2013 Fellow Reports

Reports of the 2012-13 winners in Tau Beta Pi's 79th Fellowship Program are presented here. They constitute the Fellows' only specific obligation to the Association after their appointment by the Fellowship Board. Their reports were written in April, and the verb tenses may sound wrong when read later. Each of the winners expresses appreciation to advisors and major teachers, to family and helpful friends, and to the Association, donors, and the Fellowship Board for the honor of being named a Tau Beta Pi Fellow.

Of the 40 fellowships awarded a year ago, 21 of the students have been paid cash stipends totaling $210,000. The other 19 did not need the stipend.

Joseph M. Argento, NY Ξ '12
Lynnworth Fellow No. 5

This year I completed my master's degree in electrical engineering at Manhattan College. Returning as a graduate student was an interesting change in perspective, rewarding and full of challenges. My work as a graduate assistant allowed me to experience some courses I did not take as an undergrad, while providing a new take on others.

The highlight of my studies was developing an autonomous robot controlled by a combination of PC software, an Android cell phone and Arduino. Paths drawn in Google Earth are passed to the robot via Bluetooth or 3g/4g. The Android phone's compass, GPS, and additional infrared sensors then guide the robot along the chosen path while avoiding encountered obstacles. With all the challenges involved, finally seeing the robot take photos and drive properly was supremely satisfying.

Aside from this, my first semester of full-time graduate work included courses on signal theory, software engineering and engineering management. I learned more about concepts I had applied in my internships and a host of new techniques. My second semester consisted of a mix of coursework and research, and was even more rewarding than the first. In an intensive independent study I worked with System On a Programmable Chip technology, including custom instructions, multiprocessing and networking.

This June, I began work as an electronic systems engineer at Northrop Grumman Aerospace Systems, a fresh challenge that I find both enjoyable and interesting. I am profoundly grateful for Tau Beta Pi's support during my graduate education. While my plans for future study are still uncertain, I am excited for what is to come.

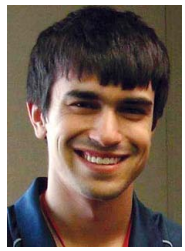
David S. Bergsman, WA A '12
Tau Beta Pi Fellow No. 791

This past year, I started working towards my Ph. D. in chemical engineering at Stanford University. After passing my prequalifying exams, I joined Stacey F. Bent's research group, where I have been studying molecular layer deposition (MLD), a technique developed in the last five years that can grow thin films of molecules on surfaces one monolayer at a time. These vapor-phase deposited films do not require costly solvents, are highly conformal, and can be grown with fine compositional control.

For this reason, MLD has seen significant interest in the creation of new photoresist materials, chemical and biological sensors, and organic solar cells. My studies have focused on improving our understanding of this technique. So far, I have shown that some MLD growth chemistries can re-initiate growth where imperfections have caused growth to slow down.

Over the next few months, I will begin examining the angle that MLD-deposited polymers grow and examine new MLD chemistries.

Joseph M. Argento



David S. Bergsman

Sheniqua R. Brown

I will soon be trained to use the synchrotron radiation source over at the SLAC National Accelerator Laboratory, and I am looking forward to being a teacher's assistant in the years to come. Outside of research, I have recently taken up a leadership position in the Stanford Polymer Collective, an organization dedicated to improving interdisciplinary discussions and career development for students and academics working with polymers.

I also plan to begin mentorship with the local ΤΒΠ chapter as an advisor. After graduating, I hope to take my research with me into a faculty position in chemical engineering. I thank TBP and the support it has given me throughout my continuing engineering career. My current future plans include earning a Ph.D. and becoming a professor.

Sheniqua R. Brown, DC A '12
Zimmerman Fellow No. 1

Currently, I am a graduate student at the University of Maryland, Baltimore County in the department of chemical, biochemical and environmental engineering. In my first year of graduate studies, I was able to obtain a vast amount of information through courses I took, as well as seminars and other academic events I attended. During the 2012/2013 school year I was able to complete all the core classes for my major which include kinetics, transport phenomena, applications of thermodynamics, biochemistry, and intro to partial differential equations. I also had the opportunity of taking a biotechnology course teaching student about good manufacturing practices in the biotech industry.

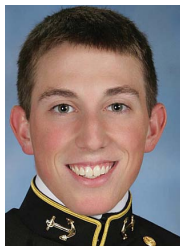
Upon my arrival into graduate school I was offered and accepted into two additional fellowship programs at UMBC, LSAMP Bridge to the Doctorate and Meyerhof Graduate Fellowship. In these programs I have been able to connect with individuals from various majors pursing both master's and Ph.D.'s. Within my first year I became a member of the PROMISE community, Maryland's alliance for Graduate Education and Professoriate, which aided in my transition into graduate school.

Other accomplishment that I've made in my first year includes presenting at UMBC's graduate research conference, as well as

Jennifer L. Cooper

Erinn C. Dandley

Christina E. Darling



Nicholas J. DeLuca

joining the university's Center for Advanced Sensor Technology to begin my master's thesis research. The area of research I'm interested in involves the use of sensors in bioprocess engineering. One area of the CREST lab looks into a non-invasive technique that uses sensors to determine glucose/sugar levels of an individual. This new method would be less invasive than current techniques and the ultimate goal is to develop a sensor that can be used on the skin of babies suffering from juvenile diabetes. Ultimately, my goal is to obtain a master's degree within the next year and move on to the university's Ph.D. program.

Jennifer L. Cooper, MA A '12
Fife Fellow No. 153

This past year as a TBΠ Fellow has been quite exciting as I've been pursing my master's degree in biomedical engineering at Worcester Polytechnic Institute. During the year, I completed the coursework required for my degree, which predominately focused on in-depth tissue engineering achievements and challenges, alongside advanced engineering math and life science courses.

Meanwhile, I also began working on the fun part of grad life – my thesis research. My lab is focused on developing tissue-engineered blood vessels by stacking cell-derived smooth muscle tissue rings on a mandrel and allowing them to fuse into a tube. The goal of my research is to create and optimize a cyclic stretch bioreactor to dynamically condition the tissue rings during culture, with the ultimate goal of improving the strength of the rings such that the tissue tubes can withstand in vivo grafting. Currently, I have designed, manufactured, and validated the bioreactor system, and ongoing efforts are focused on optimizing stretch magnitudes and culture time. As I am continuing my research this summer, I am also mentoring two students in the NIH Research Experiences for Undergraduates program.

Following my graduate studies, I am interested in pursuing a career as a biomedical engineer, either designing new medical devices/products or managing medical equipment in a clinical setting. One of my goals before graduating is to make a contribution to the scientific community through a publication, and I am very grateful for this fellowship as it has provided me the opportunity to advance to that goal.

Erinn C. Dandley, MA Z '12
Tau Beta Pi Fellow No. 793

After my first year at North Carolina State University my pursuit of a PhD in chemical engineering is off to an excellent start. In addition to the Tau Beta Pi fellowship, I was awarded the College of Engineering Graduate Merit Award and an NCSU Graduate Research Fellowship.

I was accepted into the Parsons group; the focus of our research is atomic layer deposition (ALD). It allows for angstrom length scale precision in the formation of thin films. I am using this technique to study the toxicity of carbon nanotubes that have been coated using ALD in a lung model to see how the coating will affect pulmonary fibrosis formation. I am also using ALD to create an ultra light nanolattice for NASA that has optimized thermal, optical, and mechanical properties.

Being able to focus on multiple projects at once has helped me to find connections in disparate areas and answer questions more efficiently. My career goal is to become an engineering consultant so that I can resolve different problems on a day to day basis.

In addition to research and classes I have been able to maintain a well rounded life. I am able to go on hikes, go to concerts, travel to see family and friends, garden, and rock climb.

Christina E. Darling, SC A '12
Fife Fellow No. 154

As an MSE candidate in environmental engineering at Johns Hopkins University, I accomplished many things. The program is an intense one year master's, so I focused on completing classes for my requirements. I branched out of my regular classes to take and master a few in mathematical modeling and solid waste engineering, to broaden my water resources emphasis.

During my second semester, I worked two full days at an engineering firm while attending classes the others. The lessons I learned while working coupled with my classes are invaluable. Upon finishing the first two semesters, my last requirement is to continue working at the engineering firm, full-time to complete my degree. Through this internship I will have the opportunity to take advantage of field work in Michigan, field work in Guam, as well as office design work in the Maryland home office.

This year was rewarding and challenging, taking me out of my element and allowing me to explore new thoughts and ideas. I hope to use my continued passion for learning even after the completion of my degree and work at an engineering consulting firm on innovative projects. I strive to find a firm that offers opportunities for continuing education through webinars and conference attendance.

Nicholas J. DeLuca, MD Γ '12
Tau Beta Pi Fellow No. 794

As a Tau Beta Pi Fellow, I recently completed my first year of graduate study at Princeton University in the department of mechanical and aerospace engineering. This past year I completed the coursework requirement for the master's of science in engineering (M.S.E) program.

The amount of knowledge I have gained over these two semesters has been incredible. This is really a tribute to the quality of professors and fellow graduate students here.

Over the summer and next year, I will be continuing research towards my thesis, which I plan on finishing next spring. My advisor is Professor Richard Miles, and under his leadership in the Applied Physics group I am involved in flow diagnostics using ultrafast lasers. More specifically, the project I am working on aims to develop an optical air data system for hypersonic air vehicles. The ability to extract accurate velocity, temperature, and pressure information in high altitude hypersonic flight represents a significant challenge to the future of high-speed flight.

While most of my previous engineering experience has been in aeronautics, learning about lasers, optics, and advanced physics has been fascinating. Additionally, working with supersonic wind tunnels, high speed cameras, and femtosecond pulse-length lasers has been outstanding.

In addition to graduate study at Princeton, I am also an active duty Second Lieutenant in the Marine Corps and am attached for administrative purposes to a Marine unit in nearby Fort Dix, NJ. After completing my master's degree, I will report to Quantico, Virginia for The Basic School, a six month training course that all officers of marines must complete. Following that, I will begin flight training to become a Marine Pilot.

Kyle M. Dunning

Benjamin W. Gasser

Megan E. Godsey

Clayten N. Greenwell

Kyle M. Dunning, MO Δ '12
Fife Fellow No. 155

Year one in the University of Texas structures program provided me with a multitude of opportunities unlike any other. The courses offered and their respective professors gave a one-of-a-kind look into the various topics of structural engineering. Courses have ranged from dynamic response of structures to steel bridge design. The program is uniquely structured to offer both a practical understanding of the field as well as a highly comprehensive, and progressive, view of structural engineering knowledge. In addition, seminars from previous students provided great insight into the upcoming advances in the field.

Also during my first year, I participated in the Precast/Prestressed Concrete Institute's Big Beam competition; a great experience involving the design, construction, and testing of a precast beam. Another outstanding opportunity presented itself this spring when I was offered an internship at Walter P Moore, a distinguished structural engineering firm. Within the past several months I have gained a tremendous amount of experience one cannot earn from a classroom environment.

Over the next year, I plan to graduate from the University of Texas at Austin and begin a purposeful career as a structural engineer, redefining the limits of efficiency and design. I hope to become an active member in technical committees for the various engineering organizations as well as outreach organizations. Looking back over the past year, I realize how little I knew what was in store for my life when I accepted the invitation to this school. I am extremely grateful for TBII's enduring commitment to the advancement of engineering as well as the investment in my education.

Benjamin W. Gasser, AL Δ '11
Centennial Fellow No. 27

Benjamin has been venturing through courses and research at Vanderbilt University on his way to gaining a Ph.D. in mechanical engineering with a focus in mechatronics and rehabilitation robotics. As a first year student and teaching assistant, coursework has taken the bulk of his time. He has completed courses in linear and nonlinear control theory, system dynamics and bond graph modeling, robotics, and advanced dynamics.

In addition to courses, much time has been spent researching robotic exoskeletons for the assistance of human movement. Working for his advisor Dr. Michael Goldfarb, Ben has had the opportunity to participate in the ongoing research surrounding the Vanderbilt Powered Exoskeleton which enables people with spinal cord injuries (SCI) to stand up from their wheel chairs and walk. For those who never thought to walk again, this robotic device is offering an exciting new hope for mobility, health, and the ability to interact on eye level with their peers. As the mechanical engineer on a team of three graduate students, it has been Ben's job to redesign and further develop the components of the exoskeleton for added safety, robustness, and size ranges to fit a broader demographic of SCI patients.

Moving forward, he is turning his attention to development of an upper limb exoskeleton intended to return major motor skills, and help control hand spasticity, in individuals suffering from hemiplegia – a common post-stroke condition. The anticipated device will be a poseable orthotic to mitigate muscle stiffness caused by static splinting while the hand portion will be capable of assisting grip strength – all in a package with a slim profile light enough for all day comfort.

Megan E. Godsey, KS A '12
Sigma Tau Fellow No. 39

As a first-year biomedical engineering Ph.D. at Duke University, I have spent the past year engaged in a mix of research, classes, and outreach activities. I have been focusing initially on a research project with the ultimate goal of producing an effective cell-based therapy to fill a gap between a need and the current state of the treatment methods available for neurological diseases.

Neurons have an extremely limited regenerative capacity, which is the reason neurological disorders are often so devastating. However, there is the potential for directly reprogramming another adult cell type to neural progenitor cells, which can be expanded to a therapeutically-relevant number and differentiated to serve as replacement neurons for the diseased ones. I am investigating this process using non-viral gene delivery to various easily-accessible cell sources.

In addition, I have been engaged in both increasing diversity in the engineering department at Duke and increasing awareness of engineering as a viable option for young students in the community. The first was accomplished as part of the diversity initiative at Duke, and the second was done as part of a program that focuses on giving pre-high school students an opportunity to explore and experience the science in a hands-on personal way.

After completion of the Ph.D. program, I plan to make the jump from academia to industry, working with and leading a research team in the field of cellular engineering.

Clayten N. Greenwell, KY A '12
Fife Fellow No. 156

During my fellowship year, I finished my master's degree of civil engineering with a focus in structural engineering from the University of Kentucky. As part of my degree I completed a research project that studied the effectiveness of spliced carbon fiber reinforced polymer rod panels as a direct application for bridge repair. I wrote a report on my research and presented it to my master's board at the completion of my study. These panels have been used to repair multiple bridges in Kentucky and I received 5 percent of the patent for my contribution on the project. It has been very rewarding to see experiments carried out in the lab being applied in real world projects.

I was offered and accepted a full-time job with Stantec Consulting in their Lexington, KY, office upon graduation. I have been doing design work for multiple bridges including those on the Ohio River Bridges project. I received training from the Society of Profession Rope Access Technicians a few weeks after graduation achieved a Level I Technician status. I have spent a portion of the summer traveling to Oregon and Cincinnati and applying my structural engineering knowledge and ropes training to inspect bridges. These inspections were carried out on bridges that are over 100 years old so that they can be load rated and retrofit/repair options can be presented to the clients. It has been a very exciting start to what I hope is a long and fulfilling design career.

Michael J. Hand

Duff R. Harrold

Alyssa Joy R. Hensley

Charles A. Holt

Nimit Jain

Michael J. Hand, MI Γ '12
Lynnworth Fellow No. 6

During my fellowship year, I worked toward my master's degree in control systems engineering. During the year, I've also been able to conduct research aimed at improving the emissions control and fault diagnostics in heavy duty diesel engines. This project allowed me to additionally author and have accepted my first conference paper, a summary of our work in modeling the engine's air path with a novel turbocharger design.

This project is also largely responsible for my receiving of the Bosch Sustainability Fellowship to continue my research in the Ph.D. program here at Michigan starting next year. I'll be investigating more deeply fault detection and fault tolerant control with the aim of making more adaptive and resilient systems.

I've stayed involved in ΤΒΠ throughout my studies and currently serve as an advisor for the MI-G chapter and as a member of the Student Advisory Board. I plan to stay involved throughout my studies to help with leadership development and continuity for the newer officers.

Duff R. Harrold, CA Υ '11
Fife Fellow No. 157

In the past year, I have finished my M.S. in mechanical engineering from Sacramento State and begun my Ph.D. at UC Davis in biological systems engineering. The master's degree involved the mathematical modeling of the heat transfer in compost amended soil during the solar sterilization process (solarization). The final model was able to predict soil temperatures over time at target depths accounting for the heat generation due to microbial decomposition of the added organic matter.

At UC Davis, I began work in the VanderGheynst lab in the lignocellulosic biomass to fuel group. My first year consisted primarily of course work with a focus on modeling, the plant cell wall, and experimental design. My research focus is examination of microbial communities in lignocellulosic compost and discovery of enzymes and pathways for the delignification of the plant cell wall. Lignin provides one of the major challenges in the efficient enzymatic conversion of biomass to liquid fuel and thanks to Tau Beta Pi, I was able to focus entirely on my preparation for tackling this important and interesting problem.

Alyssa Joy R. Hensley, NM Γ '12
Fife Fellow No. 160

In August, 2012, I began studying for my master's in chemical engineering at Washington State University (WSU). My work at WSU has focused on the application of density functional theory (DFT) modeling to the analysis of heterogeneous catalytic systems, specifically the refinement of biofuels with bimetallic catalyst surfaces.

Currently, biofuels are the most viable replacement for fossil fuels; however, these biofuels have high oxygen content, in the form of phenolic compounds, which causes the fuel to be corrosive. The refinement of these phenolic compounds occurs through the removal of oxygen without the saturation or breakage of the aromatic rings. DFT has been shown to be a useful technique for evaluating the performance of catalytic surfaces, such as those required to promote the above deoxygenation reaction. This method applies the principles of quantum mechanics to the analysis and characterization of the energetic and electronic interactions within model systems. I have been using this type of computational modeling to analyze and quantify, at the atomic level, the deoxygenation reaction of phenolic compounds over various palladium-iron bimetallic surfaces. These studies have shown that the palladium's electronic structure is significantly modified by the presence of iron, causing the phenolic compounds to preferentially adsorb onto the surface iron. This dominance of iron as the catalytically active site results in the preference of the deoxygenation reaction pathway over the ring hydrogenation pathway.

In addition to these research based accomplishments, I have completed all coursework required to obtain my degree. Being awarded this fellowship has enabled me to fully focus on my research and studies and has allowed me to achieve more than I otherwise would have achieved.

Charles A. Holt, TX Δ '12
Fife Fellow No. 158

This year I was able to complete my master's of engineering degree at Texas A&M University in large part because of the assistance I received from Tau Beta Pi. The school year consisted of completing a number of both theoretical and applied structural engineering courses.

I gain a much greater understanding and comfort level in performing higher level analyses of structures, and implementing such analyses using hand calculations, spreadsheets and structural analysis software. I particularly enjoyed getting to work with great professors on in depth structural problems and learning both practical and theoretical knowledge from them. Now I am getting to work as a structural engineer in training in Houston and am thoroughly enjoying it.

Nimit Jain, CT Α '12
Tau Beta Pi Fellow No. 795

The past year was full of rich learning experiences. I started at Stanford in the summer, taking courses such as linear dynamical systems, semiconductor physics and MP3 player design in the electrical engineering department.

Beginning in the fall, I have been taking the full medical school course load as I am doing a special program called Masters of Medicine (MoM) in addition to my master's and Ph.D. in bioengineering. MoM is designed to enable a select few researchers to broaden their knowledge of human biology, physiology and anatomy.

In parallel to coursework, I spent a lot of time during the year identifying areas of interest for my thesis in bioengineering. While still ongoing, this search led me to work on a microfluidics project to analyze insect hemolymph and on a high resolution, positron emission tomography (PET)-based clinical scanner for detection of breast tumors. As part of the search and to further broaden my horizons, I also attended 2-3 seminars and conferences per week in areas ranging from cancer biology and myocardial regeneration to robotics and medical imaging.

Last but definitely not least, I had my first full-blown teaching experience as a teaching assistant for Karl Deisseroth's Systems Physiology and Design course intended for bioengineering juniors at Stanford.

Kalman A. Katlowitz

Krista M. Kirievich

David E. Korenchan

Matthew R. LaRue

I really enjoyed this experience as it reinforced my own learning and re-infused me with the passion for research and a career in academia: I spent hours designing new problems for exams and problem sets to teach new MATLAB skills to students in the context of the latest scientific literature. I interacted a lot with students through review sessions, discussion groups and lectures.

With the next academic year round the corner, I am looking forward to more medical school and bioengineering coursework, and new research rotations and teaching positions.

Kalman A. Katlowitz, NY I '12
Nagel Fellow No. 15

As an M.D./Ph.D. student at NYU, I am offered the opportunity to straddle both the research and treatment sides of medicine. Last summer, I began examining how cooling the cortex of the brain locally could change the temporal dynamics of various thalamocortical patterns. I then continued with a year of medical school courses, studying everything from anatomy to biochemistry. Far more than rote learning, we had the opportunity to put what we learned into practice. Every week my classmates and I would have the opportunity to interact with patients. We would treat, watch, listen, and learn what it means to be a doctor from the patient's perspective.

This summer I am back studying neuroscience, investigating the spatial relationships of the neuronal assemblies responsible for voice production in both humans and songbirds. This knowledge will provide insight into the encoding of learned movements.

All of this comes together for my career goals. I truly believe that the next frontier of medicine will be in refining the human body, not only to replace what is lost but also to enhance what is already present. With a dual degree as both a physician and a researcher, I will be able to treat and improve my patients. I use my engineering background every day; whether it is encoding custom algorithms to process voice snippets or even simply calculating the torque on a ligament during a sports injury, it is thanks to my engineering background that I can do what I love.

Krista M. Kirievich, OH B '12
Stark Fellow No. 35

In spring of 2012, I graduated from the University of Cincinnati (UC) with a bachelor's degree in aerospace engineering. During five of my undergraduate co-op quarters, I worked at General Electric Aviation in Evendale, Ohio, in various engineering roles. As an undergraduate, I participated in several research projects including supersonic inlet flow control and wind turbine computational fluid dynamics (CFD) studies. My co-op rotations at GE Aviation combined with my coursework and research spurred my interest in fluids and propulsion. Thus, my research focus for my master's degree is aircraft propulsion and turbomachinery.

For my master's thesis, I have been researching improved CFD methods to aid in compressor off-design modeling. My research project's main objective is to develop an efficient design/analysis CFD method in order to include unsteady flow effects into turbomachinery design. Because of the importance of unsteady effects in compressor near-stall conditions, there is a need to model unsteadiness in compressor CFD simulations. However, full unsteady CFD simulations of turbomachinery are computationally very expensive. Thus, a more efficient method to model unsteady behavior in turbomachinery is desired. My proposed method involves numerical simulations of compressor stages where the stator domain is run as a steady flow and the adjacent downstream rotor domain is modeled using an unsteady approach. Thus, this method is referred to as the mixed-multistage (MMS) technique. I performed various MMS simulations of the low-speed research compressor (LSRC) stages to determine the accuracy, efficiency, and feasibility of the technique by comparing them to experimental data and other baseline CFD simulations at design point and near-stall conditions. Through my research, I hope to reduce the computational time and power required for turbomachinery analysis while maintaining robust performance prediction capabilities.

Currently, I am completing my thesis writing and have accepted a position at GE Aviation in their Edison Engineering Development Program.

David E. Korenchan, IL A '12
Matthews Fellow No. 15

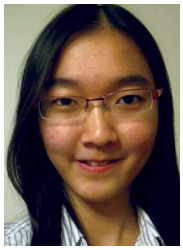
This year, I entered the joint Ph.D. program in bioengineering at UC Berkeley and UCSF. Aside from taking courses in transport phenomena, micro/nanofluidics, immunology, and business fundamentals, I performed rotations in four different labs. During my rotations, I studied the influence of micropost geometry on fibroblast proliferation, measured polyacrylamide microgel pore size via spherical nanoparticle electrophoresis, and fabricated a microfluidic xenon-129-based biosensor for multiplexed detection of protein targets.

At the end of the spring semester, I joined a lab that uses hyperpolarized carbon-13-labeled metabolites in conjunction with MRI techniques in order to identify and characterize prostate tumors within the body. I am currently developing new metabolite probes for use in evaluating the efficacy of novel cancer therapeutics.

My experiences thus far at UC Berkeley and UCSF have been very rewarding. After a whirlwind journey through several different research areas, I finally honed in on a subject I am passionate about pursuing. My research with in vivo carbon-13 imaging has many relevant clinical applications, and directing my research toward the clinic gives me a great sense of motivation and personal fulfillment. In addition, the students and faculty I have met at both institutions have made excellent colleagues and fantastic friends. Through them, I have encountered a tremendous amount of learning and individual development this year.

Matthew R. LaRue, IN Δ '12
Tau Beta Pi Fellow No. 796

During my first year of graduate study in electrical engineering at The Ohio State University, I have undergone the significant transition between undergraduate and graduate school. My coursework has focused on developing an understanding of designing RF, digital, analog, and mixed-signal integrated circuits. Subsequent years will focus on semiconductor device fabrication, electromagnetics, and antenna design. My research, under the direction of Dr. Waleed Khalil, has involved the development of the digital backend for novel phased-array antenna architecture. This work has culminated in several publications, as well as a best paper award at the SDR WInnComm 2013 Conference.



Yoke P. Leong

John R. Lewandowski

Kaitlyn F. Mallett

Andrew D. Matsumoto

My current research is exploring high-efficiency transmitter technologies, specifically linearizing switch-mode power amplifiers for use in ultra-wideband transmitter systems. Upon completion of my master's degree in fall 2013, I will continue this research at Ohio State while I pursue a Ph.D.

I am also the recipient of the NASA Space Technology Research Fellowship. Through this fellowship, I have had many exciting opportunities to work with the NASA research community, including an internship at the NASA Goddard Space Flight Center. These experiences have helped me further enhance my knowledge of RF systems and their operation in the extremely unique and harsh space environment.

Thanks to Tau Beta Pi for supporting both me and other new graduate students as we pursue higher education in the engineering fields.

Yoke P. Leong, IL Γ '12
Williams Fellow No. 33

In October 2012, I started my graduate program in control and dynamical systems at California Institute of Technology. I passed my qualifying exam in January 2013 and completed most of my course requirements in my first year of graduate school.

This year, I took advanced mathematics and control classes to strengthen my background for future research. Next year, I will be taking classes that are immediately relevant to my research area.

This spring term, I worked on a class project that involved synthesizing localized controllers to achieve localized disturbance effects for distributed systems. I learned from my teammate, who has a different undergraduate background, new methods to approach and solve the problem. Through this project, I sharpened not only my analytical skills, but also improved my ability to communicate technical concepts to people with different backgrounds. The results of this project intrigued my research adviser, and he encouraged us to further pursue the problem.

Starting this summer, I am working with Professor John Doyle and Professor Joel Burdick on a research project that applies control theory to neuroscience. Specifically, I am trying to understand the posture balancing mechanism of the human nervous system from a control engineer's perspective. Eventually, with a better understanding of this mechanism, we hope to design prosthetics and physical therapies that can better assist injured people to regain their abilities to balance, stand and walk.

John R. Lewandowski, OH Α '12
Anderson Fellow No. 6

In the past year, John Lewandowski completed his master's degree in one year at CWRU and successfully spun off his research into one of the most promising companies in the country. After identifying that malaria parasites release a magnetic biomarker when they digest red blood cells, John was able to miniaturize the technology into a portable, handheld device that quantifies the amounts of parasites in the blood by the level of light transmission through the blood sample. He experimented with several different magnetic fields, optical configurations, and electro-optical optimization techniques to ultimately increase the signal-to-noise ratio. Now equipped with just a laser pointer, simple optical components, and a small rotating magnetic armature, the device accurately diagnoses malaria in less than one minute and at 100x the detection level of competing diagnostics. John also took advantage of previous research knowledge and experts in other disciplines to build the firmware and circuit board for the device so that it is truly stand-alone. Utilizing the School of Medicine at CWRU, the research group tested infected patient samples and has submitted the excellent results to Nature Biotechnology.

John has continued to refine the technology this summer to produce a more advanced model and plans to build the company further during his Ph.D. work. The Rapid Assessment of Malaria (RAM) device plans to enter field trials in Peru after a significant grant was awarded to the research group just recently. This work has led John to actively look for more technologies that could be adapted to low-resource and high-constraint settings and have a large social impact while adding to the scientific community.

Kaitlyn F. Mallett, MI Ι '12
Spencer Fellow No. 57

I have spent the past year working on my Ph.D. in mechanical engineering at the University of Michigan. My research is in the field of biomechanics, and I focus on characterizing the mechanical properties of the anterior cruciate ligament (ACL), a key stabilizer of the knee joint. ACL replacements are among the most common knee ligament invasive procedures, and many patients who have undergone these surgeries have experienced long-term detrimental effects, including ruptures of the replacement tissue and the development of early onset osteoarthritis. These complications pose a major challenge to health care professionals. My work investigates the stress and strain behavior of the ACL in diverse situations, in order to develop computational material models that will be able to simulate and predict the response of the replacement tissue, aiding us in the development of accurate constitutive models and selection of appropriate replacement options.

I continue to be active in Science Olympiad, a competition that fosters science and engineering for middle and high school aged students. I have had the privilege of volunteering for the past five years as an event supervisor for mousetrap vehicle, where students construct and race cars that run solely on the energy provided by two mousetraps. Through this event, students are exposed to the fun and fascinating nature of engineering, it is my hope that my participation will help to inspire them to consider a STEM field in the future. It is my goal to work in industry or for a government laboratory after earning my Ph.D.

Andrew D. Matsumoto, WA Δ '12
Deuchler Fellow No. 32

I would like to begin by thanking the Fellowship Committee for selecting me as a Tau Beta Pi Fellow for the 2012-2013 academic year. This past year has been a time of transition for me. It began in May 2012 when I graduated from Gonzaga University with a B.S. in civil engineering. During the summer of 2012, I presented at the International Water Association's Young Water Professionals Conference in Budapest, Hungary. My talk focused on the development of a sustainable, low-cost ceramic water filter I helped design as a component of my undergraduate senior design project.

Sarah E. McCandless

Christopher C. McComb

Timothy M. Moeller

Jeffrey D. O'Brien

In August, I moved from Washington to North Carolina and started classes in the civil and environmental engineering doctoral program at Duke University. My coursework focused on environmental process engineering with classes in aquatic chemistry, microbiology, drinking water and wastewater treatment, and isotope geochemistry. I am currently working in the lab of Dr. Heileen Hsu-Kim on a Duke Superfund Research Center project to develop remediation strategies for brominated flame retardants and other environmental contaminants.

This spring I was awarded a National Science Foundation Graduate Research Fellowship to cover expenses for three additional years of graduate study. The last year has provided me with many opportunities for personal and professional growth, and I look forward to successfully tackling the challenges of graduate school in the coming years.

Sarah E. McCandless, KS A '12
Fife Fellow No. 159

This year, I began my graduate studies at the University of Texas at Austin, continuing to study aerospace engineering. The fall semester is coursework intensive; however, I performed a detailed weather analysis for the McDonald Observatory in Jeff Davis County, Texas. This contributes to information necessary to convert McDonald into a national geodetic observatory, which aids in coastal hazard planning.

During the spring semester, I began analyzing Texas coastal lidar data. Lidar refers to light detection and ranging, and it is an active remote sensing technology that operates in the near infrared spectrum. Lidar uses laser light to measure distances to a target (generally the ground), and this data can be organized into a point cloud. From this, a digital map of the surface (ground, vegetation, buildings) or the terrain (the bare earth without any vegetation or buildings) can be created. These digital models can then be used for a variety of purposes ranging from land use monitoring to hazard planning.

In this application, I am evaluating the quality and validity of currently available lidar data sets, particularly investigating inherent bias, tilts, and temporal trends. This information is used to evaluate the accuracy of reported topography and bathymetry maps, which is used in coastal hazard planning.

Over the next year, I will maintain my appointments at the Applied Research Laboratory and University of Texas Center for Space Research to continue my work with lidar. This is a rapidly developing field, and I am excited to be a part of it.

Christopher C. McComb, CA P '12
King Fellow No. 51

During the past year, I have been enrolled in a doctoral program in mechanical engineering at Carnegie Mellon University. Under Dr. Jonathan Cagan (mechanical engineering dept.) and Kenneth Kotovsky (Psychology dept.), my research has focused on understanding how teams of engineers respond to changing problem statements. In April, I was awarded a National Science Foundation Graduate Research Fellowship to continue this line of research. Eventually, I plan to develop methods that will assist engineers in responding quickly and effectively to changes.

In addition to research, I have completed coursework in traditional mechanical engineering fields. I also completed an introductory machine learning course, which has encouraged me to pursue a secondary master's degree in the subject. I have also continued my involvement in Tau Beta Pi. Soon after arriving at Carnegie Mellon I was invited to serve as an advisor for the local chapter, PA-G. In May, I began serving as a District 3 Director, providing guidance and assistance for chapters in Western Pennsylvania.

Following my graduate work at Carnegie Mellon, I plan to become a professor, combining my interests in mentoring, teaching and research. As a professor, I want to further explore the way that teams function by delving into the interplay between the diversity of a team's members, the structure of the team, and individual creativity.

Timothy M. Moeller, IN Γ '12
Tau Beta Pi Fellow No. 797

I am pursuing a master of science in aerospace engineering at the Georgia Institute of Technology, as part of the Space Systems Design Laboratory. In my first year, I focused on coursework, completing the majority of my course requirements. Subjects that I have studied include orbital mechanics, optimization methods, spacecraft design, kinetics and thermodynamics of gases, and aerospace systems engineering. In the fall semester, I was also a TA for the undergraduate experimental fluid dynamics lab. I guided undergraduate students in conducting experiments and in processing data.

My advisor, Dr. Alan Wilhite, resides at the National Institute of Aerospace (NIA) in Hampton, VA, as the Langley Professor from Georgia Tech. In May, I moved to Hampton, where I will complete the remainder of my studies for my master's degree at the NIA while working with NASA Langley Research Center. I have begun working with the structural and thermal systems branch at NASA Langley on thermal analysis for the stratospheric aerosol and gas experiment III (SAGE III) on ISS project.

So far, I have worked on a variety of tasks for SAGE III, including sensitivity analysis, analyzing robustness in heater failure cases, and determining worst-case orbits. I plan to finish my M.S. in May 2014, and then pursue a career designing vehicles and systems for human spaceflight.

Jeffrey D. O'Brien, IN Γ '12
Arm Fellow No. 4

Since receiving my nomination as a ΤΒΠ Fellow, I have graduated from Notre Dame and begun my graduate career in mechanical engineering at Stanford University. In addition to coursework, I perform research in the field of computational fluid dynamics as a part of the Center for Turbulence Research.

I am co-advised by Dr. Parviz Moin and Matthias Ihme. My research so far has been concentrated in two key areas: 1) the study of subgrid-scale backscatter in turbulent, supersonic reacting flows which is relevant to the advancement of large eddy simulation and 2) heterogenous modeling, the combination of traditional continuum-based models with molecular dynamics to reduce modeling error in reactive flow CFD and extend existing methods to novel fuels.

I will be completing my master's degree in the spring of 2014 and will be continuing on to pursue a Ph.D. I eventually hope to obtain a position in industry as a computationalist, developing CFD codes for reacting flows.

Yichao Pan

Daniel J. Preston

Robert A. Sinko

Joshua L. Solomon

Yichao Pan, IN Γ '12
Tau Beta Pi Fellow No. 798

After graduating from the University of Notre Dame, I started pursuing a master of science degree in mechanical engineering at the Massachusetts Institute of Technology in September of 2012. I have been doing research in the development of a pipe-crawling robot for water pipeline network discovery in the Biomimetic Robotics Laboratory directed by Professor Sangbae Kim. The project is sponsored by the Kuwait-MIT Center for Natural Resources and the Environment.

During the first year of graduate school, I took several advanced classes in linear algebra, bioinstrumentations, system identification, and controls. I learned how to use a 3D printer, CNC mill, laser cutter and other handy prototyping and manufacturing equipment. I have developed several prototypes of reversible underwater adhesion system which will be implemented on the robot. A conference paper has been published on this project.

In addition to research and course work, I am involved in a few extracurricular activities. I am one of the core members of MIT-China Innovation and Entrepreneurship Forum, which provides an interactive platform between China and innovators in America. I am also a member of Any Student Any Dream. We hope to reduce educational inequality in China by raising funds to support underprivileged children who cannot afford fundamental education.

I expect to receive my master's degree by July 2014 and plan to apply for Ph.D. programs in robotics to continue my studies at MIT. In the following year, I will complete the course requirements and prepare for the Ph.D. qualifying exam while conducting research.

Daniel J. Preston, AL B '12
Hanley Fellow No. 8

I graduated from The University of Alabama in May 2012 with a BS in mechanical engineering and started research over the summer term at MIT's Device Research Laboratory under Professor Evelyn Wang. Currently, my research is focused on the removal of droplets from superhydrophobic surfaces during condensation by the coalescence mechanism, or "jumping." During jumping condensation, droplet shedding radii are smaller than dropwise condensation as droplets jump from the surface during coalescence due to the conversion of surface energy to kinetic energy. These jumping superhydrophobic surfaces have enhanced heat transfer up to 30 percent compared to state-of-the-art dropwise surfaces.

Unfortunately, methods to create industrially compatible superhydrophobic condensing surfaces are rare and often not scalable. I have investigated scalable zinc oxide nanowires and copper oxide nanoblades grown in the lab with various hydrophobic coatings to harness superhydrophobic jumping condensation on steel, titanium, aluminum, and even plastic substrates. I've also studied the effect of vapor flow entrainment on droplet jumping and the enhancement of droplet removal through application of an electric field. These efforts have led to multiple accepted abstracts for conference presentations and several papers in review. My future work focuses on heat transfer improvement for condensation of low surface tension fluids such as refrigerants.

While at MIT, my coursework has also been very enriching. I have taken courses in fluid mechanics, heat transfer, mathematics, and interfacial phenomena, with plans to take thermodynamics and another mathematics course next fell. The rigor and level of competition have supplemented my research efforts greatly. Aside from coursework and research, I've volunteered my time giving presentations on wetting science to high school students, mentoring undergraduates working directly under me in my lab, and serving as a big brother with Big Brothers Big Sisters Massachusetts Bay. pursuing my Ph.D.

Robert A. Sinko, OH Ξ '12
Tau Beta Pi Fellow No. 799

This past year, I began my first year of graduate studies towards my Ph.D. in the mechanical engineering department at Northwestern University. Most of my time and effort thus far has been primarily dedicated to completing required coursework for our program, as I have taken a number of classes heavily focused on computational mechanics and multi-scale modeling. In addition, I have also started working with Professor Sinan Keten on a number of interesting research projects that we are continuing to develop and will ultimately shape my Ph.D. dissertation topic. Broadly, the members of our lab, myself included, look at biological and biologically inspired systems at the nanoscale using computational nanodynamics tools (i.e. molecular dynamics (MD) and Monte Carlo (MC) simulations).

More specifically, my projects thus far have focused on understanding the complex interactions between different components of nanocomposites, while trying to better understand the importance of both interfaces and interphase regions (region of the host/matrix material influenced by the presence of a filler material) at the nanoscale. I have used a simple coarse-grained lattice model to understand the influence of this interphase region, and am now transitioning into fully atomistic simulations of polymer thin films and crystalline cellulose to further understand these phenomena. The ultimate goal is to use the findings from our simulation to develop design principles for new and improved nanocomposites.

As a result of these projects and proposed future work, I was awarded a National Defense Science & Engineering Graduate (NDSEG) Fellowship for the next three years to provide funding and specifically investigate cellulose-based nanocomposites. Upon completion of my Ph.D. program, I hope to remain in academia and pursue teaching and research opportunities in the field of mechanical engineering. I'm very excited to continue working on my current research and want to thank ΤΒΠ for their support.

Joshua L. Solomon, TN Z '12
Fife Fellow No. 161

This past year I have been attending Hochschule Esslingen in Germany to obtain a master's degree in design and development in automotive and mechanical engineering. During the past six months I have been developing new standards for life cycle assessment of carbon fiber reinforced composites under shear loading.

I have nearly completed all of my course work and am preparing to begin my thesis. My goal of working for one of the infamous German automotive giants will come true when I begin my master's thesis at Daimler (Mercedes-Benz) in October. There I will be researching the joining of aluminum car bodies using laser welding,

Dmitriy Timerman

Jeffrey B. West

Craig M. Western

Matthew A. Williams

Besides my education, I have immersed myself into the German culture. I am slowly learning more of the language, which is sometimes nearly as difficult as my engineering studies. I have celebrated many of the world famous German holidays, such as Oktoberfest and Frühlingsfest with my diverse group of friends from the international master's program. I have also been fortunate enough to explore much of Europe.

In the past year, during whatever free time I have from school, I have traveled throughout Germany, Switzerland, and France. After I finish my degree, I hope to return to the U.S. to find employment in the automotive sector. My aim is to enhance the lightweight design of future cars.

Dmitriy Timerman, NY A '12
Fife Fellow No. 162

During the past year as a Tau Beta Pi Fellow, I had the opportunity to study at the joint Harvard-MIT Health Sciences and Technology (HST) program. I graduated from Columbia University and moved from New York to Boston and am greatly enjoying the academic environment. The coursework has been challenging, yet exciting.

During the spring semester, I began working at the Wellman Center for Photomedicine, a research center affiliated with Massachusetts General Hospital, on a novel application of photodynamic therapy to treat cancer. Essentially, patients with certain cancers can receive a light-activated drug that will preferentially localize to the tumor region. Following exposure to light, the drug will produce radicals that will damage the nearby vasculature and cancer cells, without causing harmful effects elsewhere in the body. Surgeons can use this technology to identify the exact location of malignant tissue, resect it, and then perform photodynamic therapy to destroy the remaining cells and reduce the incidence of relapse. The project is intellectually stimulating and demands an understanding of cancer biology, clinical imaging, and biomedical engineering.

While my optical imaging background has been particularly useful, I have had to learn new laboratory methods to be able to contribute to the field of photodynamic therapy. The ΤΒΠ Fellowship has been instrumental in allowing me to focus on my schoolwork and research studies. As I progress in my graduate work, I intend to work at the intersection of biomedical engineering, translational medicine, and imaging technology. I am very grateful for the fellowship and support from ΤΒΠ.

Jeffrey B. West, OH I '12
Tau Beta Pi Fellow No. 800

During the past year, I've served as a teaching assistant for a course called Mechoptronics, a lab course combining material from mechanics, electronics and optics. To better prepare for my career goal of becoming a professor, I had the opportunity to teach one lecture for the course, as well as help answer questions during lab sessions and office hours.

I've been working in the field of computational biology to develop a model of prostate cancer with the help of advisors Paul Newton. Ph.D., and Paul Macklin. Ph.D. Using autopsy data to inform model parameters for cancer metastasis, we can combine a macro view of the spread of cancer with the micro view of cell-cell interactions using various computational fluid mechanics approaches.

Craig M. Western, CA Δ '11
Forge Fellow No. 1

I have spent the past year at Stanford University working toward a master's degree in mechanical engineering and exploring Ph.D. level research opportunities. My focus is in robotics and mechatronic systems design, and I aim to integrate image processing and control systems into my long-term research plans.

During fall and winter quarters, I developed a proof-of-concept for a low-cost, single-transducer volumetric ultrasound probe with potential application as an affordable handheld device for on-site ultrasound imaging. The project was conducted in Professor Ken Salisbury's Bio-Robotics Lab as part of a novel telerobotic system designed to prevent damage to healthy tissues during radiation therapy - a technology currently being commercialized by SoniTrack Systems. In spring quarter I began research in Stanford's Aerospace Robotics Lab under Professor Steve Rock. In this position I explored low-altitude autonomous aerial surveying and developed software to stitch together images of the Earth gathered using a UAV. My work has the potential for application in image-based localization of autonomous aerial and underwater vehicles. The experience gained through my first year in graduate school has led to a summer internship at SpaceX, where I am currently working on development of the manned *Dragon* capsule.

I am honored to have served as a Tau Beta Pi Fellow and extremely grateful for the opportunities that the fellowship has provided. In addition to opening doors to research positions, the Fellowship paved the way for my being awarded a National Science Foundation Graduate Research Fellowship to begin this coming year. With this support I plan to move forward in pursuit of a Ph.D., hoping ultimately to find a position in R&D as part of a small tech company.

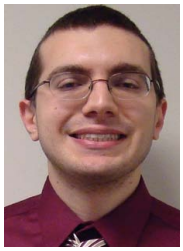
Matthew A. Williams, KS A '12
Fife Fellow No. 163

Over the last year, I have been working towards the completion of my master's degree in mechanical engineering from the University of Illinois at Urbana-Champaign. During the summer of 2012, I joined the Alleyne Research Group which focuses on systems and controls engineering.

My current research focuses on dynamic modeling and control of multi-physic and multi-time scale interconnected systems in an attempt to better characterize their behavior and improve simulation accuracy and speed. Systems of this nature often contain sub-systems that are designed and optimized in an isolated environment prior to complete system assembly. However, this optimization does not guarantee global optimality for operation of the entire system, and when the systems can be multi-million or multi-billion dollar investments then accurate modeling, simulation, and control are vital to the design of these systems.

In spring 2013, I was awarded the National Science Foundation Graduate Research Fellowship. This funding will help me continue my work as I pursue my Ph.D. in mechanical engineering. After completing my Ph.D. dissertation, I hope to work in an energy related field with the goal of increasing efficiency, decreasing operating costs, and improving societal life. Eventually I would like to move into a leadership role, or start my own company. I also hope to donate my free time and engineering skills to improving the life quality of those less fortunate.

Most of all, I would like to thank all those who helped make this opportunity possible, and especially to the benefactors of the ΤΒΠ Fellowship for their generosity and support of the next generation of engineers and scientists.



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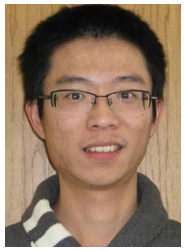

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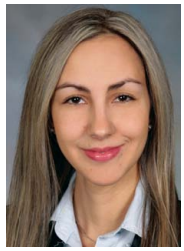

Luz A. Zidziunas

Vahagn F. Yeranossian, OH A '12
Tau Beta Pi Fellow No. 801

This past year, I began my graduate studies at the chemical engineering department at UC Santa Barbara. I am working with Professors Brad Chmelka and Matt Helgeson on using nanoemulsions (a liquid-liquid dispersion with droplets between 20-200nm in diameter) as a platform for decoupling material synthesis chemistry from self-assembly physics. We seek to create and understand techniques that use nanoemulsions to make novel materials.

For instance, my first project revolves around creating anisotropic nanoparticles (nanoparticles with geometries other than a sphere) using nano-sized droplets as nanoreactors. This is very difficult for noncrystalline material, but could have many advantages in catalysis, biological sensing, and chemical-mechanical polishing. Additionally, being able to control multiple dimensions of the nanoparticles (i.e. diameter and length of rods) from a single technique would be ideal. Thus, I aim to use nanoemulsions to decouple nanorod length growth, which is controlled by synthesis, from the diameter growth, which is controlled by nanoemulsion properties.

I have been working diligently to develop this technique and understand the mechanism behind it. I have been able to show that my system does grow anisotropic amorphous particles, but I must spend time to analyze the degree of control over the dimensions and to improve the reproducibility. Once I have a mechanism that works, I will do experiments to elucidate the mechanism so when I present this method to the scientific community, I can provide ample support for my hypotheses.

This summer, I have started working on some other projects as well with post-doctoral and visiting students. These projects involve creating novel porous materials with three distinct pore size regimes, and understanding how particle growth affects the droplet properties. These projects will help show the capability of nanoemulsions to create many different novel materials while working to understand the mechanisms involved in these processes.

Yifan Zhang, WY A '12
Fife Fellow No. 164

This past year, I have been working on my M.S. degree in geology at University of Wyoming. My research focuses on the inverse modeling of fractured aquifers and hydrocarbon reservoirs. This research is exciting because fractured geological formations are ubiquitous and are important in water exploitation, petroleum reservoir exploitation, contamination from subsurface waste repositories, and mining processes. The motivation for this study is economic resource evaluation and production, as well as worldwide concerns about radioactive waste isolation and migration. This research can improve the theory to accurately describe fracture flow phenomena and thus enhance the ability to optimize water and hydrocarbon production, as well as protect public environment, safety, and health.

The traditional inversion method requires assumption of boundary conditions of geological formations, which are usually unknown. The assumptions can lead to nonuniqueness of inversed results, thus severely influence reliability of the conclusions. My advisor Dr. Ye Zhang has developed a new inversion theory. This method can obtain unique results and do not require the information of boundary conditions. I have been working to apply the theory on fractures and have already proved its validity on two-dimensional fractured geological formations.

Next year, I will spend some time at Los Alamos National Laboratory for data quality and sensitivity studies. After I finish my degree, I hope to work in the oil & gas industry to help ensure the energy support of the society.

Luz A. Zidziunas, NJ Γ '11
Tau Beta Pi Fellow No. 802

It has been an exciting year starting my graduate studies in earth resources engineering at Columbia University in New York City. The program focuses on the environmentally sound processing of Earth's primary materials: energy, water and minerals and in the proper disposal of used materials. I have taken fascinating courses such as air pollution prevention, control and sustainability in which we developed engineering models for the prevention of pollutant dispersion understanding the local, regional and global issues that affect environmental policies. One of the models we developed was the dispersion of chemical hazards using a software called ALOHA developed by the Environmental Protection Agency and by National Oceanic and Atmospheric Administration. With this program we studied different scenarios of chemical releases interpreting the results and drawing consequences that can later be used by emergency responders and planners. Projects like this have given me an insight of different research areas I can choose for my thesis, which I'll be starting soon.

I am very proud to be a Tau Beta Pi Fellow and I would like to thank once again the organization as well as all the people that made this accomplishment possible, including my professors at my beloved alma mater New Jersey Institute of Technology. I plan to continue to excel in my career and to honor the Tau Beta Pi creed of Integrity and Excellence in the Engineering profession.