2015 Fellow Reports

The reports of Tau Beta Pi's 81st Fellowship Program and the 2014-15 Fellows are presented here. The reports constitute the only specific obligation to the Association after being appointed by the Fellowship Board. Their reports were written in April, and the verb tenses may sound wrong when read later.

The 25 Fellows, and one deferred, received a cash stipend of $10,000 for a year of graduate study, totaling $250,000. Each of the recipients expresses appreciation to advisors and 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.

Amber L. Kapoor (Butcher)

Margaret P. Chapman

Jacob M. Clary

Ashley M. Coates

Amber L. Kapoor (Butcher), TN Γ '13
Arm Fellow No. 6

During my year as a ΤΒΠ Fellow, I completed my first year of graduate school at the University of Oklahoma in the school of aerospace and mechanical engineering. This year I focused on my coursework and master's thesis research in the Building Energy Efficiency Laboratory. The courses in which I enrolled centered on HVAC design and numerical methods for heat transfer and fluid dynamics. For my thesis research, I am investigating HVAC fan fault detection and diagnosis methods using virtual meter technology. I will continue working on my thesis over the summer through next year and will begin my Ph.D. in the fall of 2016.

A significant highlight of the past year was my selection as an NSF graduate research fellow. I am honored to receive this fellowship and I know my involvement in Tau Beta Pi contributed significantly to my achievement. I will use my NSF fellowship as funding for my Ph.D. and plan to continue my research at a national laboratory after I graduate. I would like to thank Tau Beta Pi for the support I have received through my fellowship and all the other opportunities which have been available to me.

Margaret P. Chapman, CA Γ '12
Williams Fellow No. 35

This past year, I started my Ph.D. studies in electrical engineering & computer sciences at UC Berkeley. I have focused my efforts on research at the intersection of systems biology and mathematics, required coursework, and appreciating life in the Bay Area.

I am very happy to have found an advisor and a research group that I truly enjoy. I am working with Professor Claire Tomlin, a renowned expert of control theory, an outstanding teacher, and a mentor. We use tools from many fields – optimization, machine learning, control, etc. – to understand and ultimately model the dynamic behavior of biological systems. In particular, I am investigating clustering methods to reduce the dimensionality of a protein network in breast cancer cells. In addition, we have used recursion and probability theory to model viral replication. I find the mathematical methods & theory both challenging and exciting; the applications are important, and the process of solving math problems can be quite beautiful.

Outside of research, I have strengthened my theoretical background, become a mentor, and enjoy Bay Area life. Classes in linear/nonlinear systems, real analysis, and convex optimization have improved my ability to think in abstract ways, to write rigorous proofs, and to apply various problem-solving techniques. I am mentoring an undergraduate student majoring in electrical engineering; we meet regularly to discuss classes, research, and daily joys/challenges.

I am very thankful for the support I have received from the TBP Fellowship Program, UC Berkeley, and the National Science Foundation. Granting a student the flexibility to study any topic of her choice is the most wonderful gift. In the future, I hope to give back as much as I am able and become a professor or researcher in academia.

Jacob M. Clary, AL Α '14
Fife Fellow No. 183

During the past year, I entered into the Ph.D. program in chemical engineering at the University of Colorado at Boulder. Following this, I successfully completed the initial graduate classes that provide the knowledge base for topics I have started to explore in more detail in my research. At the same time, I also served as a TA for undergraduates in our department and held weekly recitation sessions to provide assistance with their class material. At the end of that semester, I began working under the direction of Al Weimer and Charles Musgrave on my Ph.D. project in the field of catalysis.

This project centers on exploring the inner workings of catalysts for Fischer-Tropsch synthesis and has been my main focus during the second half of the year. Fischer-Tropsch synthesis is a highly complex reaction that allows for the conversion of carbon monoxide and hydrogen into more valuable long chain hydrocarbons. The catalysts we are interested in have the potential to outperform current catalysts and so studying them could provide important new clues as to how this reaction proceeds. So far, I have learned and begun to implement fundamental computational methods and experimental techniques such as atomic layer deposition to determine the behavior of these Fischer-Tropsch catalysts. In the future, this reaction will be employed in a larger process that aims to prevent large scale flaring of excess natural gas from oil wells into the atmosphere.

Ashley M. Coates, CA Λ '14
Fife Fellow No. 184

Following graduation from UC Davis, I spent the summer at NASA Johnson Space Center using computational fluid dynamics to model heating environments for ascent and reentry of the Orion spacecraft. In the fall, I began work on my master's degree in aeronautics and astronautics at Stanford University. My time has been mostly focused on completing the required coursework. It has been exciting to have access to so many different types of courses. I have especially enjoyed furthering my studies in computational mathematics, which I can apply to aerospace problems.

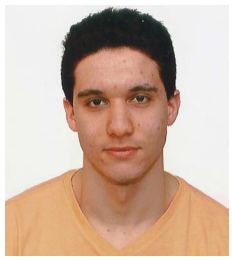
In addition, I have started working on a research project. I am looking at the coupling of a material thermal response code and a computational fluid dynamics code for predicting ablation on hypersonic vehicles. I plan to work on this research through the summer and use it as the starting point for my Ph.D. Next year, I will finish my master's and continue with my Ph.D. at Stanford doing research related to computational fluid dynamics.

I have also become involved with the Stanford Young Astronauts program that involves visiting local elementary schools and presenting lessons related to aerospace engineering. Youth outreach is very important to me and this program allows me to continue to promote youth involvement in the STEM fields.

I am grateful for the support from Tau Beta Pi during my first year in graduate school and I am excited to continue my studies and start making meaningful contributions in the field of aerospace engineering.

Thank Do Ngoc

Christopher M. Douglas



Youssef M. Elkady

Kyle R. Embry

Thanh Do Ngoc, CA Φ '12
Tau Beta Pi Fellow No. 805

I am pursuing a Ph.D. in structural engineering at University of California, Berkeley. This has been an incredibly productive year. During this time, I have completed the majority of my coursework requirements, gaining significant teaching experience, and actively conducting research. The courses cover a wide spectrum of structural engineering, computational mechanics, and mechanical engineering. I particularly enjoyed courses such as nonlinear structural analysis, structural mechanics, linear and nonlinear finite element, and theory of plasticity. I have also been serving as a graduate student instructor for two graduate-level courses. Teaching truly brings me joy. The experience has once again supported my desire to go into academia upon completion of my graduate study.

I have also been actively conducting research. My work has been focused on developing numerical models in finite element and simulations of structures under extreme loading conditions. The research has been very challenging; however, it is also enjoyable and rewarding. This summer, I will be involved in a research program at UC Berkeley in which I will mentor an undergraduate student conducting a research project in structural engineering.

Next semester, I am planning to take the qualifying exam. After that, I will devote my effort to teaching and research. Upon completion of my degree, I would like to pursue a career in academia or at a research laboratory. I am very grateful and privileged to have received the ΤΒΠ Fellowship. This support has placed an immense impact on my career. I could not have achieved all these accomplishments without Tau Beta Pi's support.

Christopher M. Douglas, IL Δ '14
Anderson Fellow No. 8

After graduating from Bradley University with a B.S. in mechanical engineering and a minor in mathematics, I began my graduate studies at the Georgia Institute of Technology in pursuit of a Ph.D. With the support of the ΤΒΠ Fellowship, I had the privilege of joining Professor Timothy Lieuwen's group to study unsteady combustor physics with a focus in hydrodynamic stability theory.

Hydrodynamic instability plays a crucial role in a problematic feedback loop in many combustion systems by linking acoustic fluctuations to flame dynamics. This coupling mechanism leads to unsteady heat release and, if uncontrolled, may result in system damage or destruction. However, current modeling capabilities for hydrodynamic stability analysis are severely limited and only permit accurate reduced-order modeling under idealized conditions in simple geometries without acoustic forcing.

Thus far, I have focused mostly on coursework, literature studies, and preliminary research tangentially related to my main emphasis. This summer, I will travel to the U.K. to apply my preliminary work to advanced hydrodynamic stability analysis techniques as part of my advisor's collaborative research effort with Cambridge Univ. Professor Matthew Juniper before I return to Georgia Tech to prepare for my qualifying exams in the fall.

In the next few years, I intend to advance scientific understanding of hydrodynamic instability as it relates to unsteady combustor physics, as well as to develop more general hydrodynamic stability analysis and modeling capabilities which will enable researchers to continue to push combustion systems toward the physical limits of efficiency and cleanliness. Overwhelmingly, combustion systems dominate mankind's effort to convert energy into the usable forms necessary to power the modern world, and despite tremendous progress in alternative energy systems, combustion will continue to provide most of our usable energy for the foreseeable future. Some of the largest obstacles facing continued progress in clean, renewable, and high-efficiency combustion result from an incomplete understanding of unsteady phenomena in combustors. Nonetheless, the applications of my anticipated research would extend beyond combustion systems to a broad range of engineering applications including fuel injectors, bio-chemical flow separators, delta wing wakes, and weather models.

Youssef M. Elkady Jr., TX A '14
Fife Fellow No. 185

I am currently pursuing my master's degree in petroleum engineering at Stanford University. The two-year master's program involves an intensive course load as well as a half-time research assistant role. This year I have been more focused on completing my courses to allocate more time for research next year. My courses are primarily focused on understanding the subsurface uncertainties, how the reservoir behaves with time or depletion, and finally ways of optimizing recovery using enhanced oil recovery techniques. However, I have also conducted preliminary experiments that helped me design an experimental setup for understanding fracture behavior of heated oil shale.

Oil shale is a very fine-grained sedimentary rock containing immature oil in the form of kerogen. It is therefore, more challenging compared to the conventional sandstone and limestone reservoirs that already have cooked oil ready to be extracted. This resource is present in 27 different countries across the globe; however, the USGS has estimated 4.2 trillion barrels of oil shale resource in just Utah, Wyoming, and Colorado. The Piceance Creek basin (CO) is considered the richest and thickest oil shale resource in the world with an estimated 1.5 trillion barrels of oil equivalent, which is enough to sustain the USA alone for approximately 120 years, under the current energy demand.

I am thankful for Tau Beta Pi's support and feel honored that ΤΒΠ appreciates my efforts in accomplishing a successful career by granting me this amazing opportunity. My next goal will be to get my MBA from one of the top programs in the country. In doing so, I have applied to Stanford's Ignite Entrepreneurial program this summer as preparation for my long-term goals.

Kyle R. Embry, MO B '14
Fife Fellow No. 186

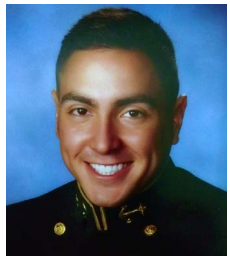
My first year of mechanical engineering Ph.D. studies at the University of Texas at Dallas (UTD) has been equally exciting and challenging. This year, my focus has been on understanding the mathematics behind the control principles I'll be employing for my research. This process has been eye-opening due to the fantastic faculty and mentors I have found at UTD. I have also become a member of student groups at UTD and come to feel more at home in Texas.

As a member of the Locomotor Control Systems Laboratory at UTD, my mission is to develop high-performance lower limb prostheses to enable mobility and improve quality of life for persons with disabilities. My specific goal is to develop more flexible controllers that enable a user to seamlessly transition between different tasks like walking, running, and stair climbing, all without needing to change controller algorithm. I am incredibly grateful to be able to work with a great team on a project with the potential to help millions.

This summer, I'm excited to be working on a collaborative project between Los Alamos National Laboratory (LANL) and Chonbuk National Univ. I'm eager to work again with several of my colleagues from LANL, and to participate in a research project in South Korea. Further down the line, I aim to continue my research in human-robot interaction with a government laboratory or university. I would also like to extend my gratitude to Tau Beta Pi for helping make all of this possible through the graduate research fellowship and for all the opportunities I've been introduced to as a member of ΤΒΠ.

Ernestine Fu

Weston K. Kightlinger



James M. Mackovjak

John P. Mayo

Ernestine Fu, CA Γ '13
Forge Fellow No. 3

It's been an intellectually stimulating and fulfilling year. I co-authored "The State Clean Energy Cookbook: A Dozen Recipes for State Action on Energy Efficiency and Renewable Energy," a report led by former U.S. Senator Jeff Bingaman and former Secretary of State and Treasury George Shultz. The report analyzes and makes specific recommendations regarding 12 policies that states are using today to encourage energy efficiency and renewable energy. The report also analyzes the U.S. Department of Energy's State Energy Program, which assists all 50 states.

I also designed and co-taught a course titled "CEE 144: Design and Innovation for the Circular Economy" with Stanford professor Martin Fischer and author William McDonough. The course builds on multiple concepts: regenerative design, performance economy, industrial ecology, blue economy, biomimicry, and cradle to cradle. It explores these concepts through case studies on consumer products, household goods, and fixed assets.

Weston K. Kightlinger, OK B '14
Lynnworth Fellow No. 9

In September, I began my Ph.D. in chemical and biological engineering at Northwestern University. My focus this year was on choosing an academic advisor, a thesis topic, and pursuing coursework in transport phenomena, reaction kinetics, thermodynamics, and biology. My interests in bioengineering and medicinal research led me to begin working with Prof. Michael Jewett on developing an in vitro glycosylation platform. Glycosylation is the addition of complex sugar moieties to cellular proteins. The majority of human proteins and 70 percent of approved or preclinical protein therapeutics are glycosylated. Despite its importance to protein specificity, pharmacokinetics, and overall therapeutic efficacy, glycosylation is poorly controlled in bioengineering processes because it is driven by a numerous and diverse group of enzymes known as glycosyltransferases. Less than five percent of known glycosyltransferases have been characterized, leading to our lack of understanding of in vivo glycosylation pathways and an inability to produce even preparative quantities of therapeutically relevant, homogeneous glycosylation patterns. In the biopharmaceutical industry, glycosylation heterogeneity has complicated glycoprotein approvals, barred the study of glycosylation structure-function relationships, and increased production costs.

I seek to develop an in vitro platform for the design and production of homogeneous, human-like glycoproteins by measuring the specificities and kinetics of 5,000 previously uncharacterized glycosyltransferases using newly developed mass spectrometry, cell-free protein synthesis, and bacterial glycosylation techniques. If successful, this work will enable us to correlate glycan structure with protein function and streamline the development of life-saving protein therapeutics. Outside the lab, I am a graduate fellow for the Brady Scholar Program in ethics and civic life through which I mentor, teach, and facilitate community service projects with undergraduates. After graduation, I will pursue a career in biotechnology and seek out entrepreneurial opportunities within this rapidly advancing industry. I am grateful to Tau Beta Pi for their generous support of my graduate studies.

James M. Mackovjak, MD Γ '14
Centennial Fellow No. 29

During the past year as a ΤΒΠ Fellow, I have been working towards my master's in philosophy in energy technologies at the University of Cambridge. The program is designed to provide a holistic perspective and grasp on the fundamental research involved in developing practical engineering solutions to meet current and future demand for sustainable and secure energy supply and utilization. The MPhil is centered through numerous courses covering renewable energy technologies, including solar, wind, biomass, tidal, carbon capture and sequestration, and nuclear. In addition, I have taken additional engineering management courses, which offer a non-technical perspective on my topic.

Through these courses I have realized the gap between the engineering bodies that are creating low-carbon solutions and the organizations that create policy to utilize those technologies. In a biofuels course, I created a life cycle analysis utilizing Argonne National Laboratory's toolkit to analyze the well-to-wake greenhouse gas emissions and energy use of generating hydro-processed renewable jet fuel derived from micro-algae grown in open raceway ponds for intended use in military aircraft platforms. Studies such as these are useful in bridging the engineering and policy gap, in order to ensure the most effective measures are being applied to mitigate anthropogenic climate change.

My dissertation research focuses on developing methods to predict NOx atmospheric emissions from the light duty vehicles, especially those utilizing stop-start technologies in an urban environment. I am pursing this research under the supervision of Dr. Adam Boies, through the Energy Efficient Cities initiative.

Plans for next year include continuing my graduate studies at UC Berkeley in the civil and environmental engineering program. In addition to my studies, I am an active duty Ensign in the United States Navy and will be commencing Naval Aviation training in Pensacola, FL following the completion of my studies.

John P. Mayo, TX Δ '14
Fife Fellow No. 187

This past August, I started my work in the Biomimetics Lab at MIT for a master's in mechanical engineering. During this year, I have developed and built a lower arm and hand for HERMES, the Highly Efficient Robotic Mechanisms and Electromagnet System. This new robot walks like a quadruped but can stand on two legs and do task like a biped, similar to a monkey. Our lab specializes in dynamic robots with fast, high-toque electric motors, and this platform is no different. The robot is driven with a teleoperation suit that includes force feedback to the user to better sense the actual situation the robot is in. The hand specifically can hold objects from a screwdriver to a sledgehammer with a strong grasp, allowing the operator to not only see, but manipulate the environment of the robot. This can help in disaster response, by keeping the responders out of danger but still able to assist as if they were there.

Through this past year, I have evolved as a researcher and designer, with full control over my own project. The classes and people at MIT have also enhanced my design ability and let me see the world from a different perspective than my original hometown university. Next year, I plan to move to the space industry to work on robots for the exploration, increasing humanities knowledge and creating technologies that can also spinoff to help humankind on Earth. I am very thankful for Tau Beta Pi's support during my studies that give me the countless opportunities I have at MIT.

Joshua D. Moon

Hannah K. Ross

Nathan M. Shay

Alexandra M. Sibole

Joshua D. Moon, AL B '14
Zimmerman Fellow No. 3

This past year, I began working towards my Ph.D. in chemical engineering at The University of Texas at Austin. During my first semester at UT, I focused on completing my core coursework and qualifying exams, and have since enjoyed the opportunity to focus on my doctoral research.

I have begun exploring the use of high thermal stability polymers for gas separation applications under the supervision of my advisor, Prof. Benny D. Freeman. This project has involved investigating the pure gas permeabilities and selectivities of new sulfone-containing polybenzimidazoles. The ultimate goal of this research is to develop high performance polymer membranes for use in a variety of industrial separations, particularly high temperature applications where conventional membranes face operation challenges. My goals for the next couple years involve processing these polymers into thin films to study the phenomenon of physical aging as well as to explore the potential for these materials to be used in olefin/paraffin separations.

I have also been involved in serving the community of Austin through science-based educational outreach. This summer I will be mentoring a few high school students in our research lab as part of a program to get students interested in scientific research. Though my ultimate plans after graduation are still liable to change, my current goal is to look for a research position in private industry, potentially in the application of membrane technology to solving current needs in industry. I am very grateful to Tau Beta Pi for the support they have provided so that I could have these fantastic opportunities.

Hannah K. Ross, TN Γ '14
Fife Fellow No. 188

During my year as a ΤΒΠ Fellow, I began my graduate studies as a master's student in mechanical engineering at the University of Washington (UW). I work under the advisement of Dr. Brian Polagye, co-director of the Northwest National Marine Renewable Energy Center. This research center is a collaboration between three universities: Oregon State Univ., Univ. of Alaska Fairbanks, and UW. Our research involves developing technologies to improve the marine energy industry with a focus on wave, river, and tidal energy.

My thesis work falls into the tidal energy category and focuses on resolving the energy balance around a cross-flow tidal turbine. This involves determining how much of the upstream kinetic and potential energy is extracted from the flow, lost to friction, or passed downstream of the turbine. The primary goal of this research is to help determine the sustainability of tidal energy by learning how disruptive turbines are to the overall energetics of a tidal site. This work also has the potential to help validate models used for resource assessments and give industries a better estimate of the amount of energy that is practically extractable from a certain site.

During my year as a ΤΒΠ Fellow, I also continued my involvement with MindSET, Tau Beta Pi's STEM outreach program for K-12 students. I started hosting monthly sessions at a local elementary school that focus on teaching an intuitive understanding of electricity and emphasize the different methods of energy generation, including tidal energy generation.

This fellowship has allowed me to conduct research in the field I am most passionate about while continuing my efforts in outreach. Upon graduation, I plan to continue this path and hope to teach at a university where I can build a program focusing on renewable energy research and community involvement.

Nathan M. Shay, OH I '14
Fife Fellow No. 189

I am currently pursuing dual master's degrees at the Ohio State University in civil engineering and city and regional planning with a focus on urban transportation planning. This year, in addition to my fellowship from Tau Beta Pi, I was awarded a University Fellowship. These funding sources allowed me to focus on my coursework in civil engineering and planning instead of splitting time with a job or paid research. This opportunity has allowed me to hasten completion of the program, and I am currently on track to receive two master's degrees in two and a half years, instead of the three to four years that it takes most students.

This year, I have been able to further my skills in transportation engineering as well as establish a strong background in planning. My engineering courses have taught me to apply mathematics and statistics in various forms of mathematical modeling to simulate real world scenarios. I have used these new found skills in course projects as diverse as mode share problems and modeling the efficacy of planning efforts. My planning courses have allowed me to construct a fuller perspective of the context in which engineering projects are completed. This has allowed me to see how other factors like land use policy, political pressures, and public opinion affect the prioritization and selection of engineering projects before engineers are even involved, and how these factors add unexpected constraints and criteria to engineers' work.

In addition to allowing me to progress towards my degree, this coursework has prepared me to work as a graduate research associate next year to fund the remainder of my coursework. My research will be in the campus transit lab, which studies transit on campus and in Columbus, to seek knowledge that will inform transportation planning on campus and beyond.

Alexandra M. Sibole, CA Z '14
Fife Fellow No. 190

A year ago, I left my undergraduate program at Santa Clara Univ. to immediately begin a master's program in bioengineering innovation and design at Johns Hopkins. My program involved eight weeks of clinical rotations at the Hopkins Hospital, traveling abroad to identify needs in low-resource countries, and designing novel medical devices to meet those needs.

For one of my projects, I worked with a team of clinicians from cardiac surgery to develop a device to detect acute kidney injury, a major and costly complication of invasive procedures. I also traveled to Nepal twice to visit neonatal intensive care units as my team worked to create an affordable newborn vital signs monitor for overcrowded hospitals. Another effort involved collaborating with a multidisciplinary team from Hopkins to design better personal protective equipment for healthcare workers treating Ebola patients, and our work earned us a USAID Grand Challenges award. My fourth project focused on optimizing a device to inexpensively image the retina using a smartphone and a 3D printed scope.

When not working on projects, I spent my time mentoring undergraduate design teams, tutoring first graders at a Baltimore public school, and exploring the East Coast. Following graduation, I will begin a full-time engineering position designing orthopedic implants. My ultimate goal is to become a leader in creating medical innovations that are accessible to the countries that need them the most. My fellowship year has been the most fascinating and exciting year of my life, and I am incredibly grateful to Tau Beta Pi for helping to make this experience possible.

Kassi T. Stein

Janelle Strampe

Sean A. Tacey

Melissa R. Taylor

Kassi T. Stein, MA E ’14
Lynnworth Fellow No. 10

After earning my bachelor’s at Northeastern University (NEU), I took the summer to work in STEM outreach before beginning my graduate work. As program coordinator of the Young Scholars Program at NEU, I mentored 24 high school students who were completing research projects in 12 different campus labs. Most of the students completed the program with the intention of pursuing a bachelor’s in engineering or computer science, and all of them left with a strengthened set of goals as they looked towards college and beyond. I had a lot of fun working with the students, helping them overcome their various frustrations in their research projects, and sharing what insights I had gained over the course of my college experience. I look forward to continuing to work with students through STEM outreach.

In the fall, I began working towards my Ph.D. in chemical engineering at MIT. The first-year curriculum is rigorous and time-consuming, so most of the fall was spent studying and completing problem sets, as well as deciding on an adviser. After passing my qualifying exam, I joined the group of Dr. Hadley Sikes to work on a quantitative approach to redox biology. Reactive oxidative species (ROS) have been implicated in a lot of diseases, including cancer, and I am interested in uncovering the pathways and perturbations one could leverage to design chemotherapeutics or other medicines using quantitative tools like genetically encoded probes. I have started formulating the direction I would like my thesis to take, and I look forward to continuing to explore this area of research. Though graduation is a long way off, I plan on working in the biotech industry or at a national lab, with the eventual goal of returning to academia and teaching.

Janelle Strampe, SD A ’14
Sigma Tau Fellow No. 41

As a ΤΒΠ Fellow, I completed my M.S. in biomedical engineering in an accelerated master’s program at South Dakota School of Mines and Technology. The year was full of exciting courses and research, broadening my knowledge in biology, biomaterials, engineering, and the medical field. A majority of this year was spent working and finishing my master’s research thesis regarding Friedreich ataxia.

Friedreich ataxia, a triplet repeat expansion disease, involves the expansion of (GAA)n repeats. By using an intercalating agent (coralyne) that stabilizes triplex structures, replication may be blocked and lead to deletion of the (GAA)n repeats. This could reduce (GAA)n repeat lengths in an individual that would alleviate the genetic source of Friedreich ataxia and could prevent or delay the onset of this disease. Overall, coralyne may provide an effective therapeutic agent for treating Friedreich ataxia.

In addition to finishing my master’s studies this year, I competed in my final year of eligibility as an NCAA Div. II athlete as a women’s basketball player and team captain. Further regarding athletics, in the last six years, I have undergone three knee surgeries, which has contributed to me knowing my life’s work would be at the nexus of science, technology, engineering, and medicine to help others.

In the fall I will begin an M.D. degree through the Univ. of Washington School of Medicine. Many advancements have been made in science and technology, and I am excited to use both of my engineering degrees to be a leader in the medical field. I cannot express how grateful I am to the ΤΒΠ Fellowship Board for supporting me. I feel proud to be a part of this incredible organization and I have greatly appreciated the support, the opportunity, and the honor associated with this fellowship.

Sean A. Tacey, FL H ’14
King Fellow No. 53

As a first year graduate student in the department of chemical and biological engineering at the University of Wisconsin–Madison, I have been exposed to a great deal of information and material to broaden my knowledge in the field of chemical engineering.

In the fall, I was presented with the exciting opportunity to join the research group led by Dr. Manos Mavrikakis. In this group, I will have the ability to use density functional theory to study various reactions pathways on a number of different catalytic surfaces. Through these studies, we will be able to guide experimentalists to develop better catalysts for a number of industrially relevant reactions.

My time in graduate school thus far has been incredibly rewarding and I am looking forward to the rest of my time conducting research at UW-Madison. Upon the completion of my graduate studies, I hope to become a professor so that I can continue my work on research in catalyst design to further the implementation of environmentally and economically feasible catalysts in industrial settings. Also, as a professor I would be afforded the opportunity to mentor and provide guidance to future students in the area of chemical engineering.

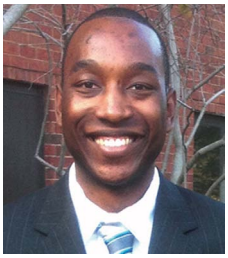
The TBP Fellowship has provided me with the ability to work on highly relevant research that will hopefully one day improve the means of chemicals production in industry. For this I am forever grateful and I hope that one day I will be able to return the favor.

Melissa R. Taylor, OH Θ ’13
Fife Fellow No. 191

During this past year, I have been working towards my master’s degree in mechanical engineering at the University of Dayton (UD) and have had many different experiences that have greatly contributed to the development of my academic and professional skills. I have completed all of the required coursework for my master’s degree, and this coming summer I will take my master’s thesis credits. In addition to the coursework that I have completed, I have also spent a significant amount of time conducting an extensive literature review in order to develop an in-depth understanding of human movement variability and nonlinear analyses for my thesis research, for which I will begin the data analysis portion this summer. Related to work that I completed as an undergraduate research assistant, I also co-authored a manuscript regarding standardization of posturography testing methods that was submitted to the *Journal of Applied Biomechanics* and is currently in review.

Additionally, in the past year I have been employed as a teaching assistant for Engineering Innovation, a project-based, undergraduate introductory course to the engineering design process, and as a production engineering co-op for Cook Medical. I have also been involved in various outreach activities within UD’s School of Engineering, at a local retirement community, and a high school. Finally, I had the opportunity to co-lead a group of nine undergraduate engineering students participating in UD’s engineers in technical humanitarian opportunities of service-learning program on an intensive 10-day breakout course to a poor, rural Nicaraguan community.

I intend on finishing my master’s in December 2015, and I will be making the decision this coming fall to either pursue a Ph.D. or enter industry in the field of biomechanical engineering. I am extremely grateful for the opportunity to pursue graduate education and for Tau Beta Pi’s support.



Brandon J. Tripp

John A. Wagner

Gerald J. Wang

Alexander S. Yachanin

Brandon J. Tripp, AL Γ '14
Nagel Fellow No. 17

My year as a ΤΒΠ Fellow was full of rewarding and enriching opportunities – coursework, graduate research, and summer internship – as I completed the first year of my master's degree in petroleum engineering at The University of Texas at Austin.

During my academic year, I completed six courses within the department of petroleum and geosystems engineering. The coursework exposed me to the different challenges within the petroleum industry and provided fundamental background needed to complete my graduate research. I also participated in research seminars to learn about additional research completed within the school of engineering and from other academic institutions.

To complement my academic coursework and participation in research seminars, I commenced my graduate research. I work as a graduate student under professor Hugh Daigle specializing in petrophysics; my graduate research topic is to determine the relationship between pore scale and the diffusion coefficient. During my first academic year, I completed multiple computational models to simulate the interactions between gains and pores within rock structures. The porous medium simulations created during my first graduate year will be utilized as I complete my graduate research and construct a computational model to simulate fluid flow through porous mediums.

This summer, I will participate in an internship program with Aera Energy to utilize my coursework to develop practical solutions within the petroleum industry. This internship will enhance my technical aptitude and facilitate me in utilizing creative thought to develop solutions to solve complex problems. Additionally, it will provide me with career development and networking opportunities.

To conclude, I am exceptionally grateful to have been selected as a ΤΒΠ Fellow and for the organization's support.

John A. Wagner, NC A '13
Matthews Fellow No. 17

During my fellowship year, I completed my first year of graduate study toward a master's degree in civil engineering at North Carolina State University (NCSU), concentrating in transportation systems. This year involved the completion of a breadth of courses in transportation engineering, ranging from vehicle sensor technology to railroad engineering to highway safety.

I have also spent much of the past year working on research with my advisor, Dr. Billy Williams. My project involves the use of Bluetooth probe data to evaluate the reliability of travel time on freeways, and is facilitated by the National Transportation Center at the Univ. of Maryland. I am also working to improve freeway traffic modeling in order to better the safety and experiences of drivers on the road. Dr. Williams and I are currently conducting a live study of freeway performance on Interstate 540 north of Raleigh, where we have Bluetooth sensors in action reporting live travel time data that we can use for later analysis.

While maintaining contact with the NC Alpha chapter of ΤΒΠ, I have expanded my involvement with the NCSU civil engineering department, our chapter of Chi Epsilon, and our student chapter of the Institute of Transportation Engineers, for which I will serve as president next year.

I intend to complete my master's degree in May 2016, after which I will pursue a career as a professional engineer in the transportation community. I express my sincere gratitude to the Tau Beta Pi Fellowship committee for this distinct honor, as well as to the entire ΤΒΠ and NCSU communities for their support of my endeavors.

Gerald J. Wang, CT A '13
Stark Fellow No. 37

I am immensely grateful to Tau Beta Pi and the Stark Charitable Trust for their support. I graduated from Yale in 2013 and am currently completing my second year of Ph.D. study in the MIT department of mechanical engineering. I work in the Nanoscale Kinetic Transport Group, directed by Prof. Nicolas Hadjiconstantinou. My research focuses on theoretical and computational modeling of fluids at the nanoscale. I am focused on investigating the often-counterintuitive properties of fluids confined in carbon nanotubes. Using statistical physics and molecular-dynamics simulations, I hope to shed light on these surprising phenomena. I am excited about the engineering impact of this work; in the long view, the physics underlying nano-confined fluids may guide and inspire the next generation of water desalinators, drug-delivery mechanisms, and energy-harvesting technologies. I have enjoyed many opportunities to share my research over the past year, including talks at several conferences as well as a publication in *Physics of Fluids*.

Aside from research, this past year has been filled with many other highlights. On the curricular end, I have completed coursework ranging from physics to mathematics to chemical engineering, and computer science – to build a multidisciplinary toolbox with which to tackle research problems. I have also passed my Ph.D. qualifying exams and completed my master's thesis. Away from school, I have served in several leadership positions, including President of ΤΒΠ's Boston Alumni Chapter, Co-President of MIT's Edgerton House, and Secretary of MIT's Graduate Association of Mechanical Engineers. I have also been lucky enough to make progress on my life bucket list, including running a marathon and starting a band with friends. As always, I'm very excited to see what next year has in store!

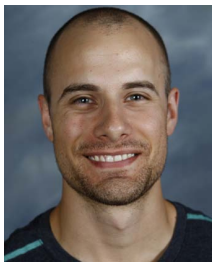
Alexander S. Yachanin, MD Γ '14
Dodson Fellow No. 1

After graduating from the United States Naval Academy with a bachelor's in ocean engineering, I began my studies at Stanford University to pursue a master's degree in civil and environmental engineering. My program, called atmosphere/energy, is designed to be very interdisciplinary and to bridge the gap between the study of our atmosphere, climate, and energy systems.

My coursework at Stanford has spanned a wide variety of topics. In the fall, I studied energy resources, from fossil fuel extraction and processing to renewable energy in the developing world, and I also studied meteorology and climate with a focus on renewable energy development. Over winter quarter, I took three very different classes: one focused on air pollution and global warming, one focused on computer programming, and one focused on energy efficient building design. This spring, I am currently learning about energy and environmental policy, climate and agriculture, and electrical engineering for renewables and energy efficiency.

So far, I have enjoyed all of my classes. The course work is incredibly interesting and relevant, and my professors include some of the world's leading experts in their fields. I still have another year at Stanford to complete my degree, and I have lined up a number of fantastic opportunities: a summer trip to Iceland to study sustainability and renewable energy, another summer trip to India to study companies in the engineering and technology sector, and a class that will travel to China next spring to study its energy system infrastructure.

My fellowship year has been challenging, but immensely rewarding, and I know that it will provide me with invaluable knowledge and skills as I begin my Navy career and beyond.



Michael J. Yakima

Courtney M. Mazur

Michael J. Yakima, CO Z ’08
Fife Fellow No. 192

I am pursuing a JD/MBA joint degree at Stanford. Throughout the past year, I have engaged in a variety of legal studies to include contracts, corporation law, taxation, and legal design, among other standard first-year law courses. I’ve enjoyed the challenge of crafting a solid logical argument, defending my views via oral arguments in a mock courtroom, and gaining a deeper understanding of the policy and socio-economic consequences of legal decisions and government regulations.

In addition to an intensive year inside the classroom, I’ve been able to contribute to the local area using my newly gained skill set. I had the privilege of mentoring a recently-incarcerated person who is seeking to turn his life around and obtain steady employment by starting his own business. I’ve helped him work through the legal and operational details of his innovative mobile auto-detailing business. In addition, I’ve had the opportunity to support a variety of additional social ventures through a leadership role in Stanford’s Social Entrepreneurship Student Association. Finally, I've contributed to broader scholarship in the intellectual property field through serving as an editor for the *Stanford Technology Law Review*.

I will spend the majority of next academic year focusing on business-related studies. I also plan to take the patent bar exam this summer to become a certified patent agent, and I will intern as a summer associate at Third Sector Capital Partners in San Francisco. The ΤΒΠ Fellowship has provided critical support throughout my graduate studies, and I am grateful to Tau Beta Pi for its generosity and encouragement.

Courtney M. Mazur, RI A ’13
Fife Fellow No. 177

With support from the ΤΒΠ Fellowship, I have nearly finished my first year as a Ph.D. student in the UC Berkeley-UC San Francisco graduate program in bioengineering. I have completed advanced coursework, volunteered at science outreach activities in my new community, and engaged in three research rotations focused on musculoskeletal disorders.

My interest in bioengineering began and still centers around understanding the mechanisms underlying musculoskeletal disease and optimizing the engineering tools that can be used for detection and prevention. Following this motivation, I selected rotations that would instruct me in three distinct approaches to this type of problem. First, I worked with Jeffrey Lotz to develop an inexpensive 3D motion tracking system for the spine with the aim of developing a risk algorithm for failure after spine fusion surgery. In my second rotation, I worked with Sharmila Majumdar on a novel combination of imaging modalities for early detection of osteoarthritis. Finally I worked with Tamara Alliston to investigate the signaling pathways involved in bone remodeling. I have recently decided to join professor Alliston’s group, where I will study the mechanisms by which bone cells sense and respond to force and the ways that loading affects both bone quantity and bone quality. By utilizing multiple disease models with related phenotypes, we can better understand the role that each component of bone contributes to bone quality, with the eventual goal of discovering new drug targets for diseases like osteoporosis.

Outside of coursework and research, I have volunteered with local organizations to mentor undergraduate students and to teach STEM lessons in elementary school classrooms. I hope that these activities will help me encourage the next generation of scientists as I pursue my own goals of improving understanding of musculoskeletal disease.