

The reports of Tau Beta Pi’s 86th Fellowship Program and the 2019-20 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.

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.

Marie E. Armbruster, TN B ’18
Fife Fellow No. 217
After graduating from Vanderbilt University in spring 2018, I spent one year in Spain as an English teaching assistant through a Fulbright grant. This past August, I began my Ph.D. in chemical engineering at the University of Colorado at Boulder. In the fall, I completed an independent study research project in the Medlin group analyzing phosphonic acid ligand modification of supported palladium catalysts to improve the direct production of hydrogen peroxide. I also completed my core coursework and served as a teaching assistant for undergraduate thermodynamics.

I have channeled my interest in materials, catalysis, and fundamental surface science to start on a Ph.D. project combining both computation and experiment. My research uses computational methods, primarily on the quantum scale, to understand how ligands bind to zeolites and influence gas adsorption with the ultimate goal of choosing key descriptors to tailor ligand choice to specific separation challenges.

Outside of my research, I volunteer as an interpreter for the Rocky Mountain Immigration Advocacy Network to help pro-bono attorneys communicate with clients seeking asylum or other special immigration statuses.

This year, it has been a thrill to learn more deeply about my field of choice and I am very grateful to Tau Beta Pi for their support. I look forward to developing our understanding of porous materials and ligands for catalysis and separations and improving my teaching and research skills over the course of my Ph.D.

Margaret M. Billingsley, DE A ’18
Williams Fellow No. 40
I am currently finishing my second year of graduate study in bioengineering at the University of Pennsylvania. This past year, I have completed my graduate coursework and continued my research in Dr. Michael Mitchell’s lab, which is focused on developing novel biomaterials for applications in oncology, immunotherapy, and genome editing. My work has been primarily focused on exploring lipid nanocarriers for the delivery of nucleic acids to immune cells with the goal of engineering cell-based immunotherapies. I was able to publish my first paper on this topic demonstrating lipid nanoparticle delivery to human T-cells, and am currently working to optimize this promising delivery platform and establish its versatility for a wide range of applications in immunotherapy.

In addition to research, this past year has been filled with mentorship opportunities. Through the National Science Foundation’s LSRS REU, I was able to mentor a visiting undergraduate researcher throughout the ten-week summer program, helping him to develop his laboratory skills while working on a new project to explore the optimization of nanoparticle formulations. In the fall, I began mentoring another undergraduate student who has continued this optimization project and made impressive progress toward his first publication. Having this opportunity to mentor younger researchers has been an extremely rewarding experience and has encouraged me to continue my path toward a career in academia.

I am grateful for the TBP Fellowship support and am immensely honored to have received this award. I would like to thank the Tau Beta Pi community and generous donors who make these opportunities possible, and I am eager to pay this support forward throughout my academic career.

Lucia G. Brunel, IL Γ ’18
Fife Fellow No. 222
After completing my research as a Marshall Scholar at the University of Cambridge (UK), I successfully submitted and defended my thesis for an MPhil in materials science. I also published a co-first author article in Interface Focus on my research generating a 3D in vitro model of the human endometrium, which is the inner layer of the uterus and an important tissue for understanding the physiology of early pregnancy.

I began my doctoral program at Stanford University in chemical engineering. By the end of this academic year, I will have completed the course requirements for my Ph.D. program. In addition to the required core classes, I was able to explore topics in rheology, biomaterials, drug delivery, and mechanotransduction, which are closely related to my research interests. After completing research rotations in three laboratories, I selected Prof. Sarah Heilshorn—a leader in the development of biomaterial-based strategies for regenerative medicine—as my Ph.D. research advisor. My research will focus on the design of biomaterials that can be used for 3D bioprinting of tissues or organs. In particular, I am interested in how to customize the biomaterials to be optimized for specific cell types. The experiences that I gained through my rotations in other laboratories this year will assist me in this research and may also facilitate future collaborations.

Outside of research, I am involved in the Stanford Polymer Collective, an interdisciplinary group of students interested in polymer-based materials, and the Society of Women Engineers for professional development and outreach events. I am grateful for Tau Beta Pi’s support of my graduate studies.

Daniel B.K. Chu, CA Σ ’19
Fife Fellow No. 224
In June, I graduated from UC Santa Barbara with a B.S. in chemical engineering and a minor in physics. Since then, I have kept busy with research and courses to further my career as a researcher. I am currently working towards a Ph.D. in chemical engineering at Massachusetts Institute of Technology, where I study quantum chemistry methods. I spent the summer continuing my undergraduate research on crystal nucleation and growth under the guidance of Professor Baron Peters. We developed models to describe the production of nanocrystals through burst nucleation and examined the ability of previous models to describe the intricacies of the process. Professor Peters, and my work with him, grew my passion for theoretical work.

The first semester of the Ph.D. program in chemical engineering at MIT consists of courses and the selection of a thesis advisor. In addition to the core, chemical engineering courses, I took quantum mechanics to obtain greater understanding within my field of research. I joined Professor Heather Kulik’s group to improve electronic structure methods for computational quantum chemistry. Ideally, these methods enable rapid discovery and design of materials for a wide variety of uses, such as more efficient catalysts. Specifically, I will work on understanding and addressing inaccuracies in density functional theory (DFT), which is one of the most widely used electronic structure methods.

My current project aims to analyze the sensitivity of DFT calculations to a chosen parameter called exact exchange. I am very thankful to have been a TBP Fife Fellow. The support has been especially appreciated during the increased stress of the pandemic. I plan to pursue a career in academia, so I may give back to the community through research and by guiding the next generations of engineers.
Joanna L. Ciatti, MI Γ '18  
Anderson Fellow No. 13

Following my 2018 graduation from the University of Michigan where I studied chemical engineering, I spent a gap year as a full-time researcher in the laboratory of Prof. Max Shtein. In 2019, I began my journey toward a Ph.D. in materials science & engineering at Northwestern University.

My current research is focused on bioelectronics and bio-integrated devices targeted at improving health outcomes within the Querrey-Simpson Institute for Bioelectronics (QSI), under the direction of Prof. John Rogers. I am privileged to collaborate with other excellent researchers at QSI on research targets ranging from drug delivery to skin health. One project I am especially proud to work on is the development of a closed-loop implantable device capable of administering a rescue drug, naloxone, in the event of opioid overdose. Since joining the effort, I have improved the biocompatibility of our electrochemical drug delivery approach and fabricated working devices for validation with animal models. I am focused on improving the long-term stability of the drug delivery sub-module to comply with eventual clinical requirements. This exciting initiative, funded by the NIH's National Institute on Drug Abuse, has the potential to save many lives from the opioid epidemic and impact future treatment paradigms for recovering addicts.

I have also made a point to get involved with STEM outreach efforts. I volunteered at a weekend Science in your Community event for underrepresented 7th - 8th grade students, and at the Society of Women Engineers Career Day for Girls after choosing to get involved with the graduate SWE section at Northwestern. Additionally, I am serving on my department's first Diversity Committee where we are working to create change that improves diversity, inclusion, and community for underrepresented groups. I am humbly grateful for the support that my TBP Fellowship has provided, and I look forward to future opportunities to give back to the organization.

John L. Dean, CA Γ '19  
Forge Fellow No. 8

Before graduating with a B.S. degree in electrical engineering degree from Stanford University, I was accepted into the co-terminal master’s program in electrical engineering. However, shortly after, I started a company, Windborne Systems, with friends from Stanford. The company started out of a high altitude balloon project that we had been working on in the Stanford Student Space Initiative. Before long, the company was accepted to the Pear VC summer accelerator, and we raised a pre-seed funding from that as well as a few angels.

Next thing I knew, I was graduating with my undergraduate degree, and working on this company full-time became my summer plan. Over the summer, we continued technical development of our balloon platform and worked on creating a more stable platform. On the technical side, I am in charge of the guidance, navigation, and control algorithms for the balloon. I design and maintain the software side of the altitude control system of the balloon, as well as the algorithms that use wind forecasts and the platform’s altitude control capabilities in order to control the spatial trajectory of the balloon.

Besides technical work, we refined our vision for the company and determined the area where our platform would have the most impact: weather prediction. We aim to provide better weather forecasts using data that only our balloon platform can collect. As the end of the summer neared, I decided to put my master’s on hold to pursue this endeavor full time indefinitely.

In the fall, we raised our seed round led by Khosla Ventures, and started leasing a workspace in Palo Alto where we can continue all technical development as we scale. Since then, we’ve been developing our technical capabilities, scaling manufacturing, and have applied (and received) grants with various government agencies. I love what I work on at Windborne Systems, and I would like to thank Tau Beta Pi for this fellowship and for believing in me.

Charles B. Dawson, CA Ω '19  
Record Fellow No. 13

After graduating from Harvey Mudd College with a B.S. in engineering, I started my graduate studies in the Department of Aeronautics and Astronautics at MIT. During my 1st year, I have had the opportunity to gain both depth and breadth in my education by taking courses in AI and optimization and by diving into robotics research.

In my first year, I joined the Model-Based Embedded & Robotic Systems Lab under Prof. Brian Williams, where we develop algorithms that help robots act more intelligently and safely. In particular, I have been researching the problem of motion planning under uncertainty; helping robots move from point A to point B safely, even when their environment is unpredictable. By guaranteeing safety even in an uncertain environment, I hope that my research will enable robots to interact more efficiently with humans, improving human-robot collaboration.

So far, my work has resulted in submissions to two major robotics conferences, and I hope to explore applications of this technology in the coming year, focusing on hardware demonstrations. I also work on the MIT student team competing in the 2020 NASA BIG Idea Challenge, where we are designing a tower that can be remotely deployed from a lander at the lunar south pole. By elevating a payload 20-30 meters above the surface, we hope to increase the range of line-of-sight communications, provide a better vantage point for sensors, and access high-availability solar power at the Moon’s poles.

Outside of the lab, I have represented my fellow aero-astro students on the MIT graduate student council and helped organize social events with the graduate students’ association. I have also joined the MIT ceramics studio, which provides a welcome break after a day in the lab. I am extremely grateful to Tau Beta Pi for this fellowship and its support of my graduate studies.

Anna C. Deleray, CO Α '17  
Swalin Fellow No. 3

During this past year as a Tau Beta Pi Fellow, I completed my second year of coursework and doctoral research at the University of Utah in the department of biomedical engineering. Prior to the University of Utah, I completed my B.S. in chemical and biochemical engineering at the Colorado School of Mines and then spent time at Los Alamos National Laboratory conducting protein design research.

In my first year at the University of Utah, I joined the lab of Dr. Jessica Kramer. My research involves the design, synthesis, and characterization of biomimetic glycopolyptides. Currently, I am working to synthesize antifreeze glycopolyptides that have applications as biocompatible cryoprotectant agents in the medical field.

Outside of my research, I am involved with the graduate women in biomedical engineering group. As the outreach chair of this group, I am working on expanding our impact in the community by organizing events for local girls to explore STEM fields. Additionally, I spend my free time skiing, trail running, and enjoying Utah’s abundant opportunities for outdoor recreation.

I want to thank TBP1 for supporting my graduate education and helping to prepare me for my future. After completing my Ph.D., I plan to pursue a post-doc position with the eventual goal of becoming a university professor.
After graduating from the University of Massachusetts Lowell with B.S. degrees in chemical engineering and biology, I spent four months as a purification process development engineering intern at Genentech in San Francisco, CA. My work involved designing and implementing experiments to develop improved protein purification processes using filtration and chromatography. I was also selected for the gLINX professional development and mentoring program, which allowed me to develop a greater understanding of Genentech’s functional areas and career paths in the organization.

In the fall, I began my Ph.D. studies in bioengineering at Stanford University. I have completed two research rotations, one in tissue engineering with Prof. Fan Yang, and one in data-driven cancer biomarker discovery with Prof. Shan Wang. I am planning to complete another rotation in the spring before deciding on a permanent research group.

In addition to laboratory work, I have taken several exciting and challenging courses, such as computational biology, molecular and cellular bioengineering, and clinical needs and technology. These have provided me with both the rigorous quantitative skill sets to tackle challenging engineering problems as well as the perspective of understanding how research can evolve into viable technology platforms for helping patients.

At Stanford, I am also completing a master’s degree in management science and engineering, which will help me to further develop my business skills and perspective. Upon graduating, I plan to pursue a career in the biotechnology industry.

I continue to be enriched and challenged by communities at MIT outside of research. This year, I began mentoring MIT undergraduate students as a graduate resident advisor. For this role, I live in a dorm community and provide support to a group of 32 students. I have also participated in MIT’s Graduate School Leadership Institute and the MIT Arête Fellowship to explore how my commitment to engineering can be translated into social and practical good.

I am incredibly grateful for the generous support from Tau Beta Pi that allowed me to not only continue my graduate studies, but reflect on my responsibilities to the engineering profession. Thank you so much.
Christopher A. Hampel, OR Γ’18
Bower Fellow No. 1

After graduating from the University of Portland with a B.S. in mechanical engineering and minor in mathematics, I began a master’s thesis degree at the Colorado School of Mines. I became motivated to pursue a graduate degree in thermal-fluid sciences to gain the exposure needed to combat climate change through advanced energy systems. I began working under the Advanced Energy Systems Group (AESG) which specializes in the advancement of numerous sustainable energy conversion and renewable technologies. In particular, I’ve had the pleasure to partner with AESG and the National Renewable Energy Laboratory in efforts to promote hybrid renewable and combined heat and power (CHP) systems for distributed generation applications in commercial buildings. The work consists of energy systems modeling of various CHP prime movers such as combustion turbines, reciprocating engines, and fuel cells. Ultimately, modeling is used for enhancing prime mover performance prediction in an optimization program to recommend a minimal cost solution of on-site generation technologies for building owners.

Most importantly, a graduate education has opened my eyes to countless new ideas, ways of thinking, and technical and soft skills needed to become a meaningful asset in the pursuit to initiate the global energy transition. Graduate school has truly ignited my fascination within the energy field, and I am excited to continually captivate future work based upon my educational foundation.

Meanwhile, I am thankful for the opportunity to have enjoyed the Colorado lifestyle with skiing, sport climbing, and mountain biking. Last, I would like to thank my advisors, research cohort, and all colleagues that have guided me along the way; additionally, I would like to thank TBI and Mr. Robert Bower for the fellowship award that has undoubtedly made life easier in my quest for education.

Ashley N. Hersey, NY Γ’19
Tau Beta Pi Fellow No. 827

After graduating from Rensselaer Polytechnic Institute with a B.S. in chemical engineering, I moved to Atlanta to begin my graduate studies. I am now a part of Dr. Corey Wilson’s Biomolecular Systems Engineering Lab at the Georgia Institute of Technology. I have focused, so far, on the fundamentals of chemical and biomolecular engineering in core coursework and began exploring synthetic biology research in the lab.

My Ph.D. research will focus on engineering of genetic logic gates under the control of inducible transcription factor proteins in bacteria. I will not only build genetic architecture, but also engineer novel chimeric proteins with new functions as well. This work will have far-reaching impacts from the fields of chemical production to therapeutic drug design.

Outside of research, I enjoy exploring new and interesting food and going to museums in metro Atlanta. I have volunteered my time to elementary and middle school-aged students in my community interested in STEM through performing science demonstrations.

I am deeply appreciative for the opportunities afforded me by this TBI Fellowship as I pursue my dream education and, accordingly, I plan to give back by assisting the Georgia Alpha Chapter in establishing a MindSET program with a local middle school in the coming months.

Rachel A. Hegab, LA Γ’19
Record Fellow No. 17

I graduated as a National Academy of Engineering Grand Challenge Scholar with a B.S. in biomedical engineering from Louisiana Tech University in May 2019. Over the summer, I wrapped up my research with Dr. Caldorera-Moore at Louisiana Tech on pH responsive hydrogel microparticles for oral drug delivery. Our collaborative work was published and featured on the front cover of a special issue on Intelligent/Responsive Polymers as Biomaterials in the Journal of Applied Polymer Science.

Starting in August, I began my position as an associate professional staff in the Biological Sciences Group of the Johns Hopkins University Applied Physics Laboratory (JHU/APL). Supporting a portfolio of sponsored and internal projects, I conducted research with a focus on tailoring hybrid biomaterials to enhance functions of living organisms for novel applications. My recent project work includes developing hybrid biomaterials, optimizing engineering fabrication methods for integration of biomaterials and living organisms, and characterizing these novel systems for tissue engineering and biosensing applications.

As I settle into working full time and being a part time graduate student, I hope to give back to the community by getting involved in JHU/APL’s STEM outreach programs. It has been an honor to be a TBI Fellow and as I continue my professional research career, I will continue to strive to work towards solutions that enhance human welfare.

Amanda C. Hornick, NY K’19
Tau Beta Pi Fellow No. 824

After graduating from the University of Rochester with a B.S. in biomedical engineering, I began pursuing a Ph.D. in medical engineering and medical physics through the Harvard-MIT Health Sciences & Technology program. As a graduate student, my goal is to uncover the mechanisms behind food allergies and autoimmune diseases and utilize my previous research experience in genetic engineering to create better therapeutics for these conditions.

From August to January, I met with seven labs and performed three rotations. In the end, I joined Prof. Jose Ordovas-Montanes’s lab at Boston Children’s Hospital. His lab seeks to understand the formation of immunological memory in human barrier tissues and ultimately reprogram such tissues to treat conditions, such as food allergies. The lab specializes in single cell RNA sequencing data analysis, and I look forward to expanding my computational skill set through working in his lab.

Thus far, the focus of my graduate school education has been coursework. I had the opportunity to learn human pathology from an array of experts, view dozens of histology slides, and even participate in an autopsy. I also took immunology, where I learned about immunological conditions from physicians and their patients. Additionally, a drug development course allowed me to work with a team to “develop” a genetically engineered probiotic therapy for rheumatoid arthritis.

Beyond academics, I was elected to be my graduate student dormitory’s executive committee, where I will champion sustainability initiatives and design ways for residents to share and collaborate on written and visual art. I would like to thank TBI for its generous support of my graduate education! I look forward to giving back to the engineering community through a career as a professor and researcher.
Tyler A. Kleinsasser, SD A ’19
Sigma Tau Fellow No. 45

After completing my bachelor’s degree in civil engineering at the South Dakota School of Mines and Technology, I have continued my education and pursued a master’s degree in construction, engineering & management.

During the summer, I took two courses and had the opportunity to further my education via real-world experience working on a $64 million aircraft maintenance hangar. In the fall, I returned to South Dakota Mines, and I’ve enjoyed my classes and learning more about engineering this year.

My professional aspiration after graduate school is to find a challenging and rewarding career in the construction industry. I would like to utilize this education to help benefit society by designing and building critical infrastructure around the nation and world.

Outside of academics, I have also been involved as a leader in several organizations this year. For example, I have served as president of the Student Association Senate and as a leader in Residence Life.

Overall, I am incredibly grateful for the generosity of Tau Beta Pi for having this fellowship program and supporting my graduate studies by selecting me as a recipient. This award has allowed me to continue my educational, personal, and professional growth. I look forward to my future career, and I’m excited for whatever opportunities come next!

Aswini R. Krishnan, CA Ψ ’18
Fife Fellow No. 220

After completing my B.S. in bioengineering at UC San Diego and my MPhil at the University of Cambridge as a Churchill Scholar, I began my M.D. at Stanford. Over the past year, I have gained foundational knowledge in areas ranging from biochemistry to immunology to neurobiology through my medical school coursework. I have been fascinated to learn about the underlying molecular bases of diseases, and how scientific advances over the years have revolutionized our ability to understand and treat debilitating maladies.

I plan to become a physician-scientist, bridging my interests in research and patient care to improve human health. Inspired by my experiences at Cambridge, where I studied the structural bases of protein translational mechanisms in the lab of Dr. Venki Ramakrishnan, I am interested in gaining a mechanistic understanding of how life processes go awry in disease.

I am now working in the lab of Dr. Mother Abu-Ramia in the Stanford chemical engineering department, where I am investigating the roles of lysosomes in neurodegeneration. I am exploring how dysfunctional lysosomal transport leads to altered metabolism and neuronal toxicity, with the aim to identify novel therapeutic targets for neurodegenerative diseases. I have found my bioengineering background especially helpful, enabling me to utilize both biological and engineering methods in my research.

At Stanford, I have also enjoyed exploring clinical medicine. As leader of the Oncology Interest Group, I coordinate oncology seminars for medical students. In addition, I am the student partner for a pediatrics patient with end-stage renal disease, through which I have gained valuable perspective into how chronic illness affects children’s lives. I am grateful to Tau Beta Pi for their generosity and support, which I hope to pay forward as my academic career progresses.

Trevian Jenkins, AL Λ ’19
King Fellow No. 58

Trevian will submit his report in the fall (2020).

Andrew C. Lee, PA Θ ’19
Record Fellow No. 19

In September, after receiving my B.S. in mechanical engineering from Villanova University, I embarked on the 3,000-mile journey to the West Coast in pursuit of my Ph.D. in materials science at Stanford. Supported by Tau Beta Pi, NSF, and the Knight-Hennessy Scholar Program, this academic year has been full of rich experiences increasing my competence as a scientist, leader, and mentor.

Amidst fundamental coursework in materials science, I joined Wendy Gu’s research group. Surrounded by capable and motivated peers, I am excited to explore the intersection between mechanics, transport, and structure. My current work aims to elucidate embrittlement mechanisms in high-strength metals for hydrogen transport. Despite experimental shutdowns due to COVID-19, I am staying engaged in academic writing and using molecular dynamic simulations to understand structural transformations of nano-particles at high pressures.

Beyond academics, I actively engage in community outreach through the Materials Research Society. I coordinated demonstrations to high school classrooms, taught classes at Stanford’s SPLASH program, provided feedback as a judge for a local science fair, and sparked curiosity in materials science at the Bay Area Science Festival.

In the Knight-Hennessy Scholar Program, I connect with graduate students across disciplines on issues ranging from climate change to improving childcare access to graduate student parents. Between organizing fireside chats for scholars to share their personal stories, orchestrating discussion forums on program improvement, and listening to world leaders, I am building strong relationships with peers and developing intangible skills needed for success. I am thankful for the support of Tau Beta Pi and excited for the opportunities that await!
Chantelle Y.Y. Lim, NY K ’19
Fife Fellow No. 223

After graduating from the University of Rochester with a bachelor’s degree in biomedical engineering, I began my Ph.D. in biomedical engineering at Johns Hopkins University in the lab of Dr. Hanzhang Lu. The lab’s research focus is on the development of novel magnetic resonance imaging (MRI) technologies for the measurement of physiological and biophysical parameters, and on their applications to understanding how the brain functions and regulates its blood supply.

My current project focuses on the development of a radial acquisition technique to measure blood oxygenation level-dependent (BOLD) fMRI signal changes. Compared to conventional fMRI, this new technique can provide a higher spatial resolution without image distortion or blurring. This work has resulted in an abstract that has been accepted by the International Society of Magnetic Resonance in Medicine to be presented at their annual conference. I am also working on quantifying white matter hyperintensity in an older cohort of subjects.

Outside of research, I have begun coursework through the School of Engineering and the School of Medicine. One of my classes, “Surgineering,” involves shadowing surgeons inside and outside the operating room to find ways that could improve workflow and enable new advances in clinical care. In addition, I volunteer as a Girls On The Run coach to a group of 3rd-5th graders at a local elementary school. I am incredibly grateful for the support that the TBPI Fellowship has provided me during my first year of graduate school.

Cristina Lorenzo Velázquez, PR A ’19
Tau Beta Pi Fellow No. 829

After graduating from the University of Puerto Rico at Mayaguez with a bachelor’s degree in civil engineering, I have begun my Ph.D. at North Carolina State University in geotechnical earthquake engineering. My first year has been focused on completing coursework for the required core courses in my field related to soil properties, dynamics, and earthquakes. Also, I’m getting involved with everything related to earthquake engineering through my research, which is new for me and I have learned fascinating things in a field that will let me contribute to one of the most devastating and unexpected natural disasters.

Through coursework and literature, I have gained skills such as processing, coding, and analyzing earthquakes data. This semester, I had the opportunity to attend, for the second time, the Emerging Researchers National conference, but this time as a graduate student. Also, I visited a few universities on my island, including my alma mater to inform undergraduate students about the opportunities and what they can achieve as graduate students. That filled my heart with joy because it reminded me of when I was in their place looking for opportunities and receiving guidance, which helped me take that big step in my future.

Starting this year my homeland suffered the impact of a series of earthquakes that caused a lot of damage. Those weeks of fear and desperation gave me the strength to put all my efforts and heart into continuing this path to obtain my Ph.D. and in the future contribute with my knowledge on the recovery and damage prevention of my island and where it is needed. I am honored and incredibly thankful to Tau Beta Pi for the support, contributions at the beginning of my dream, and future as a Ph.D. student and professional.

Tres Litten, SC Γ ’17
Matthews Fellow No. 22

Tres has not submitted his report.

Celeste B. Marsan, MA A ’19
GEICO Fellow No. 4

Since graduating from Worcester Polytechnic Institute in May 2019 with a B.S. in chemical engineering, I have begun my doctoral studies at the University of Texas, Austin. In addition to completing the core coursework, I joined Dr. Hal Alper’s Laboratory for Cellular and Metabolic Engineering to perform research on expanding the secondary metabolism of yeast. My research focuses on the expansion of bioactive secondary metabolites that can be produced from yeast and the high-throughput characterization of their activities.

My overarching aim is to discover, diversify, and detect novel molecules for applications in the pharmaceutical, nutraceutical, fragrance, pigment, and polymer spheres. Right now, I am engineering a strain of yeast to produce a potent small molecule shown to have beneficial effects for patients with Alzheimer’s disease, diabetes, osteoarthritis, and anxiety. With the power of high-throughput detection, synthetic biology, and bioinformatics tools, there is an endless amount of untapped potential in nature that is just now within our reach.

In addition to research, I served as a teaching assistant for an introductory undergraduate chemical engineering course. The opportunity to act as a mentor and help foster the development of young chemical engineers has been very fulfilling. The ability to positively impact the future of our field is always rewarding. I hope to continue mentoring undergraduates throughout my graduate work, specifically within the lab. I am extremely grateful for and honored by the generous support from Tau Beta Pi, which has allowed me the flexibility to pursue my Ph.D. It has helped me develop the foundational education and knowledge upon which I hope to build a career developing novel, accessible medicines.
Julia D. Mihaylov, AZ Δ’19

2020 Fellow Reports

Following graduation from Embry-Riddle Aeronautical University’s Prescott Campus with a bachelor’s in aerospace engineering focused in astronautics, I began my master’s degree in space systems engineering at Johns Hopkins University. In the summer between receiving my bachelor’s and starting my master’s, I interned at NASA’s Jet Propulsion Laboratory (JPL) working on modeling spacecraft safe mode events in support of the Psyche mission. During this time, I also attended a conference for the programming language of ‘Julia’ as an invited speaker for my co-led research project on a Julia Language Ephemeris reader for solar system bodies, a tool built to aid and support interplanetary mission design. At the end of summer, I was offered the opportunity to continue working at JPL, while maintaining full-time student status.

While at JPL as a master’s student, I have had the opportunity to support the Europa Clipper mission, dedicated to sending a spacecraft to Jupiter’s moon, Europa, to investigate whether this icy moon has the ability to support conditions suitable for life. During my second semester of graduate courses, I was awarded Aviation Week Network’s 20 Twenties award, recognizing the top 20 students worldwide earning STEM degrees, nominated by their universities, on the basis of their academic performance, civic contribution, and research or design project. At the end of my second semester, I was offered a full-time position at JPL as a systems engineer, where I am continuing my work on Europa Clipper.

Next semester, I will have more than half-way completed the required credits towards my master’s degree and plan to graduate in May of 2021. I cannot be more grateful and honored to have been selected as a TBP Fellow, and cannot express my appreciation enough for Tau Beta Pi’s generous aid in continuing my higher education.

Victoria G. Muir, DE A ’18
Zimmerman Fellow No. 8

I am completing my 2nd year of graduate studies at University of Pennsylvania (Penn) in the department of bioengineering. I am pursuing my Ph.D. under the direction of Dr. Jason Burdick, where I am developing granular hydrogels for musculoskeletal tissue repair. I delivered oral presentations on my research at two national conferences (BMES and AIChE) as well as poster presentations at a few local symposiums.

I am excited to continue my doctoral research as a National Science Foundation Graduate Research Fellow. To advance my skills in education, I served as a teaching assistant for two graduate-level courses at Penn: biomaterials and tissue engineering. In spring, I was awarded the Penn Prize for Excellence in Teaching by graduate students, a university-wide award given to 10 students annually.

I have also continued my commitment to STEM outreach, working closely with the Delaware Museum of Natural History to develop STEM demos and workshops for guests. At Penn, I was a lead presenter for Beta Days, which brings K-12 students to campus for bioengineering activities. Last summer, I lead a workshop for GEMS Camp, a week-long science camp for middle school girls. In fall, I was a lead workshop presenter for GAINS, a national STEM career conference for high school girls and continued my service in K-12 outreach with the American Institute of Chemical Engineers. Over the past year, I developed and delivered two workshops on engaging in K-12 outreach for chemical engineering professionals. In fall, I coordinated and presented a workshop on applying to graduate school for 300+ undergraduate students at the AIChE Annual Meeting and was awarded the inaugural AIChE Pedlar Award for rising star in chemical engineering. The award recognizes a recipient who demonstrates contributions in chemical engineering, and who shows potential for future growth and leadership.

Josue D. Mihaylov, AZ Δ’19

After receiving the TBP Fellowship, I was also an NSF Graduate Research Fellowship. I completed my B.S. in chemical engineering at the University of Delaware.

Thanks to the TBP Record Fellowship, I was able to seamlessly transition into graduate student life, starting my Ph.D. in bioengineering at the University of Pennsylvania. I have taken a wide variety of classes, including biofabrication and machine learning to supplement the interdisciplinary research I have been pursuing in Dr. David Issadoro’s lab. I am working to develop a robust, handheld, microfluidic platform for tuberculosis diagnosis. By combining machine learning with digital droplet-based measurement of multiple biomarkers in small blood samples, this enzyme-linked immunosorbent assay based diagnostic platform could improve quality of care for at-risk patients. By employing soluble biomarkers, the platform avoids the requirement for mechanical or chemical lysing. It employs three lasers with independent flashing sequences to barcode each droplet that passes the camera. I am working on developing more robust optics, as well as the machine learning aspects of this project.

I have learned about many different fields of engineering during my 1st year on this project, as it spans optics, microfluidics, machine learning, probability, product design, and more. I have continued my professional development by attending the Biomedical Engineering Society Conference, held in Philadelphia this year. There, I was able to absorb cutting edge research in low-cost and microfluidic biomedical sensors, network with other scientists/engineers, and advise undergraduates considering grad school.

Outside of the lab, I’ve been quarantineing. This has given me more flexibility to make homemade bread, tend to my houseplants, and make progress on knitting projects. I am deeply grateful to Tau Beta Pi for all the opportunities this year. TBP for life!

Isabel B. Navarro, DE A ’19
Record Fellow No. 16

After receiving the TBI Fellowship, I was also awarded an NSF Graduate Research Fellowship. I completed my B.S. in chemical engineering at the University of Delaware.

Thanks to the TBI Record Fellowship, I was able to seamlessly transition into graduate student life, starting my Ph.D. in bioengineering at the University of Pennsylvania. I have taken a wide variety of classes, including biofabrication and machine learning to supplement the interdisciplinary research I have been pursuing in Dr. David Issadoro’s lab. I am working to develop a robust, handheld, microfluidic platform for tuberculosis diagnosis. By combining machine learning with digital droplet-based measurement of multiple biomarkers in small blood samples, this enzyme-linked immunosorbent assay based diagnostic platform could improve quality of care for at-risk patients. By employing soluble biomarkers, the platform avoids the requirement for mechanical or chemical lysing. It employs three lasers with independent flashing sequences to barcode each droplet that passes the camera. I am working on developing more robust optics, as well as the machine learning aspects of this project.

I have learned about many different fields of engineering during my 1st year on this project, as it spans optics, microfluidics, machine learning, probability, product design, and more. I have continued my professional development by attending the Biomedical Engineering Society Conference, held in Philadelphia this year. There, I was able to absorb cutting edge research in low-cost and microfluidic biomedical sensors, network with other scientists/engineers, and advise undergraduates considering grad school.

Outside of the lab, I’ve been quarantineing. This has given me more flexibility to make homemade bread, tend to my houseplants, and make progress on knitting projects. I am deeply grateful to Tau Beta Pi for all the opportunities this year. TBP for life!

Michael P. Nitzsche, NJ B ’19
Tau Beta Pi Fellow No. 823

After graduating from Rutgers University with my bachelor’s degree in mechanical engineering and computer science, I completed my second summer internship at NASA Glenn Research Center, this time in the propulsion systems analysis branch. There, I developed software tools for modelling thermal management systems in electrified aircraft, and then contributed to a propulsion system model for a turboelectric plane concept.

In the fall, I began my Ph.D. in mechanical engineering at MIT. I joined Dr. Asegun Henry’s research group, which works to develop materials and technologies capable of withstanding extreme temperatures for applications in renewable energy. My research has focused on experimental testing of novel molten salt pumps and storage infrastructure for concentrating solar power systems. With the shift to remote work in the spring, I have focused on developing system and component-level models of technologies for CO2-free production of hydrogen through methane pyrolysis in molten metal.

In addition to research and coursework, I have been actively involved with the energy club at MIT. There, I have worked to communicate renewable energy research to the broader community through events such as energy night and by organizing a panel on decarbonizing aviation at the annual energy conference.

After completing my Ph.D., I plan to continue conducting research in the thermal sciences to address challenges in renewable energy and sustainability, either in academia or in the private sector. I am incredibly grateful for the support and opportunities given to me by Tau Beta Pi, and I hope to continue paying this support forward throughout my engineering career.
Outside of coursework, I started to explore the many activities in society. These activities include gaining insight into topics that require a combined perspective for enhanced activity and gene expression through my coursework. I also had the opportunity to learn about control models. I look forward to my final rotation in the summer.

I developed a novel antibody-drug conjugate platform for discovering novel protein-protein interaction using yeast surface display, respectively. I am also currently in the process of writing a manuscript for publication based on my undergraduate research in red blood cell surface display, respectively.

While completing my rotations, I bolstered my understanding of computational genomics and methods of manipulating neuronal activity and gene expression through my coursework. I also had the opportunity to attend seminars both in science and law, which gave me insight into topics that require a combined perspective for enhanced application in society.

Outside of my coursework, I started to explore the many activities in society. I am incredibly grateful to Tau Beta Pi for their support in my graduate education and for the many opportunities the fellowship has afforded me. It was an honor to receive this fellowship.
Fransiska Susan, MA B ’18
Record Fellow No. 14
After graduating from MIT with an S.B. in mathematics and computer science, I began
my doctoral program at MIT in the Operations Research Center. In my first year, I joined the Laboratory of Financial Engineering under the supervision of Prof. Andrew Lo. I worked on a privacy-preserving platform for sharing cyber risk, which uses a homomorphic encryption scheme to aggregate risk exposures while protecting the individual risks of all parties involved.

In my 2nd year, I have been working under the guidance of Prof. Negin Golrezaei, on topics related to statistical learning, machine learning, optimization algorithms, and mechanism design. My research focuses on developing robust online learning and combinatorial algorithms with applications in operations management, such as dynamic pricing, ranking, revenue maximization, and auction mechanism. In a recent project, I created an efficient Blackbox framework that transforms an offline algorithm to its online counterpart for combinatorial problems that admit greedy-like heuristics. This framework improves the regret bounds of many well-known online combinatorial problems, such as the unconstrained submodular maximization problem that frequently appears in influence maximization and determinantal point processes in machine learning.

I am currently working on several ranking and assortment optimization problems. I have also taken several statistics and optimization classes that helped solidify my theoretical foundations. I serve as an officer for the MIT Indonesian Student Association and INFORMS, an international association of operations research and analytics professionals & students. I am also passionate about financial inclusion and co-founded MINA, a budgeting and goal-based investing platform for Indonesians. I am honored and grateful for the generous support from TBI through this fellowship and I look forward to paying it forward through my personal and professional pursuits.

Noreen A. Wauford, CA A ’17
Tau Beta Pi Fellow No. 826
I’m currently a third year Ph.D. candidate at MIT in the biological engineering program, working on mammalian synthetic biology in the lab of Prof. Ron Weiss. As a TBI fellow, I’ve been able to pursue exciting research and volunteer my time to the community.

My research focuses on how to best engineer cells for applications in cancer therapy, specifically to encourage the immune system to attack the tumor. Engineered immune cells have been able to cure blood cancer patients who have failed multiple other treatment options, but many challenges remain in the field.

I believe synthetic biology offers a promising platform to improve these engineered cells. Recently, I was able to present on my work at the Keystone Cell Therapies conference in Banff, Canada. This year is my second year working with the Office of Educational and Outreach Programming at MIT to teach a synthetic biology course for high schoolers in the Saturday Engineering Enrichment and Discovery Academy. This 8-week course combines lecture and lab components to allow students to learn biotechnology skills and build and test an engineered bacterial strain.

I also serve as my department’s representative for the Grad Women at MIT club. Outside of research and volunteering, I play soccer on MIT’s club team, and rock climb and hike in the White Mountains. I’m extremely grateful to TBI and the alumni that make this fellowship possible, allowing me to improve next-generation cancer therapies goals.

Rose Yin, NY A ’19
Nagel Fellow No. 22
After graduating from Cornell University with a B.S. in chemical engineering and business minor, I moved to Cambridge, MA, to begin my Ph.D. in chemical engineering at MIT. While my undergraduate research in the Paszek Lab was in experimental glycobiology and microrheological method development, I transitioned to computational research and joined the Chakraborty lab, a computational immunology lab that focuses on applying statistical mechanics principles to complex immunological problems. Although the methods of research used are different, my biological-focused background allowed me to start engaging right away.

My current project is involved with understanding how T cell repertoire selection and development impacts the immune system’s ability to recognize self and foreign peptides, and what this might implicate for autoimmunity or aging related diseases. For the first steps, I plan to use statistical mechanics principles to build a physics-based model of T cell selection that can later be verified with experimental collaborations and data.

In addition, I joined many academic and community-focused programs including NetPals, a program focused on partnering local STEM professionals with underrepresented middle school students, and REF-X, the department’s resources for easing friction and stress organization, and the ChemE graduate-undergraduate mentorship program.

I am also involved in social dance community and help organize events for the MIT waltz club, salsa club, and Lindy Hop society. I would like to thank TBI for providing the generous funding that has helped me become a better researcher, mentor, and peer. The funding and support allowed me to transition smoothly into my doctoral studies, and gave me the means to become more interconnected with the research community at MIT. I hope to pay this support forward as I continue to further my academic career.