureRF Technology to build their solution, "adapting existing cryptographic solutions to our customers' products to prevent malicious activities."

The possibilities seem limitless, they said, because the medical device industry is a multibillion dollar industry that is expected to grow at a rate of five percent a year. According to their research, Bluetooth device sales are growing at 8.9 percent annually. Medical tech sales are expected to grow 5.2 percent over the next few years, from $371 billion in 2015 to $529 billion in 2022.

They arrived at the Startup competition, each with their own idea to pitch, but once the top ideas were voted on, they chose this one. They were a group of students with an array of talents, interests, and academic backgrounds who were suddenly a team. Theokritoff is a graduate of the IÉSEG School of Management in France, pursuing a master's in Computer Science. Nagaraj, Ramirez, and Klemme are electrical engineering majors; Miles is a marketing major, and Bobish is studying accounting. Students from universities throughout the region took part, and faculty members and entrepreneurs from the region's start-up community mentored the teams.

In the high stakes, pressure cooker whirl of the Startup weekend, where day turns into night and day again, and the collaborative work rolls on, they found they worked really well together. "We all shared a passion about this idea; we knew how important it could be to people, and we wanted to make it happen," Theokritoff said.

For 45-plus hours, they worked together on their idea and, in the end, they won. "It was so exciting to win," said Nagaraj. "The best part of this experience is working toward a solution which would benefit a lot of people in the future."

Theokritoff said having the chance to create the team they did, to network, to gain a professional mentor, to develop all the soft skills needed to create a business, and to go on to work to develop that business — were the big wins.

In November, they presented their project to the TCoE Advisory Board. Dean Ron Harichandran said buzz continues to build about their idea. This spring, they will enter the Consortium of Entrepreneurship Educators' Connecticut Business Plan Competition.

Work continues on their product. "The licensing agreement with Secure RF, which would enable us to use recognized industry technology to build our solution, has been approved, and all that is left is the signing," Theokritoff said. They are building the infrastructure needed to manage the use of cryptography in the products, developing consulting, testing, and training services and fine- tuning their business plan.

"I love working on this; we all do," Ramirez said. "We think it can make a big impact on people's lives."

Out of an Annoying Frustration Comes an Entrepreneurial Idea and, Soon, a New Product

All Nathan Pitruzzello '18 wanted to do was send a file to his professor. But each time he'd hit send, the file would be corrupted.

It was that all-too-familiar "Aaarrrrgh!" that "Are you kidding me?" moment when, with deadline approaching, a file just won't send.

But from that frustration an idea was born. What if Pitruzzello could create an app that would let people simply slide data from one laptop to another or from one device to another?

"I was looking for an application where I could literally swipe data to and from multiple devices without the four to five different options required that most upload/download platforms require," said Pitruzzello, a computer science and economics double major. "I heard a lot of people complaining about this, so I figured that could be an integral part of a new data transfer application."

He talked with Mia Sumra '18, an economics major, and Samuel Opper '19, a computer engineering major, and the three decided to collaborate on an app and enter the 2017 Alvine New Venture Pitch Competition. Joey Nicklas '19, a graphic design major, who had been running his own graphic design freelance business since he was in high school, became the chief creative officer; and Khashab Khashab, formerly of Gateway Community College, who had worked with Sumra at the Peabody Museum and did his own marketing projects, was named chief marketing officer.

They named their app SlideDrive and their company SoluTech, with Pitruzzello the CEO, Sumra the COO, and Opper as CTO.

They didn't win the competition, but "The loss was enough motivation for us to push this," Pitruzzello said. "We knew we were onto something; everybody was seeing it."

Mia Sumra, Nathan Pitruzzello, and Joey Nicklas

"What's different about SlideDrive is it's a completely cloudless peer-to-peer file transfer," Khashab said. "There is no middle man between you and the person the information is supposed to go to. It's encrypted. There is no third-party connector, no third-party server, no size restriction. Mac to PC, it doesn't matter. SlideDrive works across all platforms."

"In addition to ease of use, those using SlideDrive retain the rights to their work," Nicklas said, unlike what happens when people use cloud services. "They take the rights to anything you put out there on the cloud, and, as an artist myself, I don't want to just give anyone the rights to my work," he said. With government agencies phasing out the use of flash drives and cloud storage, they plan to market the app to governmental agencies, to corporations, and to individuals, Sumra said.

Nathan Pitruzzello

Today they have 19 employees — almost all University of New Haven students opting to defer salary until the product is on the market. They have juggled classes, their own jobs, and working on the app, developing, alpha testing, raising $8,200 in a kickstarter campaign, attaining pre-seed funding, building a website, diving into the New Haven startup scene, and meeting with New Haven Mayor Toni Harp to discuss future office space. As they worked, "We got lots of advice from our professors," Sumra said. "We read on our own about entrepreneurship. We just haven't slept much."

Their immediate goal: to bring SlideDrive to market this year. In five years, they said they hope to have developed at least five to 10 products in the areas of sustainable living and new software.

In October, they were invited to participate in Forbes' Fourth Annual Under 30 Summit in Boston, which Forbes states brings together "6,000 young entrepreneurs and game-changers from around the world, as culled from the Forbes 30 Under 30 lists, as well as a wide range of CEOs, founders, leaders, mentors, investors and disruptors."

Dressed in SlideDrive t-shirts, with lanyards and other branded swag designed by Nicklas, the team made a real impression. "People thought we were sponsoring the event because our name was everywhere," Khashab said.

That same weekend, they got a call from their attorney to say they were officially incorporated. "It was the best moment — so far," Sumra said.

Discovering a New Country and what it Takes to be an Entrepreneur

Hungarian Parliament Building, Budapest

As the ferry floated along the Danube River, all of Budapest opened up before Kevin Rivas: the majestic Parliament building, the old world architecture in silhouette, the cobblestone streets.

So much was new last summer: that view, the parades, songs and merriment that spilled into the streets all over the capital city on St. Stephen's Day, the paprika, liberally sprinkled in so many dishes in Hungary, and the stories his fellow college students from Hungary, Russia, Serbia, Romania, and Italy told about their lives.

Over 10 days, Rivas, a mechanical engineering major, worked on idea generation and product development, collaborating with a team of students in two different business startup competitions. He took part in seminars with founders of successful startups from Central and Eastern Europe, with professors from an array of universities, and a leader from OTP Bank, one of the largest banks in Central and Eastern Europe, all as part of the Mathias Corvinus Collegium-OTP Bank Summer Academy, a deep dive into entrepreneurship and innovation.

But one of the most valuable lessons he left with, he said, was getting to know the people and culture of Hungary, exploring a new city, eyes wide, camera in hand. "It let me see how important it is to travel and to get to know people from different cultures, to talk with them and see them living their lives," Rivas said. "In Hungary, they care deeply about their history and their culture and, at the same time, they are very entrepreneurially focused."

It confirmed for Rivas that he wants "to work in the creative world of research and development in manufacturing engineering," eventually running his own biomedical engineering company, one with a global reach. "I'd like to work to create products that help people," he said.

His other big takeaway? "With the right planning and right drive, anyone can move forward and create their own business," he said. "You can succeed — with a biomedical startup or a nonprofit or developing a new division for a major bank — if you have innovative ideas and do your research. With planning and real initiative, you can make things happen."

The trip capped a summer that centered on innovation. For the first two months, he took part in the Quinnipiac University Center for Innovation and Engineering (QUCIE) Summer Entrepreneurship Academy Internship Program in partnership with New Haven Promise, working on product development. Rivas developed prototypes for a device that relays the UV index of a specific location — at public parks or stadiums — letting people know in real time how quickly they can get sunburned at that locale. It worked so well, he is continuing to work for one of the startups, Vanessa Research Inc., at the Hamden-based incubator, The Garage.

Rivas is a New Haven Promise Scholar, and Patricia Melton, New Haven Promise president, encouraged him to apply for the internship and summer academy. "I am very pleased that Kevin had such a great international experience, where he could learn new perspectives from peers across the globe," Melton said. "I am sure it will help guide him in the future."

Kevin Rivas, Mikhail Anuchkin (Russia), Ramon Brown (Tufts University)

Norman Gray, the Carlton Highsmith Endowed Chair of Innovation and Entrepreneurship at the Center for Innovation and Entrepreneurship at Quinnipiac University, mentored Rivas at the incubator and was a featured lecturer at the academy. Gray said it's important that students are "exposed to global markets, ideas and cultures." "No longer do we live in a society where the product was conceived and manufactured in the same town/city; today, the idea could be generated in Hungary, developed in the U.S.A., made in China, and sold in Europe," he said.

Gray said that successful entrepreneurs work hard, mitigate their risks by doing their research and due diligence," and surround themselves with innovative thinkers. "Kevin is an entrepreneur at heart."

Remembering a Professor Always There for His Students

In Memoriam — Bouzid Aliane

A year ago, Karthikeyan Reddy Thoomu was struggling with his graduate electrical engineering courses. He was close to giving up. "I'd lost hope in my academic career," Thoomu said.

He missed one of Professor Bouzid Aliane's classes, and at the next class, "I could read the disappointment on his face," he said.

Bouzid Aliane

Thoomu stopped in to Aliane's office afterward to talk. Aliane urged him to dig into the rigors of all of his coursework and to never miss a class. Aliane told him by putting in his best possible effort each day, "I will win the battle."

"He inspired me saying, 'Whatever happens in this life you must keep going on. Don't fall back! Keep moving!'" Thoomu said. So he redoubled his effort and everything improved, he said. He'll graduate in May and is planning to pursue a Ph.D. in engineering.

Ali Golbazi, professor and chair of the Department of Electrical and Computer Engineering and Computer Science, and Reddy spoke at a memorial service in October as TCoE faculty, staff, and administrators and the larger University community paid tribute to Aliane, who died earlier this year.

Born in Algeria, Aliane received his undergraduate degree in France and his Ph.D. from Syracuse University. He began his long teaching career at the University of New Haven in 1983. He served as coordinator of the University's graduate program in electrical engineering for more than two decades and was department chair from 2010 to 2012. "He developed and taught a wide range of graduate and undergraduate courses in the electrical engineering program since he joined the University," Golbazi said. "We greatly miss his presence in the department."

Aliane was active across the University, serving on the University Graduate Council and a number of other University committees, and his passion for electrical engineering extended beyond the University. He chaired the Connecticut section of the Institute of Electrical and Electronics Engineers and the Digital Signal Processing Society and the Communications Society.

Thoomu thinks often about Aliane, about the energy he brought to each of his classes and his steadfast belief that he could achieve all he wanted with focused hard work. "He was an outstanding professor, inspiring and motivating students," he said. "I'll never forget how he helped and guided me over the past 12 months, generously sharing his time and experience. He will always be in my heart."

The Connecticut Society of Civil Engineers Honors Gregory Broderick as Educator of the Year

Gregory Broderick

A row of baseball caps from Duke, Michigan, MIT, and Cornell sit along the top shelf of a bookcase in Gregory Broderick's office.

They arrive in the mail from former students. When Broderick, Professor of Civil Engineering, writes recommendations for his students who want to pursue their master's or their doctorates, he asks them, "When you are admitted to the chosen university with support, send me the school's ball cap."

And they do.

Cassandra Champagne '17 mailed a University of Michigan hat to Broderick this fall. She is pursuing her Ph.D. in Civil Engineering in the Geo-environmental Engineering group.

When she thinks of Professor Broderick, she thinks first about the concrete canoe. She was in her first year as president of the University's chapter of the American Society of Civil Engineers (ASCE), and she and her team had worked for months designing and building their entry into the ASCE's Concrete Canoe Regional Competition.

With the conference deadline approaching, "The student chapter ran into some unforeseen problems," she said. It was beginning to look like they weren't going to be able to make it to the conference. "Dr. Broderick worked with us until we had made a realistic plan to overcome the obstacles we were facing," she said. They made it to the competition after all.

She said she applies that push-beyond-the-obstacle approach as well as a healthy skeptic's view to her doctoral studies. "That has proven to be one of the most valuable pieces of advice Dr. Broderick has ever given me," she said. "He used to say in class, 'If you don't retain anything else that you've learned from me in your time here, remember to question everything you are presented with.' This advice has been tremendously helpful as I begin my graduate research. I know that when I read something in a textbook or an academic paper that I need to investigate where the information came from before I can accept it as fact."

Broderick loves seeing his students thrive, whether at an internship, working in industry, or pursuing an advanced degree. "It's the best reward," he said, of a teaching career that has spanned three decades at the University. In fall 2017, the Connecticut Society of Civil Engineers honored Broderick with its Educator of the Year Award.

Research and Teaching Utterly Entwined — Faculty Spotlight: Can "Jon" Aktas

Can "Jon" Aktas

Research can be thrilling and challenging all at once. A promising idea can suddenly lead to a dead end requiring forging on toward a new path. There are deadlines to meet, papers to write. But Daniel Perrucci '17 says Professor Can "Jon" Aktas has the uncanny ability to "simplify the daunting world of research, so that students similar to me at the University of New Haven could excel."

From the start, when Perrucci took the Global Solutions for Sustainability course and learned about natural disaster response, he wanted to know more. He went on to research with Aktas, laying the groundwork for the research he is currently conducting as he pursues his Ph.D. at Vanderbilt University. "If it was not for Dr. Aktas, my path to where I am today would not have existed," Perrucci said.

Perrucci's current research work includes statistical modeling of natural disaster severity, location, and the expected displaced people. "Once this study is completed, it will be aimed towards reducing loss of life during natural disasters, enhanced protection of social, physical, and emotional needs of the affected population, and reduction in overall expense from natural disasters," Perrucci said.

For Aktas, teaching and research are completely entwined. Any given semester, he has as many as a dozen students conducting research. In the summer of 2016, he took six students to two conferences in Arizona where they presented their work which was later published. "There are multiple benefits to doing research," Aktas said. "Professionally, it puts them a step ahead, and it's a golden opportunity to tell a supervisor at a company or a professor that they've taken this initiative and achieved something."

While about 80 percent of his research students are undergraduates, he also works with graduate students. Angelica Quintero worked as a civil engineer for three years before coming to the University to pursue her master's in Environmental Engineering with a concentration in water and wastewater treatment.

Her research centers on the study of severe storm event implications for water infrastructure in coastal Connecticut. She was invited to present a poster at the American Water Works Association (AWWA) Water Quality and Technology 2017 Conference in Portland, Oregon in November and to submit her paper to the *AWWA Journal*. She said Aktas worked to find a project that would align with her career path and allow her to develop models using software popular in the water resources industry. Quintero said her research work has given her a new set of skills she will apply to her new position at WSP, the global engineering firm, where she'll return next year after completing her master's. "Professor Aktas is an eager researcher and mentor," she said. "He wants his students to succeed in their area of expertise and passion."

Creating a New Course

At the same time, Aktas is developing a new course that will blend the Global Solutions for Sustainability course with the Professional Engineering Seminar course, creating "Sustainability, Ethics and Professional Issues" for engineering majors. They are discussing also keeping a sustainability course as students from all academic departments show interest. "Sustainability is an issue that many students care deeply about," he said.

Aktas is also at work on his own research, though he quips that his papers have almost been calling him lately saying, "What about us?" "I have multiple papers saved on my desktop that I am working on and that need my attention," he said.

It makes for a very busy life. But Aktas said he wouldn't have it any other way.

One of his projects takes a close look at hospitals and health care centers that are certified green, looking closely at patient health outcomes. He is studying whether a building filled with windows, ambient light, healing gardens, and green areas patients can spend time in improve a patient's health and well-being. He is comparing green hospitals with traditional hospitals.

"More natural light and access to gardens and plants are known to have positive impacts on health. But as an engineer, I want to be able to measure these outcomes," he said. "I want to see if we can prove quantitatively whether there is a benefit. If there is, then we can make a policy push that this be incorporated in hospitals, but if it doesn't, then we have to look more closely at the strategy."

When he was an undergraduate, following a traditional course of study in civil engineering at Middle East Technical University in Turkey, he was very interested in environmental issues and the resiliency of buildings and water systems. But he didn't have the opportunity to do research as an undergrad. "I would have loved it," he said.

After earning his master's in Turkey, he was planning to pursue a traditional civil engineering doctoral degree at the University of Pittsburgh when the university created a doctoral program in Sustainability and Green Design. Aktas was the first to receive a Ph.D. in the program in 2011. He taught at Robert Morris University and was drawn to the University of New Haven after speaking with then-new Dean Ron Harichandran. "He planned to embed sustainability studies and an environmental focus in engineering courses, and I knew I wanted to be a part of that," said Aktas, who coordinates the Sustainability Studies program.

Looking Closely at the Natural World

Just as he did when he was younger, he spends a lot of time out in cities and in the natural world, on the shore, in parks, looking at the environmental impact of structures. When he looks at buildings, shorelines, at city sewer or water systems, at any engineering plan, he wonders first about its resiliency. Can it stand up to a changing climate, to changing rainfall patterns and battering winds?

"By the time our students graduate, they are very good at designing buildings and infrastructures like municipal water systems, bridges, interstates," Aktas said. "But they aren't building these structures in outer space; they're being built on land, and so the structures are susceptible to certain environmental impacts. So, for example, as rainfall patterns change, storm water systems must be designed accordingly. If you don't take that into account, your system will fail, which will lead to flooding in urban environments."

He uses Superstorm Sandy as an example. "It devastated certain coastal communities, and rebuilding efforts focus on making structures more resilient," he said. "I teach my students that you aren't designing for today; you're designing with the future in mind, for a building that will be used for decades, maybe 100 years, in a changing world."

Rebecca Andreucci, who conducts land use and transportation planning across a 15-town region for the South Central Regional Council of Governments, worked with Aktas on her Summer Undergraduate Research Fellowship (SURF) in her sophomore year, again on a research fellowship in her junior year, and on her Honors Thesis and Senior Design Project in 2016.

"He always encouraged me to take my work further than I otherwise would," Andreucci said. "Under his advisement, a research paper was more than an opportunity for a good grade; it was a chance to take my work to a professional audience at academic conferences."

She presented her research on the vulnerability of coastal Connecticut to sea level rise at an academic conference in Arizona. After graduation, she and Aktas continued to tweak the paper, and it was accepted into the *Civil Engineering and Environmental Systems Journal*. Today, she said, she uses so much of what she learned from him as she works on "projects related to coastal resilience, climate change, agriculture, sustainable transportation, land use, and open space planning."

Aktas likes knowing that the next generation of civil and environmental engineers he and his colleagues are teaching will be in great demand as it is such a fast-growing field, "and there is so much work to be done."

Nancy Ortins Savage Named TCoE Associate Dean

Nancy Ortins Savage

The teaching experience on the resumé said chemistry. Her degrees? In chemistry. But when Nancy Savage met with the search committee of the Department of Chemistry and Chemical Engineering back in 2005, she talked about how much she enjoyed collaborating with the material science and engineering faculty while pursuing her Ph.D. at The Ohio State University.

She also spoke about her work with the engineers when she was a National Research Council postdoctoral fellow at the National Institute of Standards and Technology in Maryland, integrating sol-gel materials with micro-machined sensing platforms. She liked looking at research through an applied chemistry lens.

"When I had finished my talk, a couple of the chemical engineering faculty said, 'If we didn't know any better, we would have thought you were a chemical engineer,'" she chuckled.

She was immediately sold on the College. "I knew the unique arrangement of a Chemistry/Chemical Engineering joint department would provide the possibility to do exciting things because of the access to engineers and engineering thinkers," she said. "In a pure science program, that would have been more challenging." The College, in turn, was sold on her as she was hired as an Assistant Professor.

Perhaps then it comes as no surprise that, 12 years after landing that job, Savage has been named the TCoE's Associate Dean.

"Nancy has great organizational, communication, time management, and people skills that make her an effective Associate Dean," Dean Ron Harichandran said. "She is also personable and effective in talking about our various programs to potential students and parents, in resolving difficulties current students have, and in representing the College to internal and external audiences."

Just as she's always had an affinity for the melding of chemistry and chemical engineering, she also has long been interested in the administrative side of a university. She led the Chemistry program through the American Chemical Society approval process, "coordinating everything, making sure all the boxes were checked, and rallying the troops to help when needed. It gave me an opportunity to really think about the direction of the program."

Promoted to Associate Professor in 2011 and Professor in 2017, she has served as TCoE Assistant Dean, blending that with her teaching, her research, and mentoring students from Chemistry and Chemical Engineering on their research projects.

Mike Ambrose — Friend and Champion of the TCoE — Named Vice President of Engineering and Technology at Sikorsky Aircraft

Mike Ambrose

Mike Ambrose was close to not finishing college. A runner and an artist who loved math, he'd been encouraged by his guidance counselor to become an engineer. But during his first year at a college, "I'd run out of money. I was going to get a job, and that's when the track coach at the University of New Haven reached out to me and offered me a partial scholarship," Ambrose said.

As Ambrose was blazing along the track and footpaths and city streets, he was also tearing it up in the classrooms. By his second semester, the University offered him a combined academic and athletic scholarship, a full ride. He would go on to be inducted into the University of New Haven Athletic Hall of Fame for Track and Cross Country and later into the University's Engineering Hall of Fame.

"The University of New Haven played a big role, allowing me to go to college and helping me to be an engineer and a runner at the same time. It was very personal; they worked my schedule to accommodate both," he said. "I had to overcome a lot of obstacles and had such a great support network of people who really wanted me to be successful. I saw the importance of perseverance and teamwork. I know how important it is to have confidence in yourself and in the team around you. That still guides my leadership style today."

In December 2017, Ambrose took over as Vice President of Engineering and Technology at Sikorsky Aircraft, overseeing the work of more than 3,500 engineers as the company integrates with Lockheed Martin and innovates the next generation of aircraft and services. "It's a time of transition as we are now part of Lockheed Martin, which is very exciting in terms of future synergies," Ambrose said. "I really want to continue to make Sikorsky an attractive place to work, as competition for talent is as fierce as ever. We have great products and we work for a great corporation and I want to be the champion for all of that."

His focus: "Making sure we perform at the highest level so we execute our commitments so we are in a position for future growth and developing leaders, developing technically strong engineers so we can continually get better."

He is excited to be developing engineers at a time of such great change. "Back when I was starting out, you wanted to be the best mechanical engineer you could be and the same was true for an electrical engineer, but today the lines are blurry with data and artificial intelligence, with cybersecurity and electro-mechanical interfaces," Ambrose said. "You can't be one type of engineer anymore. You really have to understand every type of engineering."

He said the TCoE prepares its engineering students well for this. "The University of New Haven has always had a culture of hands-on learning, and I always like the engineering students. They're practical. They tend to be quick studies, and what is different today is just how tech savvy they are. The University has done a great job teaching students. It isn't enough to be a mechanical engineer; you have to understand how a mechanical system interfaces with other systems and understand the business aspects of engineering. I see that in University of New Haven students today."

Ambrose's 33-year career at Sikorsky began after he graduated from the University in 1984. He has been a Chief System Engineer for the UH-60M Black Hawk and was part of the original design team for the S-92 aircraft in 2000. Ambrose was part of the S-92 development team that was awarded the American Helicopter Society's 2000 Gruppo Agusta International Fellowship Award. That same year, he earned his MS from the Massachusetts Institute of Technology.

He's worked in "operations, programs, and new business" before moving back to engineering where he was Vice President of Aircraft Design & Manufacturing Engineering and then Vice President of Aircraft Design and Manufacturing Engineering. "One of the opportunities of working at Sikorsky is that the work you do on a project can last for generations. It isn't like you design something today and in two to three years, it's obsolete," Ambrose said. "Some of the things we designed when I was a younger engineer, those aircraft are flying today, still saving lives, still performing missions."

"I think one of the things that makes working at our company more than just a job is when I hear stories of how our products saved lives and I see in that person's eyes how it affected their lives and their family's lives," he added. "Our work is influencing the world in a very positive way. That's part of our DNA."

His work takes him around the globe, with frequent trips to Poland, and during his trips he taught himself Polish. About seven years ago, he started reading poetry and especially liked the poems of Robert Frost and Wallace Stevens, the Pulitzer Prize-winning poet who blended writing with a longtime career as an insurance executive. Soon, Ambrose was writing poems; he's since had 30 poems published in national and regional magazines and journals and published a book, *And on the Fourth Day*, with all proceeds going to charity.

"I'm always trying to learn and be better, and I think you need to have a balance in life," he said. "I started writing to have better insight into myself and the world."

He encourages the engineers who work for him to delve into their own creative interests. "Innovation often comes from seeing the world differently or seeing things differently than you did before," he said.

A recipient of the 2016 TCoE Distinguished Lifetime Alumni Award, Ambrose is a member of the University's Board of Governors and has long played an active role in the TCoE. "He is a steadfast champion and friend of the College and has promoted opportunities at Sikorsky for our students," Dean Ron Harichandran said. "Sikorsky has been one of the College's long-term partners, Mike has been instrumental in keeping this relationship strong, and the University is proud that one of its alumni has attained such a prominent position at the company," he added.

The University's support made a lasting impression on Ambrose. "The University of New Haven made a difference in my life at a time when I really needed it," Ambrose said. "I knew as a young man that when I had the chance to give back to the University, I would."

Leaders of Prominent Companies Named to TCoE Advisory Board

Dean Ron Harichandran is pleased to announce that Raphael Crawford, Samuel Reid Hanford, and William A. Welsh were named to the TCoE Professional Advisory Board in the fall.

Harichandran said Crawford, Hanford, and Welsh bring new energy, diversity, and partnerships to the College. "The Board provides valuable feedback that helps us ensure that we are educating students in our various programs to meet industry hiring needs," Harichandran said. "Board members also provide support to the College in a variety of ways, including the sponsorship of senior design projects, internships, and philanthropy."

Crawford, who received his master's degree in Finance from the University, has had a swift rise at Albemarle, the global specialty chemicals company. He joined Albemarle in 2012 as Vice President for the company's Performance Catalyst Solutions division. In 2015, he was named President of Albemarle's Bromine Specialties global business unit and member of the Executive Leadership Team as well as a board director for the Jordan Bromine Company, a joint venture between Albemarle and the Arab Potash Company in the Kingdom of Jordan. Crawford, who is fluent in Spanish and German, has a degree in Economics from Wesleyan University and maintains professional certifications in Management Accounting and Financial Management by the Institute of Management Accountants.

Raphael Crawford

Samuel Reid Hanford, BS '82 started his career as a Project Engineer in the Electro-Fluidic Systems Division at The Lee Company of Westbrook and Essex 35 years ago. Four years later, he was the Engineering Group Leader of that division. Today, as Vice President of the Scientific Products Group, Hanford manages 110 employees and $32 million in sales, focusing on the design and manufacture of valves, pumps, and systems, primarily to diagnostic instrument manufacturers. He is a licensed Professional Engineer in the State of Connecticut. He received his associate degree in Mechanical Engineering Technology from Thames Valley State Technical College, in Norwich, Connecticut in 1977, his MS from Rensselaer Polytechnic Institute, and an Executive Certificate in Technology, Operations, and Value Chain Management at the Sloan School of Management, Massachusetts Institute of Technology. He was awarded a patent with two co-applicants for the Fluid Metering Pump. He's been published by the ASME and been a speaker on a variety of subjects.

Samuel Reid Hanford

William A. Welsh's career with Sikorsky spans 36 years. He is currently the Sikorsky Dynamics Technical Fellow and is a Technical Fellow of the American Helicopter Society. He holds 24 patents and has done groundbreaking work in active vibration and noise reduction, aeroelastic stability, and vibration analysis. He was instrumental in incorporating active vibration control on all of Sikorsky's current military and civil helicopters. He invented the Hub Mounted Vibration Suppressor which recently completed a successful flight test at Ft. Eustis, receiving the AHS Bell Award in 2015. As chief of the Dynamics and Internal Acoustics group for 10 years, he participated in the development of active noise and vibration control systems to reduce cabin noise on Sikorsky helicopters. Welsh has worked with the College's Senior Design course for eight years. He received his M.S. in Mechanical Engineering from Cornell University, his B.S. Mechanical Engineering from SUNY, Buffalo, and an A.A.S. Engineering Sciences from SUNY, Alfred Technical College.

William A. Welsh

To learn more about the University of New Haven, please contact:

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