

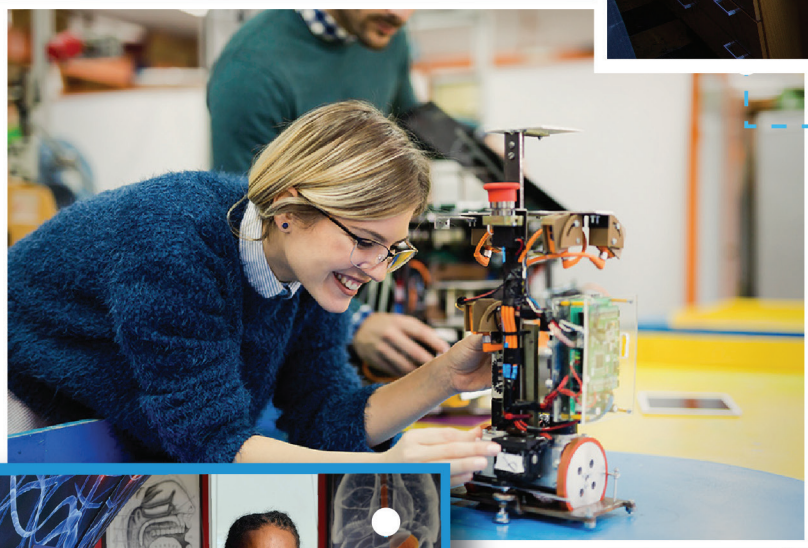
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FALL 2018

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Quarterly Publication of the Engineers' Society of Western Pennsylvania

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Pittsburgh ENGINEER

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In this Issue...

GUEST EDITOR COLUMNS:

- 4 James H. Garrett, Jr., P.E., Ph.D., Dean, College of Engineering
- 5 Arif Sirinterlikci, Ph.D., CMfgE ssociate Dean for Research and Outreach, School of Engineering, Mathematics, and Science
- 6 Gregg Johnson, Ph.D., Chair of the Natural Sciences, Engineering and Technology Department

FEATURED ARTICLES:

- 8 Conceptualizing Emerging Health Technologies: A Case for Humanistic Engineering, Woodrow W. Winchester, III, PhD, CPEM
- 10 Designing the City of the Future, Madelyn Dinnerstein
- 14 Recollections from a Summer Student Internship, Haley Caretti
- 17 Closing The Gap Between Men and Women in STEM

UNIVERSITY UPDATES:

- 15 Carnegie Mellon University
- 19 Point Park University
- 20 Seton Hill University
- 21 Grove City College



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Guest Editor Column

Engineering Education at Carnegie Mellon University

James H. Garrett, Jr., P.E., Ph.D.
Dean, College of Engineering

Every day when I watch the news, I am compelled to think about the relevance of the College of Engineering. From the livability of modern cities to the health of our planet, we can't afford to ignore the challenges facing modern society and why would we want to? Much is to be gained through innovations in technology and informed policy making.

Through fundamental research and government funding (which is woefully shrinking), universities have literally founded industries. A prime example is the one that grew up in our backyard—the autonomous vehicle (AV) industry. The self-driving car technologies that have transferred out of Carnegie Mellon University (CMU) since the mid 1980s have lured both startups and long-established companies to the region, and now Pittsburgh is a hub for AV innovation.

The self-driving car phenomenon epitomizes what can happen when industry, academia, and government collaborate. As a result of this synergy, jobs will be created, a new labor force will be trained, and perhaps, most profoundly, fewer people will die in auto accidents. The AV revolution is exciting, and in a similar vein, I anticipate sweeping transformations in fields such as advanced manufacturing and biomedical technology. These areas align with CMU's research and education strengths, and the implications of our work will seep into daily life in ways we now only imagine.

The world is rife with increasingly complex problems—there is no simple issue anymore. We see that. By trade, engineers are problem solvers, and the faculty and students in the College of Engineering have long focused on developing practical solutions to complex problems. Tough problems require an array of knowledge and experience, and we have grown adept at capitalizing on our connectedness, bringing together internal and external collaborators. We designate our approach “Advanced Collaboration,” which is deeply native to CMU and the people who work and learn here.

An example of advanced collaborative practices driving breakthroughs is a project between the Pittsburgh Penguins, the advanced materials giant Covestro, and CMU students. The initiative, called “Rethink the Rink,” aims to make hockey safer by developing materials solutions that enhance hockey safety without compromising game performance. The students were directed to devise boards that made the rink safer while maintaining pace of play, which is no easy feat. Therefore, 25 students from every engineering major and several science fields formed five multi-disciplinary teams, ranging from freshman to Ph.D. candidates, that each developed a unique new design and prototyped their solution.

Another collaboration that connects CMU to industry is our partnership with ANSYS, a global leader in engineering simulation. The company generously funded a new building on campus in which experts and undergraduate students—or experts-to-be, as I like to think of them—will use cutting-edge computational and prototyping tools that inspire innovation and creative problem solving, thus setting a new standard for engineering education and industrial innovation. Professionals from ANSYS will be resident

in the building to collaborate with the students with the goal of taking the projects to a higher level of outcome.

We don't develop technology for technology's sake, instead we think about its implications for society. Here again, the College of Engineering is flexing its collaborative prowess by developing mutually beneficial relationships with government entities and influencers.



On the local front, CMU engineers along with the City of Pittsburgh, Allegheny County and others are reshaping urban areas to create connected, intelligent communities called Smart Cities. CMU's Metro21: Smart Cities Institute takes a forward-looking, creative approach to bringing people, technology and policy together to improve the quality of life for citizens. CMU and key partners are researching, developing, and deploying smart city solutions. We are testing the viability and scalability of novel technologies throughout a “real world” laboratory, the city of Pittsburgh. Our work will redefine city systems—infrastructure, water, climate change and environment, and transportation and mobility—in our region and beyond.

The College of Engineering is recognized worldwide for its pioneering research and highly trained students. We know how to solve problems by accelerating our collaborative practices and culture, and we are fortunate to have opportunities to deploy and test our work with great industry and government partners. What we do in Pittsburgh matters because the innovations founded here will benefit people globally and change the future that we will all thrive in.

James H. Garrett, Jr. was appointed Dean of the College of Engineering at Carnegie Mellon University in 2013. He also holds the Thomas Lord Professorship of Civil and Environmental Engineering. Prior to becoming Dean, Garrett was Head of Carnegie Mellon's Department of Civil and Environmental Engineering from June 2006 to December 2012. Garrett is a licensed professional engineer in Texas. He is a founding co-director of the Smart Infrastructure Institute.

Garrett served as Co-Chief Editor of the ASCE Journal of Computing in Civil Engineering from 2008-2013. Garrett's research and teaching interests are oriented toward applications of sensors and sensor systems to civil infrastructure condition assessment; application of data mining and machine learning techniques for infrastructure management problems in civil and environmental engineering; mobile hardware/software systems for field applications; representations and processing strategies to support the usage of engineering codes, standards, and specifications; knowledge-based decision support systems. Garrett has published over 250 journal articles, conference papers, and monograph/book chapters related to his research.

Guest Editor Column

Engineering Education at Robert Morris University

Arif Sirinterlikci, Ph.D., CMfgE
Associate Dean for Research and Outreach
School of Engineering, Mathematics, and Science

It has been only nineteen years since the first Bachelor's degree in Engineering was inaugurated at Robert Morris University (RMU) under then newly formed School of Engineering, Mathematics, and Science (SEMS) by its Founding Dean Dr. Yildirim Omurtag. The school graduated its first class in 2003 and received its initial ABET (Accreditation Board for Engineering and Technology) from the Engineering Accreditation Commission (EAC) soon after. Over its brief history, RMU Engineering offerings have expanded to two BS degrees (Engineering with the concentrations of Biomedical, Industrial, Mechanical, and Software, and Manufacturing Engineering) and an MS degree in Engineering Management including a Fully-Online program while its mission remained constant. Graduating engineers with progressive education responsive to major industry needs, providing a hands-on, problem- and project-based learning experience for developing technical competencies complemented by strong business and communication skills are the core factors of the RMU Engineering mission. RMU's BS Manufacturing Engineering program has been the only ABET accredited Manufacturing Engineering program in the Commonwealth of PA and one of the twenty-two such programs in the U.S. The expansion of the RMU programs was followed by a strong enrollment growth and RMU Engineering continues to place its graduates to regional, national, and international positions at very high rates within 3-4 months of graduation. Growing number of alumni are also continuing their education at RMU and other reputable universities, earning prestigious scholarships and fellowships from their respective schools or entities like Department of Defense (DOD), National Science Foundation (NSF).

Every RMU student has to complete at least a 150-hour internship at an industrial company or at an external research center. Now, there is an internal research thesis course offered due to growing research needs of faculty and students as an alternative to the internship course. The final course requirement for this newly design course is to submit a good quality scholarly work to a conference, scientific or trade journal. The number of provisional patents earned by RMU students are also growing, and a start-up company was also formed and more are in the works. RMU students also engage in professional activities through student chapters of: American Society of Mechanical Engineers (ASME), Biomedical Engineering Society (BMES), Engineers for the Sustainable World (ESW), Engineers for A Sustainable World (ESW), Mechanical Contractors Association of America (MCAA) National Society of Black Engineers (NSBE), Society of Automotive Engi-

neers (SAE), Society of Women Engineers (SWE), and through clubs like Mechatronics Club. RMU students have successfully competed in multiple competitions over the years and won Mascaro Center's Sustainable Innovation Design Competition, Business Strategy Games Competition, and SAP's Utility of Tomorrow Contest. There are also multiple ways RMU students can develop an understanding of Global Engineering including a semester visit to a partnering institution overseas or after finishing their Spring Semesters, spending two weeks while engaging in industrial and research site visits in countries like Germany, Scotland or Mexico through the RMU Faculty Lead Excursion Abroad (FLEAP) Program.

Under the leadership of Dr. Maria Kalevitch (Dean of SEMS since 2009), RMU Engineering has been thriving and continues to offer its students a hands-on learning experience complemented by business and soft skills development as they continuously progress to help meet needs of major industries.



Arif Sirinterlikci, Ph.D., CMfgE

Arif Sirinterlikci holds BS and MS degrees both, in Mechanical Engineering from Istanbul Technical University (Turkey) and a Ph.D. in Industrial and Systems Engineering from the Ohio State University. He is also a Certified Manufacturing Engineer (CMfgE). He is the recent past Head of Robert Morris University (RMU) Engineering and currently serves as the Associate Dean for Research and Outreach at the RMU School of Engineering, Mathematics, and Science. He had served as an officer of the American Society for Engineering Education (ASEE) Manufacturing Division in the years of 2003-2011 including its Chair as well as Society of Manufacturing Engineers (SME) Journals and Manufacturing Education and Research (MER) Community Steering Committee Member. His interests lie in Reverse Engineering, 3D Printing/Additive Manufacturing, Medical Manufacturing, Industrial Automation/Robotics, and Entertainment

Guest Editor Column

Engineering Education at Point Park University

Gregg Johnson, Ph.D.

Chair of the Natural Sciences, Engineering and Technology Department

Engineering programs are not typically housed within liberal arts campuses. Perhaps more typically, a liberal arts university would have science majors and potentially a 3-2 program that would help aspiring engineers transfer into a larger, nearby university offering engineering degrees. Pennsylvania contains a handful of exceptions to this rule including Bucknell University, Lafayette College, Swarthmore College, Grove City College and Point Park University. Each university or college likely has a unique story regarding how their institutions came to have engineering or engineering technology departments. At Point Park, the net result of the liberal arts focus is a healthy dose of core curriculum credits, forcing a tight squeezing of the engineering curricula into four-year sequences. A constant battle to keep degree credit totals to a reasonable level, while providing the necessary engineering coursework, wages on. For many reasons, I believe this tension and struggle to be a very healthy one and worth the fight. After all, the goal of the liberal arts school is to produce well-rounded individuals trained how to think (not what to think), strong on communication and soft skills. What qualities could better complement an engineering education?

Based on my own experiences and observations working in industry and the defense department for nearly two decades, the engineers who rise through the ranks the fastest tend to be those with the best non-technical skills. The technical skills are there too, of course, but the combination of a highly capable engineer with polished soft skills is unbeatable. As I look at our core curriculum that all Point Park students must take, among others, there are two courses in the category of Understanding People, two courses in Exploring the World, one in Succeeding in Business and of course a heavy dose of oral and written communications. To an engineer, understanding people means being able to understand your customer. Understand his or her point of view; understand how to communicate with your customer, your colleagues, your boss, your executive team. Most importantly, many of these individuals may not have a technical background at all – if you can't get through to them, you're in trouble. If you truly understand people – and realize that that is a lifetime goal to constantly work at, not a credential – then you're ahead of the game. A few years into a career it can become even more critical, certainly those engineers who get promoted into first or second-line engineering management positions could attest – working with people isn't just part of the job, it IS the job.

Courses in the Exploring the World category are those classes that explore other cultures, and from the engineer's perspective, feeds into and significantly broadens the same concept of understanding people. In my own experience, I was in the working world for less than a year before I found myself on more than one overseas assignments. Not many of today's engineering students will have a career that does not come into contact cultures quite different from their own. Business deals and engineering contracts can be instantly jeopardized by unwitting cultural faux pas, so figuring it out on the fly could be a costly approach. It is simply es-

sential that today's engineers have an appreciation of the sometimes vast differences that exist from culture to culture.

What is clearer today than in the past is that technology development is leading us head-on into major societal impacts that are inevitable, predictable, and yet unknown in their scale. For example, artificial intelligence, so-called killer-robots (yes, that's a thing), and autonomous driving, among many others, are all developments that will spring onto the scene in the near future. Yet unlike in the case with social media—which took much of the world by surprise in the scale of its impact on so many aspects of daily life—the effects of coming technology are at least being discussed and debated ahead of time while the development careens ahead. Young engineers entering these fields need to not only be aware of the debates, but be active in them, and lead them when necessary. To do so, they will need to be well-equipped to converse with experts in ethics, psychology, sociology, philosophy, politics, and a host of other areas. In other words, they should be—to repeat the phrase most heard when talking about liberal arts schools—well rounded.

Not all of our students sought out Point Park University's engineering and engineering technology programs because the school is a liberal arts school, but in the end I believe most of them have a firm appreciation for what that means and how it complements their technical education. As an advisor, I tell the skeptical student that you will get out of your liberal arts education what you put in. You have the opportunity to broaden and open your mind to so many things, and it's not a series of boxes that need to be checked on the way to earning your engineering degree, it is a means of enhancing your degree, bringing something a little extra to the table, and very likely leading to a more satisfying and successful career.

Gregg Johnson is the chair of the Natural Sciences, Engineering and Technology department at Point Park University. He earned his bachelor's degree in physics from Gustavus Adolphus College, a small liberal arts college in Minnesota. He went on to get his Ph.D. in physics from Ohio University in 1995. He worked for the Department of Defense at the Naval Research Lab in Washington D.C., followed by stints as engineering director at two successful D.C.-area start-up companies, one telecom focused and the other defense focused. He joined Cisco Systems in Atlanta as a hardware engineering director and after six years decided to give academia a shot, joining the faculty of Point Park University in 2012.



Gregg Johnson, Ph.D.

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Conceptualizing Emerging Health Technologies: A CASE FOR HUMANISTIC ENGINEERING

Woodrow W. Winchester, III, PhD, CPEM

The healthcare industry is witnessing considerable growth within Western Pennsylvania. Engineering, as both a profession and discipline, holds great promise in advancing this progression particularly in the emerging health technologies space. While advances are being made, this promise is not without its methodological challenges.

With personal health care technologies, in particular, integrating wearable sensors, artificial intelligence (AI), and the Internet of Things (IoT) as illustrated in the efforts by Pittsburgh start-up Behavior in addressing the opioid crisis, social, cultural, and ethical considerations are becoming increasingly important in both framing and driving the design, development, and deployment of these technologies. The methodological challenges are in integrating within the practices and processes of engineering the means by which to uncover and address these salient contextual factors.

“As we look to a future that will be heavily influenced, if not largely determined, by technology, including autonomous systems, big-data analytics, and artificial intelligence. The need to understand the human dimensions and impacts of those advances, as well as the basis for making many of the ethical decisions that should guide their use, has never been greater.” states Thomas Burish, Provost at the University of Notre Dame, in a recent article in the Chronicle of Higher Education. As such, more humanistic engineering approaches are needed. Approaches that, ultimately, embed within the engineering ethos the more explicit consideration of broader contextual factors within technical decision making.

Responding to this call, Robert Morris University (RMU) engineering professors, Woodrow W. Winchester, III, Jameela Al-Jaroodi, and Rika Wright Carlsen are exploring the use of speculative design (conceptual design as a tool to speculate about possible technological futures) engaged through Afrofuturism (viewing those possible futures through a Black cultural lens) in re-imagining connected fitness technologies (e.g. Fitbit devices) for Black/African-American women, for whom considerable health disparities exist. Prompted by research that suggests that the potential of these personal health technologies in increasing physical activity (PA) levels is often curtailed by their lack of social and cultural (i.e. socio-cultural) relevancy to a more diverse user base, the team collaborated with Pittsburgh artist Marcel L. Walker to begin to answer the research question, “if future designs of these personal health technologies were centered on the Black/African-American women user; could their potential in increasing PA be realized for this group?”

Inspired by a core tenet of Afrofuturism, collectivism, and the Afrofuturistic imagery of the warriors of the Dora Milaje—Wakanda’s Special Forces, as depicted and featured in Marvel’s film Black Panther, the team translated pertinent socio-cultural factors

into several future concepts. Figure 1 offers one of the envisioned speculative concepts.

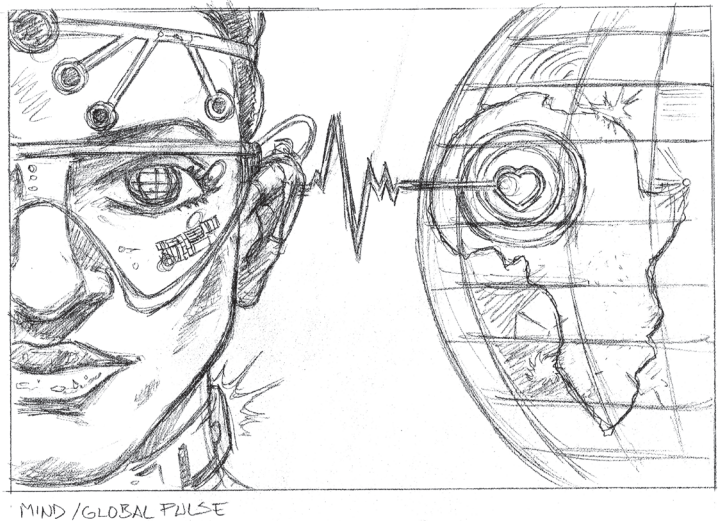


Figure 1: Global pulse connected fitness concept

From an interface and interaction design perspective, in particular, this concept conveys an importance of community and the value of connecting to a greater Black collective in contextualizing and motivating increased individual physical activity levels. While it is not the intent that the depicted concept be implemented as conceptualized; it is the intent that this speculative concept provokes and triggers a more holistic conversation about both user and context of use in the design and engineering of more socio-culturally responsive connected fitness device technologies.

As the healthcare industry within Western Pennsylvania region grows in prominence particularly within the emerging personal health technologies space, the development and use of these more humanistic engineering methodologies is critical. This will both support the design of more socially robust and responsible technologies and, with this greater attention to broader contextual factors, a diversification of design concepts can be afforded; facilitating increased Regional technological novelty and innovation.

Woodrow W. Winchester, III, PhD, CPEM is an Associate Professor of Engineering Management and Coordinator of Graduate Engineering Programming at Robert Morris University in Moon Township, PA

Learn more at <http://www.behavior.com/> and <https://www.wired.com.com/2014/11/where-fitness-trackers-fail/>

*Technology is not neutral. The choices
that get made in building technology
then have social ramifications*

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Designing THE CITY OF THE FUTURE

By: Madelyn Dinnerstein
Senior Manager for Marketing, Public Relations, and Social Media

Imagine having the chance to build a city from the ground up. Middle schoolers do that every year and learn about engineering at the same time by participating in the Pittsburgh Regional Future City Competition.

Carnegie Science Center and the Engineers' Society of Western Pennsylvania (ESWP), the event's Platinum Sponsor, are gearing up for the competition's 20th year and recruiting this year's engineering mentors. The 2019 regional competition is scheduled for January 19 at Carnegie Science Center. As in previous years, the team that wins the regional competition will advance to the international competition in Washington, D.C.

Carl W. Schwartz, Executive Director of the regional competition and a past ESWP President, said the society got involved because Future City is a great way to promote the engineering profession and for local engineers to help middle schoolers understand what engineers do every day to improve the quality of life for people all over the world. "ESWP mentors also share their real-life experience with engineering as a profession and inspire middle school students to learn more about engineering and science," said Schwartz, who has worked for Westinghouse for more than 30 years.

The Future City Competition aims to foster interest in math, science, and engineering in sixth- through eighth-graders, who showcase their vision of a city design using SimCity™ software, an essay, a scale model, a project plan, and a presentation. Each year, Future City challenges middle schoolers to investigate and design solutions to a specific issue. For the upcoming Competition, students will respond to the issue of "Powering Our Future" by designing innovative power grids for their cities that can withstand and quickly recover from the impacts of a natural disaster.



The presenters for the team from The Ellis School in Pittsburgh show off their model during the 2018 Pittsburgh Regional Future City Competition. The team won first place and advanced to the international competition.

*Students see how STEM
relates to challenges that
residents of actual cities all
over the world*

Lorren Kezmoh, a STEM (science, technology, engineering, and math) Programs Coordinator for Carnegie Science Center and Future City Competition Regional Coordinator, said the competition gives students the opportunity to utilize STEM skills, such as problem solving, data-driven decision making, critical thinking, teamwork, and creativity in a novel way. They also learn about the scientific method, artistic expression, and how to incorporate all that they've learned into their final design, she said.

"Students not only use these skills to solve real problems when they work on this project, they see how STEM relates to challenges that residents of actual cities all over the world encounter every day, such as obtaining affordable housing, managing utilities, and accessing transportation," said Kezmoh, who participated in the competition herself when she was in middle school. "Adults are often quite surprised by how creative and innovative the students' solutions are."

The challenge for the 2018 competition was “The Age-Friendly City.” Last January, teams from 29 schools showed off their models and gave presentations before judges about every aspect of life in their cities. Toy blocks, repurposed water bottles, oatmeal containers, and yogurt cups – often colorfully painted – became houses, schools, and hospitals for the city models. Some models had flashing lights, and one even had a working waterfall.

Karen Compton, the teacher who worked with the 2018 first-place team from The Ellis School in Pittsburgh, said what students gain from participating in the program is immeasurable. “I think the main thing is that they become much stronger citizens. They have a much more thorough understanding of how a city operates and all the components that go into running a successful city,” said Compton, who teaches science. “They know that you have to balance the needs of so many different groups – citizens of all ages, businesses, government, environmental issues, industry. You can’t ignore any segment, or your city could fall apart.” One of the key takeaways, she said, is that students learn about the importance of being able to compromise, something that challenges adults, too.

John Wojtyna, a civil engineer, was the engineering mentor for the Ellis team, which went on to the international Future City Competition in Washington in February, 2018 and won the special award for Most Sustainable Buildings. He said he gave students guidance on gathering and managing resources and how the many systems in a city are connected. “I got involved because it is so fascinating to see how young minds work to pull together and create fascinating futuristic cities of tomorrow,” he said.

The Ellis School’s entry was a reimagining of Oslo, Norway, decades in the future and renamed Idunn Eir after the Norse gods of youth and the elderly. The city, powered through a combination of solar panels, tidal sails, and a geothermal plant, featured multi-generational complexes where senior citizens could live together with other residents to reduce their potential social isolation.

Compton said her students held a recycling drive to collect the medicine containers, straws, and plastic lids they used to make the buildings in their model.

Monica Supanik, the teacher for the 2018 team from Warwood Middle School in Wheeling, WV, said the regional competition was an incredible experience for her students, some of whom were new to academic contests.

The team won the special award for Most Effective Homeland Security in the regional competition. “We lost kids and gained kids. Two young ladies who were not originally in Future City were the driving force,” Supanik said. “In the last two days before the competition, they owned their presentation and were beaming with confidence. The transformation I saw in each of our presenters was absolutely my favorite part of this journey.”

Shell and LGA Partners are 2018 Gold Sponsors for the Pittsburgh Regional Future City Competition. Silver Sponsors for 2018 are the Allegheny County Department of Health, Air Quality Program, Clean Air Fund; AECOM; the American Society of Civil Engineers; Bechtel; Duquesne Light Company; The Buhl Foundation’s Henry C. Frick Educational Fund; and Hatch.

For more information about the competition or to volunteer as an engineering mentor, please go to futurecity.org/pennsylvania-pittsburgh.

“They know that you have to balance the needs of so many different groups... You can’t ignore any segment, or your city could fall apart.”

FUTURECITYALUMNUS

It has been a long time since Stephen Canton participated in the Pittsburgh Regional Future City Competition as a student, but he still is using the skills he gained from it.

Now a University of Pittsburgh medical student, Canton was named the Future City 2018 Alumnus of the Year by the international Future City Competition. Canton participated in the Pittsburgh Regional Future City Competition in 2004 and 2005, when he was a student at St. Benedict the Moor School in Pittsburgh.

“In my current roles as a researcher, bioengineer, and physician to be, I utilize skills that I learned while participating in Future City: application of math and science education, teamwork, research, time/project management, and confidence that my hard work can actually make a difference in the lives of future citizens,” Canton said.



Regional Future City coordinators nominate former participants who have remained active in the program or whose lives have been positively affected by the program for the national alumni award.

As the national honoree, Canton was a judge at the 2018 international Future City Competition in February in Washington, D.C. and gave a speech there to an audience of about 1,000. He said he tried to emphasize to the students that “exploration is key at their young age.” “That helps you formulate your end goal,” he said.

Canton has a bachelor’s degree in bioengineering from the University of Pittsburgh and a master’s degree in kinesiology from Louisiana State University. He expects to complete his medical degree with a concentration in bioengineering, biotechnology, and innovation in 2020 or 2021.

ESWP Member News

More than 75 firms are represented in the Corporate Member program of the Engineers' Society of Western Pennsylvania (ESWP). Corporate Memberships are available at 3 levels: Gold, Silver and Bronze. Gold members are entitled to 14 memberships that can be exchanged by employees; Silver, 9; and Bronze, 5 — annual dues are \$2400, \$1700, and \$1000 respectively. In addition, ESWP Corporate Member Firms may add 2 additional individuals in our Under-35 age category at no additional cost!

We also offer Individual Memberships, including a new "Under-35" category, which allows for full member privileges at annual dues of \$25 and a Government rate (full-time), with for \$50.00! Also, our new Dining Membership allows use of the Executive Dining Room for conducting client entertaining in a great private club setting, all for only \$50 annual dues, plus regular entry fee. More information can be found at eswp.com. Please contact the ESWP Office (412-261-0710) for additional details.

Membership in ESWP comes with a long list of benefits! From our continuing education opportunities earning you Professional Development Hours (PDHs), to the business networking events in our Executive Dining Room, there is something for everyone in your organization. Also, ESWP is helping the next generation of engineers with student outreach programs, giving you the opportunity to participate in many rewarding programs.

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Here's a cure for **THESUMMERTIMEBLUES**

By: Hayley Caretti

"Some things cannot be taught; they must be experienced. You never learn the most valuable lessons in life until you go through your own journey." This quote by Roy T. Bennett summarizes my summer as an intern with the Pennsylvania Department of Transportation (PennDOT). I had the opportunity to intern with PennDOT in the field of Construction Inspection. The project assignment was a road rehabilitation in Blair County. This type of internship was a new journey for me, and I had no idea what to expect. I knew the definition of inspection, but I was not aware of how the job was performed.

I received some advice before my internship that proved to be very beneficial. That advice was to keep a journal and record daily the things I learned and tasks I got to perform. I took this advice and every day I wrote something in my journal. This is something I would recommend to anyone doing an internship or even a permanent job. Using a journal is something I will continue to do throughout my engineering career because it will help me update my resume and as a record of tasks that I have learned or completed in my career.

On the road rehabilitation project there were many things I got to experience, some that I had learned about in school and some that were completely new. I had learned in school about concrete joints and if they had any dust left in them, then the sealant would not adhere to the concrete. Sawing and sealing of the concrete pavement joints was one thing that I got to inspect while an intern. I got to see all of the steps taken to reach the final result. Not only did the contractors have to saw out the old joints and put new sealant in, they also had to clean the joints and insert the backing rod. Another thing I learned about in school was concrete testing. In class we made our own concrete and completed the compression testing lab, but we did not have time for the slump or air tests. In the field I got to see all three tests performed. For the sidewalk project, we used concrete with a low slump of about four and then accelerated concrete with a higher slump of about seven for the patches. The difference between how the concrete behaved was incredible.

Halfway through the summer, our inspection staff was assigned to another project. This project was a safety improvement, which included updating the ADA Ramps and signals,

as well as paving. This new project intersected the other project at the end limits. The project began with excavation and replacement of the ADA Ramps. This was my favorite operation of the summer. Before starting the sidewalks I did not know how many steps were involved. Each step had to be done in order and correctly before the next steps could begin. When the operation began, my job was to keep track of which ADA ramps were worked on and the day the work was done. This helped me learn how to use the plans and the tab sheets along with the stationing along the road. I also helped take measurements and watched the concrete testing.

This summer happened to be very rainy, which created some challenges. Some days the work was suspended because of heavy rain and other times they worked in the rain, if the operation allowed. One problem we experienced was a lack of inlets near the construction site, which resulted in our excavated sidewalks filling with water. We then had to make sure all of the water was out of the area and the soil had non-movement before they could proceed with the work. I learned that plans will be changed when out in the field because of unpredictable circumstances and that you need to be flexible.

Overall, this summer was a great experience. I learned a lot about not only inspection, but engineering and the construction process. I now know more about how inspection is done. I helped take measurements for the excavation, length of curb that was poured, yards of concrete used in the sidewalks, and more. I also kept record of the work that was done each day and learned how to write and submit a project site activity (PSA). Everything I learned and worked on, is important in becoming a good inspector.

As I head back as a junior to the University of Pittsburgh at Johnstown, I will take these experiences and lessons that I have learned and apply them to my studies of Civil Engineering. I am excited for this new school year and more opportunities to arise to be able to expand my knowledge.

Hayley Caretti is an engineering student at the University of Pittsburgh Johnstown, and the daughter of ESWP Publications Co-Chair Tanya McCoy-Caretti



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CMU Research Overview

By: Sherry Stokes
Senior Marketing and Communications Manager
Carnegie Mellon College of Engineering

At Carnegie Mellon University (CMU), we know that the biggest questions of today's world aren't just theoretical. That's why everything we do, from the lab to the classroom, is focused on exploring exciting breakthrough areas of research to solve hard problems. Carnegie Mellon students and researchers are in constant conversation with companies about the technical challenges they face, and we use this perspective to guide our research, developing prototypes and workable models aimed at answering industry's toughest questions.

Lifesaving techniques and future technologies are born from these tough questions. How do we transport drinking water to communities that need it most? Can we treat pain without the use of addictive opioids? How do we make self-driving cars safe for everyone? What if computers could be made of liquid?

The question of liquid electronics might sound anything but practical, but mechanical engineer Carmel Majidi and members of his Soft Machines Lab at CMU have been looking at new ways to create electronics that are not just digitally functional but also soft and deformable. They use a special, liquid metal alloy, which can be infused in rubber to make circuits that are as soft and elastic as natural skin.

"Think of a flying robot that mimics the properties of a bird," says Majidi. "When it spreads its wings, you want the circuitry on the wings to also deform and reconfigure so that they remain operational or support some new kind of electrical functionality."

With this new technology, it will one day be possible to create not just systems of liquid circuits—but fully soft and deformable computers. Think of miniature computers that interface with biological material to monitor disease in the body. Imagine search and rescue robots that can self-assemble new parts when damaged. Although it sounds like

science fiction, liquid electronics might one day be as commonplace as today's laptops.

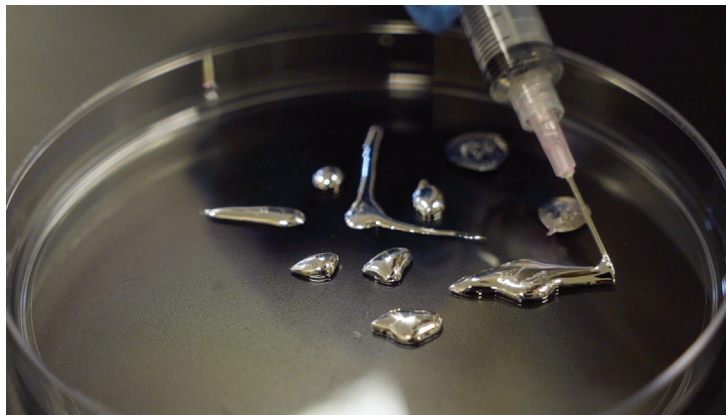
As computing technology becomes more compatible with the human body, even physical problems can have electronic solutions. For instance, instead of using painkillers like opiates to treat pain, why not use electricity? Using local electrodes to stimulate appropriate regions of the spinal cord could be more targeted and effective, while avoiding the risk of addiction associated with pharmaceuticals. The challenge, however, is finding a material that is flexible enough to meld with the brain, but adhesive enough to stay in one place. All without damaging the brain.

"Imagine you have a bowl of Jell-O, and you insert a rigid plastic fork into the bowl and

move it around," says Materials Science and Engineering and Biomedical Engineering Associate Professor Chris Bettinger. "It's going to damage the Jell-O, producing defects and irreversible structural changes. That situation is analogous to inserting a rigid electronic probe into soft tissue such as someone's brain."

To solve this problem, Bettinger and his group have created a hydrogel material and fabrication process for electrodes that stick to the brain, matching its soft, deformable makeup. The fact that the nodes do not move around or injure the tissue means they are able to record a stronger and more accurate signal from the firing neurons, as well as to stimulate therapies. For example, the electrode array in the probe could block the signal that induces inflammation in people with rheumatoid arthritis.

While these sensors are effective for monitoring and solving problems inside the body, what about the problems outside? Water scarcity is one such problem—especially in the United States. Fifteen percent of the U.S. population is considered "at risk" for water scarcity, and as such, we are always looking for more efficient and effective ways to move water to the places it's needed most. Interbasin Transfers (IBTs) are one such way: Picture a nation-wide system of waterways connecting



Carmel Majidi and members of his Soft Machines Lab investigate liquid metal alloys to make flexible circuits.

As computing technology becomes more compatible with the human body, even physical problems can have electronic solutions

watershed basins all around the country. “Without IBTs, cities wouldn’t be sustainable in large sections of the country, such as the southwest,” says David Dzombak, head of the Department of Civil and Environmental Engineering. “Los Angeles, Phoenix—much of their water is brought in from the Colorado River. That’s a critical lifeline for the city of Phoenix. These two locations, along with much of the Southwestern U.S., are under pressure from climate change that is only going to get worse.”

But surprisingly, there exists very little information on the location of these IBTs. That is until Dzombak took it upon himself to map them out. Using a number of databases, Dzombak has created the map of how water moves around the United States.

“With this new understanding,” says Dzombak, “we can start to ask important questions like: If the populations in Denver or Phoenix or Houston increase by X, how will that affect the city’s ability to acquire enough water?”

But water scarcity isn’t the only public health challenge cities face. Traffic accidents cause about 1.3 million deaths globally every year. To solve this challenge, thirty-five years ago, Carnegie Mellon research gave rise to self-driving car technology. Since then,

we have been innovating technologies, solving problems, and educating engineers who are leading the transportation revolution.

But these autonomous vehicles still have fundamental technology problems, including issues with sensing capabilities and software logic. All it took was one fatal accident in Arizona to show that self-driving cars are still test vehicles under development. Industry is financially motivated to get self-driving cars on the road, but we must give more thought to what it takes to instill a safety culture in AV companies. This is especially salient with regards to on-road testing of these cars. Because of CMU’s expertise and focus on safety, we advise policymakers on transportation safety.

The transformation that self-driving cars will bring about will not happen in a vacuum. Cars will connect to each other and to their environment, and infrastructure systems will work together, helping to create intelligent communities. With an eye toward futuristic smart cities, Carnegie Mellon is entrenched in fundamental research that promises to revolutionize the way we live, produce, and interact in the future, all for a better quality of life.

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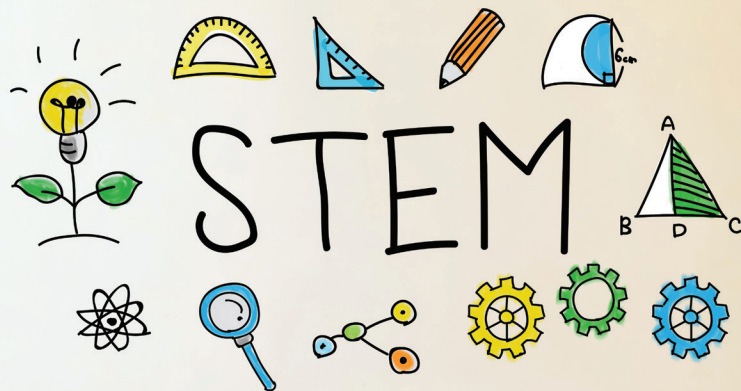
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Closing The Gap Between Men and Women in STEM

Gender inequality in the workplace is nothing new. When women entered the workforce during World War II, it was out of necessity. During the feminist movement of the 1960s, women entered the workforce by choice. However, their options were quite limited. Most simply became secretaries, nurses, babysitters, or teachers. Today, women work in all fields, but, the hard sciences, technology, engineering, and mathematics are still dominated by men.

Is there a reason that such a gap continues to exist in these particular fields? And what can be done to close this gap?

WHAT IS STEM?

STEM stands for Science, Technology, Engineering, and Mathematics. Educators across the country have been beating the drum for STEM expansion for years. This isn't necessarily a bad thing as any country's workforce that is proficient in science, technology, engineering and mathematics produces economic growth, advances scientific innovation and creates good jobs.

For high school students, being labeled as a STEM graduate is seen as a positive boost to college applications, and the public assumes that STEM education leads graduates to fields rich in employment opportunity.

However, the truth is that it takes more than just a STEM degree to get a job.

STEM JOBS AND EMPLOYMENT OUTLOOKS

STEM includes a diverse list of occupations, including mathematicians, engineers, biomedical researchers, and more. The degree levels vary from bachelor to Ph.D. Some professions lack qualified employees, like nuclear and electrical engineering Ph.D.'s with U.S. citizenship. In other areas, such as biology Ph.D.'s aiming to become professors, there are simply too many candidates.

The U.S. is failing to produce enough skilled STEM workers to meet current employment needs and the demand will simply increase in the future:

- The U.S. could be short three million high-skills workers by the

end of this year

- In careers related to connected technologies, industry experts project a national shortage of half a million trained workers by 2020
- The U.S. Department of Labor projects that by 2020 there will be 1.4 million computer specialist job openings, while universities are projected to produce degree candidates for only 30% of those jobs.
- By 2020, there will be 1 million more IT jobs than there are computer science students in the U.S.
- By 2022, 1.3 million Cybersecurity and IT positions will need filling
- Two-thirds of the IT jobs employers need talent for arise from non-tech industries like healthcare, banking, or manufacturing
- The Top 10 cities with the greatest demand for IT jobs are New York, Detroit, Washington, Philadelphia, Chicago, Atlanta, Dallas, Houston, Seattle and Baltimore; but for every 8 openings in these cities, the talent pool yields only 5 workers

Research conducted by LinkedIn identified the STEM skills most in demand. Of the top 10 in 2017 were computer skills, "including expertise in cloud computing, data mining and statistical analysis, and writing smartphone applications."

In the decade ending in 2024, 73% of STEM jobs will require computer skills, but only 6% will be in the physical and life sciences. Not only does the U.S. need more women in STEM, we need more women with computer skills.

WOMEN IN STEM

According to recent research, only 27% of students taking an AP Computer Science exam in the U.S. are female. The gender gap only gets worse: Just 18% of American computer-science college degrees are conferred on women. Around the globe, women in other, more male-dominated societies, are not even given the opportunity to engage in STEM learning. But in the U.S., corporations and other interested parties are taking notice of the disparity.

Forbes magazine partnered with Audi of America in 2017 to launch the inaugural “Idea Incubator,” designed to inspire a new generation of female STEM leaders. Students from the New York University Tandon School of Engineering were asked to develop solutions to the issue of safe access to affordable transportation for women and girls.

The members of the winning team had some good advice for educators, parents, and women seeking STEM degrees:

Aida Mehovic, a Computer and Electrical Engineering Major, says “Bust the Math Myth! There’s a myth that if you’re bad at math, you can’t enter a STEM field. Having a natural competence in math can be helpful, but skill and intelligence grow with consistent practice and effort. Getting involved in projects is the first step to do this!”

Camila Morocho, a Chemical and Biomolecular Engineering Major encourages girls to “Spark Curiosity, Inside and Outside the Classroom. I would encourage young women to be fearless and confident. Women should look past their fears of entering a male-dominated field with hopes of making their own mark. As my education progressed, I became fascinated with the human body and how elements and chemicals allow us to breath, live, and feel. To understand the body, it is not enough to just know biology, but also other subjects like Calculus, Physics, and Thermodynamics.”

Emily Muggleton, a Mechanical Engineering Major with a Minor in Aerospace suggest the importance to recognize the role of role models. “The lack of visible female role models continues to be a major problem. In my opinion though, the real problem is that the women working within STEM are hiding in plain sight. One way to overcome this would be to spotlight examples of actual women succeeding in STEM which could inspire young women by giving them real-world examples to model themselves after.”

These ladies are great examples of how a girl’s rise in STEM is based on many factors, and any young lady can break through the inequality that exists. So, why are there so few successful women in STEM careers?

WHAT’S KEEPING WOMEN OUT OF STEM?

It’s clear that low numbers of American women in STEM is an issue. While some will argue that the low numbers are due to not enough young female students being directed toward the sciences, research simply does not bear this out.

Some suggest that women are choosing a work-life balance over the demanding careers in STEM. However, the research does not support this theory either.

More recent studies are adding to the mounting evidence that gender bias is driving women out of STEM careers. According to Joan C. Williams of the Harvard Business Review:



“A 2012 randomized, double-blind study gave science faculty at research-intensive universities the application materials of a fictitious student randomly assigned a male or female name and found that both male and female faculty rated the male applicant as significantly more competent and hireable than the woman with identical application materials. A 2014 study found that both men and women were twice as likely to hire a man for a job that required math.”

Williams’s research with Kathrine W. Phillips and Erika V. Hall, also shows that biases push women out of science:

- Bias 1: Prove-it-Again. Two-thirds of the women interviewed, and two-thirds of the women surveyed, reported having to prove themselves over and over again – their successes discounted, their expertise questioned.
- Bias 2: The Tightrope. Women need to behave in masculine ways in order to be seen as competent—but women are expected to be feminine.
- Bias 3: The Maternal Wall. Professional women with children often find themselves having their commitment and competence questioned, and opportunities start drying up.
- Bias 4: Tug-of-War. Studies show that women who have encountered discrimination early in their careers often distance themselves from other women.
- Bias 5: Isolation. Many women may perform excellently, but they are not invited to share their ideas.

While it is tempting to characterize the scarcity of women in STEM to education pipeline problems or women’s personal choices, we should listen to women scientists: they believe the issue is gender bias, and the most recent research supports their view.

HOW CAN WE FIX THE ISSUES?

While pipeline problems are not a big part of the women in STEM issue, the biases discovered by researchers can begin at the university level. Catherine Hill, PhD, presented specific steps to “Create College Environments That Support Women in Science and Engineering.”

THINGS STUDENTS CAN DO

- Actively recruit women into STEM majors
- Send an inclusive message about who makes a good science or engineering student
- Emphasize real-life applications in early STEM courses
- Teach professors about stereotype threat and the benefits of a growth mindset

- Make performance standards and expectations clear in STEM courses
- Take proactive steps to support women STEM majors
- Enforce Title IX in science, technology, engineering, and math

THINGS THE FACULTY CAN DO

- Conduct departmental reviews to assess the climate for female faculty



- Ensure mentoring for all faculty
- Support faculty work-life balance with stop-tenure-clock policies and on-site child care
- Counteract Bias
- Learn about your own implicit biases
- Keep your biases in mind and take steps to correct them
- Raise awareness about bias against women in STEM fields
- Create clear criteria for success and transparency in the classroom and the workplace

While these would be great steps forward in the university environment, businesses also need to do their part to retain STEM women in their employ. Biases are causing women to leave their jobs.

While many women have managed to build highly successful careers with degrees in STEM disciplines, the definition of highly successful is a matter of interpretation. A nationally representative survey of 3,212 individuals with STEM credentials differentiated what success for women in STEM really means.



According to Laura Sherbin, Harvard Business Review, researchers define success simply: satisfaction with your job, an obvious respect for your expertise, and a senior-level position. About 20% of women currently employed in STEM positions meet that definition. But, there are ways for women to improve their positions:

- Telegraph confidence
- Claim credit for your ideas
- Invest in peer networks
- Build up protégés
- Be authentic.
- Hone your brand

It is ultimately up to the women in STEM to take advantage of their positions and break through the biases.

CONCLUSION

While the traditional refrain of “we need more women in STEM” continues to play ad infinitum, the research shows that the true issue is not bringing women to STEM – it’s keeping them there.

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POINT PARK UNIVERSITY

Point Park University has provided ABET (www.ABET.org) accredited Bachelor of Science degrees in civil, mechanical and electrical engineering technology since the late 1960s. We have long served a mix of traditional and non-traditional students – many already working as technicians or junior engineers – by offering evening and weekend classes. Two years ago, we launched engineering science programs in mechanical and electrical engineering, and we expect to grant degrees to our first grads in these new majors this coming spring, at which time we will be eligible to apply for accreditation.

At the graduate level, Point Park continues its Master of Science in engineering management program. This year we launch a 4 + 1 program which allows qualifying engineering and engineering technology students to take courses in the master’s program while completing their bachelor’s degree. Most students will be able to then complete the master’s degree within one year post bachelor’s. We like to use the phrase that this master’s program is for engineers that want to lead engineering, not leave engineering. We also recognize there are also engineers out there who do feel drawn to the business side, and for them we have collaborated with Point Park’s Rowland School of Business to create an MBA degree with an engineering management track. While the combination of an engineering degree with an MBA has long been deemed a valuable combination, this degree is designed to further enhance that combination by putting an engineering management lens on the traditional MBA curriculum. We envision that the graduates of this program should be able to excel in leadership positions on the business side of technology-sector companies.



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Seton Hill University's First-Ever Partnership with National Cyber-Forensics & Training Alliance Advances Student Training

By Mary C. Finger, Ed.D.
Seton Hill University President

When Seton Hill University opened its Office of Academic Innovation and Planning in 2016, our goal was to rapidly develop new academic programs and partnerships that would meet workforce needs in the Pittsburgh region and beyond.

We quickly recognized cybersecurity was an area of growing concern for every organization connected through technology. Every day, hackers are finding new ways to infiltrate business and government computer systems – making everyone's data more susceptible to theft.

But we heard time and again from business leaders that there simply are not enough people educated and trained to effectively manage the growing cyber threat.

So Seton Hill launched a Cybersecurity academic program in 2017 with the aim of educating students to tackle those issues and help the Pittsburgh region meet the expected 20 percent job growth for information security analysts estimated by 2025 in The Allegheny Conference on Community Development's "Inflection Point" report.

Our academic program combines courses in Cybersecurity, Computer Science, Forensic Science and Criminal Justice as well as Liberal Arts courses to provide students with not only the technical skills they need but the soft skills required to effectively work in a team environment, problem solve and communicate issues effectively.

Seton Hill faculty developing Cybersecurity courses recognized that working with experts in the industry would provide our students with the up-to-date training they would need.

Earlier this year, Seton Hill announced a new partnership with the National Cyber-Forensics & Training Alliance (NCFTA).

Seton Hill is the first undergraduate Cybersecurity program to partner with the NCFTA, a Pittsburgh-based non-profit corporation focused on identifying, mitigating, and neutralizing cybercrime threats globally.

The partnership provides Seton Hill Cybersecurity students with internship and research opportunities with the NCFTA and offers an opportunity for collaboration in the development of Seton Hill cybersecurity courses.

This unique partnership will enable our students to be on the cutting edge of the technological training they need to prepare for the Information Technology security field of the future and prepare students with the skills employers are seeking.

NCFTA experts are helping Seton Hill develop Cybersecurity courses that are always current in a world that is experiencing an ever-increasing risk of cyber threats. The Cybersecurity program is designed to advance as technology does, and the partnership with NCFTA will provide Seton Hill students with real-world opportunities.

As students advance through the program, they will have the opportunity to attend classes and workshops at the NCFTA in Pittsburgh, where they will access the dark web in a controlled atmosphere so they gain hands-on experience in this area of threat.

The partnership between Seton Hill University and NCFTA will provide Seton Hill students with the ability to serve as interns with NCFTA as well as collaborate onsite for possible capstone and research projects with the organization.

Students have already taken advantage of the internship opportunity, including our first NCFTA intern, Sarah Hefferin, who said her experience opened her up to all the possible job opportunities in the Cybersecurity field and opened her eyes to the methods used by cybercriminals and to combat them.

As a former women's college, celebrating the Centennial of its founding in 1918, it is especially important for Seton Hill to encourage women like Sarah to enter the technology sector, as only about a quarter of those jobs are currently held by women.

A year after launching the program, more than 30 students are majoring in Cybersecurity at Seton Hill, and we expect enrollment to continue to grow as students recognize that they have the opportunity to truly make a difference in protecting all of our data from harm.

For more information on Seton Hill University academic programs, visit www.setonhill.edu.



Mary C. Finger, Ed.D.



At Grove City College Engineering is a Calling to Serve

Erik Anderson, professor of Mechanical Engineering, works with students in his biofluid lab. Anderson's work focuses on the hydrodynamic strategies that aquatic organisms use to move through the water efficiently and effectively. The work has applications to managing ocean resources and novel marine vehicle design.

Grove City College is an engineering education powerhouse that is recognized as one of the top 100 schools in the nation for its undergraduate program, according to U.S. News and World Report.

It's a small college that delivers a big college equivalent technical education. With courses of study accredited by the Accreditation Board for Engineering and Technology (ABET) and specific bachelors of science degrees in Electrical and Mechanical engineering, Grove City College distinguishes itself among its private undergraduate degree-granting peers. It is one of just handful of Christian colleges that deliver this level and quality of instruction.

Mechanical Engineering is the most popular major at the private Christian college and graduates of that program and the Electrical and Computer Engineering track see near 100 percent placement in jobs or graduate schools within a few month.

"Grove City College has a long and strong history of providing students with the skills they need to dive into a STEM career," Dr. Timothy Mohr, interim dean of the Hopeman School of Science, Engineering and Mathematics and professor of Electrical Engineering, said. "The high demand to hire our STEM graduates is a testimony to the quality of our students and the effectiveness of our majors."

Alums hold jobs with Bechtel Plant Machinery, General Electric, Honda R&D Americas, Northrop Grumman, Rolls Royce Nuclear Services, Toyota Motor Engineering & Manufacturing, Westinghouse Electric Company and other leaders in the field. Many engineering students go on to graduate schools such as MIT, Princeton, Notre Dame, University of Virginia and Penn State.

Beyond their technical prowess, students are grounded in a solid

liberal arts curriculum thanks to a longstanding commitment that every student at Grove City College is introduced to the great ideas, events, literature, art and faith that underpin civilization. The humanities core is intended to foster the formation of a worldview that values faithfulness, excellence, service to the common good and love of neighbor.

At Grove City College, engineering students are encouraged to discover their calling and find a way to serve their neighbors "by applying science, engineering, and math to solve real human problems," Mohr said.

The idea that engineering or any other discipline that rests on empirical data and hard science is a "faith free zone" isn't accurate, according to Dr. Mike Bright, chair of the Department of Electrical and Computer Engineering at Grove City College. Even engineers who don't subscribe to a faith tradition like Christianity take ethics seriously and every professional society observes a code of ethics.

"Engineers deal with the physical reality and rules of the universe God created," Bright said. "Most modern philosophers agree that technology is not ethically neutral. The problems you choose to solve, the process of solving them and the features you build-in provide an ethical bias towards good or evil in the resulting product," Bright said.

"Engineering as a whole feels a responsibility to all society and often talks about promoting the public welfare. Christian engineers have a solid foundation for doing such things - i.e. our faith explains why," he noted.

Solving the world's problems demands sound science and Mohr said research is a key element in Grove City College's program.

Grove City College has a long and strong history of providing students with the skills they need to dive into a STEM career,

"In addition to an excellent grounding in discipline fundamentals, students will find many opportunities to engage in hands-on learning, directed research projects with faculty, study-abroad programs, and team capstone projects," Mohr noted.

That time in the lab or the field pays off when it comes to taking the next step in an engineering career or getting to the heart of the discipline, Bright said.

"As a faculty we know that research is important – to prepare for grad school if nothing else. We have a good number of students who do summer jobs on research projects at big universities," he said. "Engineering is intensely practical, so not all our research is purely academic. Our student projects often try to produce some solution to a real world problem."

Current student-faculty research focuses on alternative energies, biomimetic propulsion, light alternative vehicles, experimental fluid dynamics, control systems, electrostatics applied in the food drying industry, hearing aids, wind turbines, a super-computer setup to support chemistry research and other questions.

Students also gain a broader perspective by studying abroad at the College's European Study Center in France, securing internships at Westinghouse, FirstEnergy, NASA and other top operations, working summers at research institutions such as Woods Hole Oceanographic Institution, MIT, Harvard and Vanderbilt universities, and just being of service.

"We do emphasize service throughout our curriculum," Bright said. "Our students have a holistic view of their lives and futures. They regularly get involved with service activities on and around campus and on the mission field," Bright said.

"For my students, there are more important priorities than making top dollar," he added. Many work for non-profits because they believe in the work, some choose family and community over salary, others seek to make a direct impact on people's lives, he said.

"I poll my seniors every year and probably less than 20 percent have a large salary as one of their top priorities ... a big salary almost never comes up. The regular topics are work-life balance, fulfilling God's call in their family and personal lives and how they can contribute to society as a whole" Bright said.

That's an idea that Grove City College's engineering faculty tries to inculcate in graduates who live in a world of self-driving cars, household robots and phones that are smarter than their users.

"It is clear we live in a time when a host of developing technologies are poised to radically affect our daily lives," Mohr said. "Engineers certainly need strong technical skills to work creatively in these rapidly changing fields, but there is also a growing need for people who consider love of neighbor and not just love of profit in tackling engineering

challenges. At Grove City College we try hard to develop young engineers who have both the knowledge and the heart to be a blessing to those around them."



In Grove City College's machine shop, students get hands-on experience. Here they're working on one of the College chapter of the Society of Automotive Engineers' competition Baja cars. Students build the cars from scratch and compete in a number of competition races.



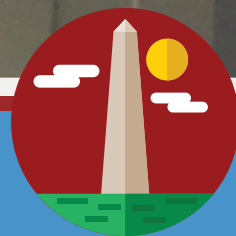
Grove City College engineering students compile data on wind tunnel experiments in one of the College's labs in Hoyt Hall. The College's nationally ranked engineering program provides students with solid technical and scientific skills.

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