

2008 Fellow Reports

Reports of the 2007-08 winners in Tau Beta Pi's 74th Fellowship Program are presented here. They constitute the Fellows' only specific obligation to the Association after their appointment by the Fellowship Board. Their reports were written in April, and the verb tenses may sound wrong when read later. Each of the winners expresses appreciation to advisors and major teachers, to family and helpful friends, and to the Association, donors, and the Fellowship Board for the honor of being named a Tau Beta Pi Fellow.

Of the 36 fellowships awarded a year ago, 15 of the students have been paid cash stipends totaling \$150,000. The others did not need the stipend. One student has delayed his studies until fall of 2008.

Jeffrey S. Schlosser, GA A '07 Centennial Fellow No. 22

I am currently enrolled in my third quarter of the mechanical engineering M.S. program at Stanford University. My concentration is in the field of robotics, so I have spent most of my Fellowship tenure taking classes in robotics, mechatronics, dynamics, and mathematics. I will receive my master's degree in the fall of 2008, after which I plan to pursue a Ph.D.

Last quarter I completed a research project involving computer vision for autonomous vehicles. The goal of the project was to detect stop signs quickly and reliably using data acquired from a camera mounted on an autonomous vehicle. I designed and coded a framework that increased the efficiency and performance of traditional traffic-sign detection algorithms by taking advantage of known 3D scene geometry.

This quarter I have chosen to pursue a different research direction. I will be working to develop a robust real-time photoacoustic imaging system for a stereotactic radiosurgical robot known as the *cyberknife*, developed here on campus. The robot provides patients with non-invasive tumor treatments at sub-millimeter accuracy within the body. Working with a neurosurgeon in the medical school and an electrical engineering professor, I hope to reduce the cost and increase the accuracy of the current X-ray imaging system, enabling the installation of the robot at many more hospitals around the world.

After my Ph.D., I plan to work in industry for a short while, and eventually start my own robotics company. Thanks to TBPI for honoring me with the Centennial Fellowship!

Christopher M. Abela, E.I., CA P '07 Fife Fellow No. 93

I have been immersed in research at California State University, Fresno. Although in my application for the Fellowship I mentioned being interested in dampers, my thesis project will be on the investigation of carbon-fiber wrap as a seismic retrofit. The project will culminate in the building of two replicated bridge bents at 40 percent scale. The first test will investigate the current strengths and displacement capabilities of the concrete structure without carbon fiber. The second test will investigate the benefits of carbon fiber in dissipating earthquake-induced forces through higher strengths and greater ductility. Both bridge bents will be tested on the university's new seismic shake table. Thank you TBPI for helping me fulfill my academic goals by selecting me as a Fellow.

Nathan J. Falkiewicz, NY I '06 Fife Fellow No. 94

My first year as a Ph.D. student in aerospace engineering at the University of Michigan has been both exciting and full of new chal-



Jeffrey S. Schlosser



C.M. Abela, E.I.



Nathan J. Falkiewicz

lenges. Much of my time has been spent conducting research under the advisement of Professor Carlos Cesnik. My dissertation topic is reduced order aerothermoelastic modeling of hypersonic vehicles as part of the Michigan/AFRL Collaborative Center in Control Sciences. The goal of my research is to develop new computational techniques to characterize the dynamic response of these aircraft. This is an extremely interesting topic to me as the high speeds of hypersonic vehicles lead to heating of the structure, making determination of the flight characteristics an intricate problem. Through collaboration with the AFRL air vehicles directorate, we hope to develop techniques that will enable the implementation of hypersonic vehicles with possible applications in enhanced national security and easier access to space.

Upon arriving here, I attended a kickoff meeting for my research project and a few weeks later traveled to Virginia for a weeklong short-course in hypersonic flight at the National Institute of Aerospace. I am also keeping busy with coursework and hope to receive my M.S. in aerospace engineering by the end of next year. Next year I will continue my research while preparing for my doctoral qualifying exams. I thank TBPI for honoring me with this Fellowship as it has been instrumental in working toward my goal of earning a Ph.D. in aerospace engineering.

Kevin M. Ford, IN Δ '07 Fife Fellow No. 95

As a graduate research assistant at Purdue University, I have had the chance to work with some of the top minds in transportation engineering. Most notably with the help of my advisor Professor Jon D. Fricker and INDOT, I have had the opportunity to work on multiple projects in the area of transportation planning. My current projects vary from researching:

- Real-time socio-economic data for travel demand modeling and project evaluation—searching for data sources that could be used to update socio-economic variables in trip generation models more frequently than the decennial census.
- A disaggregate trip-generation methodology for metropolitan planning organizations lacking direct local data—creating a procedure that allows MPOs to forecast trips by way of cross-classifica-



Kevin M. Ford



Ariane I. Fund, E.I.



Shawn M. Gargac



Aaron J. Hartwell



Nicole L. Heacock



John W. Kelly

tion without having to perform costly surveys.

- Using sensitivity analysis to guide travel data collection in small and medium-sized communities—determining the sensitivity of variables throughout the standard four step planning process, allowing decision-makers to best optimize the allocation of their resources.

- Identification of historical trend reversals in socio-economic data—identifying early trend reversals so as to best plan for society 20 years from now.

Upon completion of these projects and my master's degree in December, I am looking forward to continuing my education on to earn a Ph.D. in transportation engineering with a focus on sustainable transportation planning. Then, my plan is to obtain a teaching position in civil engineering.

Ariane I. Fund, E.I., RI A '06

Fife Fellow No. 96

My TBPI Fellowship has helped enable me to complete my master's of engineering degree in high-performance structures within the civil engineering department at MIT. This intensive nine-month program is geared toward enhancing practical skills to be used in professional practice as a structural engineer. As such, most of my time has been spent on coursework, building on my undergraduate studies and developing more in depth knowledge of structural engineering theories. The program is also highlighted by a year-long group design project, in which my group of four carried out the entire design of a building—starting from conceptualization, to architectural and structural design, to construction methods and cost. After graduating in June, I plan to work as a structural engineer at Simpson Gumpertz & Heger in Waltham, MA. I am extremely honored and grateful for the Fellowship and support from TBPI.

Shawn M. Gargac, OH M '07

Fife Fellow No. 97

Under my TBPI Fellowship this year, I have accomplished many things. I will be graduating this summer with a master's degree in biomedical engineering with a concentration in biomechanics. I have spent the past year working on research centered on a novel total ankle-replacement implant. A fellow student and I designed the implant for our senior-design project. Some of my work has involved finite-element analysis and design optimization of the implant models and the development of a surgical technique and cutting jigs. I have also been involved with a study on fatigue testing of cadaver femur bones. Work on the ankle project has led me to become a co-inventor on at least one patent application with possible others to come. In the fall I presented my research at the ASME Dayton engineering sciences symposium and was awarded the best presentation award in the area of biomechanics.

Upon graduation, I plan on either looking for employment or continuing my education and going for a Ph.D. My area of greatest interest is in orthopedic implants, and I would like to continue working in this field.

Aaron J. Hartwell, SD A '07

Fife Fellow No. 98

Aaron plans on completing his master's degree in civil engineering and minor in business administration next May. He also has been working with a structural-design-consulting firm as an E.I.T. and plans to pursue his P.E. within a few years. His graduate project involves modeling partially restrained composite connections (PRCC) in buildings subjected to progressive collapse. The intent of the project is to show that PRCC may provide enough redundancy when used throughout a building to greatly reduce the potential of progressive collapse when certain structural members have failed due to blast loading. The parameters of the model are in accordance with the U.S. General Services Administration design guidelines for progressive collapse analysis. This project was started last October and is planned to run until next May with the goal of publishing the findings in an effort to improve the understanding and design guidelines of PRCCs subject to blast loading.

Nicole L. Heacock, IA B '07

Fife Fellow No. 99

In my first year of graduate studies as a TBPI Fellow, I have pursued curiosities, used my engineering background to design devices to improve humanity, and gained invaluable knowledge through a vast array of coursework.

As part of my master's research, I began to delve deeper into investigations of direct borohydride fuel cells (DBFC). An early part of this research focused on writing a program to predict reaction products of fuels based on thermodynamic properties. This was used to validate experimental data. Recently, we developed a new design concept, and experimental data from the newly fabricated DBFC will be obtained later as I continue to work toward my thesis.

Beyond my primary research, I also worked on a design team to develop an electrolytic chlorinator. The device is intended to disinfect drinking water at an affordable cost so that the technology is available to people in the developing world. The fabricated prototypes, which were significantly more affordable than currently available designs, were entered into a sustainability research competition hosted by the Environmental Protection Agency in April 2008.

As I gain more knowledge through coursework, I continue to grow increasingly interested in sustainability in design and renewable energy. I anticipate graduating from the University of Iowa with my master's degree in mechanical engineering in December 2008. After graduation, I hope to pursue a career with a sustainability focus in engineering consulting, design, or research and development.

John W. Kelly, NC A '07

Fife Fellow No. 100

During my time as a TBPI Fellow I have been researching methods of analysis for musculoskeletal systems. The first part of my work involves an investigation of tools available for analyzing the system dynamics of motion capture data. Some of these analysis tools are unusable for many clinicians due to compatibility problems between



Jeffrey J. LaBundy



Anirban Mazumdar



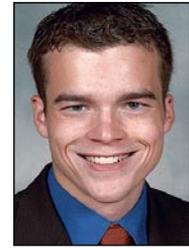
Ashley C. Smith, E.I.



M.A. Sofolahan



Daniel M. Studer



Jeremy L. Schroeder

the software and common motion capture systems. A robust software package was created to help address this problem and give clinical researchers access to more powerful tools in analyzing musculoskeletal systems.

The second part of my work uses pattern recognition techniques to classify the conditions of patients performing tasks in a virtual reality environment. Data that was recorded on some healthy patients and on some patients who have suffered a stroke will be automatically classified in order to identify if a patient has abnormal mechanics in their motion. Although this is a diagnosis that can be made fairly easily by a clinician, it is hoped that any developed techniques and feature spaces used for classification can be expanded upon to help make more difficult diagnoses and improve rehabilitation.

The TBI Fellowship has helped me towards the completion of my M.S. at North Carolina State University. Next year, under the support of an NDSEG fellowship, I will begin my Ph.D. in electrical and computer engineering at Carnegie Mellon University. Later, I hope to pursue research in the field of robotics, especially in areas with applications to medicine and rehabilitation.

Jeffrey J. LaBundy, MO B '07
Fife Fellow No. 101

During the 2007-08 academic year, I have had the privilege of expanding my problem-solving abilities and engineering skills while pursuing a M.S.E.E. at the University of Texas at Austin. Through my coursework, I have had the opportunity to gain a significant amount of experience designing integrated circuits using computer-aided drafting tools. As a final project for an integrated circuit design course last fall, I was part of a team that was responsible for designing an integrated circuit that performs trigonometric functions within a scientific calculator. The project's scope included the full design process, from the initial logic design to the final silicon layout.

I have also spent this year as a graduate research assistant at Applied Research Laboratories, a naval research facility within the university. There, I have gained real-world experience with analog circuit design, printed circuit board layout, and power electronics. I have had the opportunity to solve challenging design problems and implement creative solutions. Through this research, I have gained practical skills that will further aid me in my career as a circuit designer.

After obtaining the M.S.E.E., I wish to enter the fast-paced semiconductor industry and begin a career in integrated circuit design. I am particularly interested in working at the logic design level using hardware description languages—a fascinating area of work to which I was introduced by attending graduate school.

Anirban Mazumdar, MA B '07
Fife Fellow No. 102

Over the past year I have had a few accomplishments of which I am particularly proud. First, I became a mentor in MIT's science technology engineering math (STEM) program. This program pairs fellow students with at-risk high-school and middle-school children

from the greater Boston area. My mentee and I share an interest in robotics, and I have very much enjoyed this experience.

In addition to my participation in the program, I began working as a research assistant at the D'Arbelloff Laboratory in the department of mechanical engineering. I also had a paper accepted by the IEEE International Conference on Robotics and Automation, and I presented it in May in Pasadena.

Finally, I was recently awarded a NSF graduate research fellowship. I hope to use this fellowship to continue research in robotics. Specifically I hope to involve undergraduate students in my research and I plan to continue to participate in programs such as STEM that reach out to at-risk youth and increase opportunities in science and engineering. I still hope to obtain a Ph.D. in mechanical engineering and perhaps pursue a career as a professor. I truly appreciate the great honor of being a TBI Fellow, and I am very thankful for this opportunity.

Ashley C. Smith, E.I., SC B '07
Fife Fellow No. 103

My first year in graduate school at the University of Michigan consisted primarily of coursework and attending seminars. My classes have enabled me to develop a better understanding of construction methods, equipment, and project management skills that are sure to benefit my future career. This past year included a directed studies project that analyzed the implementation of local union labor agreements versus national agreements in the construction industry. The primary focal points were potential cost savings and increased productivity levels. I also studied topics such as construction contracts, safety, worker motivation, ergonomics, and cost estimation.

This summer, I will take a short break from my master's program to play professional softball for the Philadelphia Force. Next fall, I will continue with my degree and plan to take courses in scheduling and probability. My final semester will also include an independent study project that will attempt to forecast future trends in sustainable construction. Upon graduation in December, I plan on entering the construction industry, either as a consultant or a project engineer. I thank TBI for the opportunity to further my education. I feel both honored and grateful to be affiliated with such an outstanding organization.

Mopelola A. Sofolahan, MD E '07
Fife Fellow No. 104

My first year at Purdue University has been focused on coursework, attending departmental seminars in order to broaden my knowledge of ongoing research, and studying for my qualifying examination. For the past year, I have been surrounded by reputable faculty and other excellent students who have created the perfect environment for me to learn more about research areas in electrical engineering. The Fellowship from TBI has afforded me the freedom to do all of these while carefully deciding on the area I would like to research. My current area of interest is image processing. Although I was not particularly involved in research this past year, I have cultivated the habit of studying research papers and subsequently discussing them with faculty. Thus far, I have not finalized my research

topic, but I will undertake research projects that focus on image processing during the summer. Apart from school work, I have participated in mentoring initiatives within my department such as the women in engineering graduate mentoring program. This program in particular has given me the opportunity to network with female students from different departments, engineering faculty, and practicing engineers.

As the year comes to a close, I say *thank you* to TBPI for the financial support and recognition given to me. I make no overstatement by saying that graduate school thus far has been made possible, in no small way, by the generosity of TBPI.

Daniel M. Studer, AZ A '07

Fife Fellow No. 105

Daniel has spent the last year at the University of Colorado at Boulder studying sustainable building technologies. He has learned how to implement these technologies to ensure that future buildings continue to become more energy efficient and that they provide healthier environments for their occupants. Besides taking courses in areas such as advanced solar design, energy technology and policy, and HVAC controls, he has also started preliminary work for his master's thesis. The ultimate goal of his thesis will be to determine if ground source heat pumps reduce carbon dioxide emissions when they replace traditional HVAC systems in typical Colorado residential homes.

Upon graduation, he plans to work with residential home builders to help make sustainable, energy efficient, cost-effective technologies available to the average consumer through their use in green housing construction. He wants to make this practice commonplace in the industry to help create a more sustainable world.

Jeremy L. Schroeder, OH I '07

Spencer Fellow No. 53

This year, I have completed two semesters of transportation classes at the University of Virginia where I am working to complete a master's degree in civil engineering. I have also begun research in conjunction with the Virginia Department of Transportation at the Virginia Transportation Research Council where I am evaluating driver reactions to variable message signs so that they may be most effectively used. After graduation in May 2009, I plan to pursue a Ph.D. in civil engineering before taking a job in the transportation sector and, ultimately, becoming a professor of civil engineering. Thank you to everyone from TBPI for awarding me this Fellowship.

Jennifer M. Cloud-Buckner, TN Γ '07

King Fellow No. 46

Jennifer is in her first year at Wright State University, where she is working on her engineering Ph.D. with a focus in industrial and human systems. She graduated in May 2007 from Tennessee Technological University with a B.S.I.E. and a B.S. in professional communications. In summer 2007, she received the third place student award for excellence from the Institute of Industrial Engineers. In addition to completing coursework, she is working on a research team with the Veterans Administration Medical Center in Dayton, OH, to design and implement a teleconsultation system for surgical patients in rural areas. She was also a co-author on a conference paper, "Issues in Alerting: Medication Order Entry in Real Practice." A member of the IIE and Human Factors and Ergonomics Society, she plans to pursue a career with a focus on risk perception and decision-making support in health systems.

Emily P. Chang, PA Δ '07

Sigma Tau Fellow No. 34

My first semester as a Ph.D. student in the chemical engineering department at MIT was an incredibly challenging one. I completed



Jennifer Cloud-Buckner



Emily P. Chang



Ryan J. Staab

three of my core courses and an elective; through them, I gained a better understanding of chemical systems and learned to solve many complex chemical engineering problems using analytical and numerical methods that I previously did not know. At the end of that term, I passed all of my classes as well as my doctoral qualifying exams.

During my second semester, I took two more required classes and started research with the Novartis-MIT center for continuous manufacturing, which was established at the end of last year to develop new technologies for continuous processes in pharmaceutical manufacturing. In the fall, I plan to spend a few months working in industry to complete my master of science in chemical engineering practice.

After finishing my graduate program, I intend to work in research and development at a pharmaceutical company. I also enjoy interacting with students, so I would like to obtain a university advising or lecturing position sometime during my career.

Ryan J. Staab, WI E '07

Stark Fellow No. 30

Since starting my graduate work at the University of Minnesota-Twin Cities, I have worked to broaden my engineering skills. Along with courses in heat transfer and fluid flow, I have taken courses in engineering ethics, microfabrication, and engineering quality and the design of experiments. To gain more research experience, I have joined the laboratory for heat transfer and fluid flow practice, which is headed by Dr. Sparrow. The laboratory works with local industry to find practical solutions to industrial heat transfer and fluid-flow problems through the use of both numerical simulations and experimentation. Currently, I am working to evaluate the heat transfer from biomedical implantable devices. Outside school, I have been enjoying the Twin Cities and keeping myself active by biking and playing tennis.

Sterling J. Anderson, UT B '07

Williams Fellow No. 28

I'm happy to report the first year of my graduate studies at MIT; in matters of research, classes, and career preparation, it's been a good one—where family is concerned, even better.

I am working with the robotic mobility group to develop novel planning and control approaches to enable mobile robots to operate at higher speeds and in more varied environments. Interest in this research is growing rapidly in both defense and commercial sectors and, with the sponsorship of Ford Motor Company, we're rising to the opportunity.

Our research has produced a novel framework for high-speed mobile robot navigation. We have presented this framework to researchers at Ford and look forward to experimentally validating it with them this summer. Once validated, we believe our model will provide a significant advance in high-speed mobile robot navigation technology. I'll refer the interested reader to <http://web.mit.edu/mobility> for a further description of our work.

My coursework has included studies in advanced system dynamics and control, optimal control, disruptive innovation, and leadership. In addition, I'm serving on the executive board of the



Sterling J. Anderson



Rick A. Nugent, E.I.



Kevin Zhou



K.M. Steele



Travis B. Wolf

institute's science and engineering business club and working with a technical startup to develop a market-launch strategy for its disruptive technology.

Almost as if to accent my first year of graduate study, my wife and I recently welcomed our first child—a little girl. I plan to graduate with my master's degree next summer and begin my career in design and control.

Rick A. Nugent, E.I., LA A '07 Deuchler Fellow No. 28

I am pursuing a Ph.D. in civil engineering with a concentration in geotechnical engineering at LSU. I have maintained a 4.0 G.P.A. after completing coursework in clay mineralogy, advanced environmental hydraulics, advanced soil mechanics, wetland biogeochemistry, environmental microbiology, and coastal physical-chemical systems. My goal with this selection of courses is to gain a broad background in chemical and biological processes, as well as physical geotechnical systems.

In addition, I earned my E.I. license and taught the soil and water conservation merit badge to twelve Boy Scouts. I also helped with geotechnical lectures and lab work for my advisor. In March, I attended ASCE's geotechnical conference in New Orleans where I was a member of a team that designed and built a paper retaining wall that earned us the national first place award. In June, I traveled to the Argonne National Laboratory to assist a fellow doctoral student with his research and later will be helping with the First American Academy of Mechanics conference in New Orleans.

Last fall, I studied prior research in clay-biopolymer interaction. Then, I began conducting unique research into the interaction between biopolymers and clay minerals. I am currently compiling my lab research and hope to publish my findings by this fall. The end goal is to use this knowledge to improve erosion resistance of wetland soils and to become an expert on biopolymers.

Kevin Zhou, IL A '06 Matthews Fellow No. 10

During my tenure as a Fellow, I worked on research projects studying shock waves through air and water. Focusing on solid-fluid interaction effects, I helped design and run experiments to measure the deflection and deformation of structures subjected to these waves. The experiments explored a wide variety of impact conditions, structural configurations, and material parameters and allowed me to develop a broad education spanning several disciplines. In addition to my research, I completed upper-level coursework in fluid dynamics, solid mechanics, and applied mathematics. My objective is to use my graduate-school experiences to develop the background and skills necessary for a productive career as a researcher in academia or industry.

Katherine Muterspaugh Steele, CO A '07 Nagel Fellow No. 10

This past year has been incredibly busy, energizing, and full of change as I have completed my undergraduate work at the Colorado School of Mines, married TBP member (Daniel Steele, CO A '07),

and moved to begin my graduate work in mechanical engineering at Stanford University under an NSF Fellowship. Coming from a small school, I have enjoyed the wide variety of graduate courses available including such offerings as modeling and simulation of human movement and medical device design. I've also begun research in the area of biomechanics primarily relating to comparing novel markerless-motion-capture techniques to the traditional marker-based methods. Motion capture provides quantitative data and visualization capabilities that aid in biomechanical analyses, clinical evaluations, and sports-performance investigations. These tools will be a critical experimental and clinical component of my future research as I hope to focus on understanding, diagnosing, and treating neuromuscular disorders. Although I miss the mountains and snow of Colorado, one can hardly argue with the beautiful weather and wide spectrum of new experiences and opportunities I have found in California. It has been a wonderful year, and I thank TBP for the past experiences it has provided me and future possibilities it has helped reveal.

Travis B. Wolf, MD Γ '07 Astronaut Fellow No. 7

This year, during my S.M. program in aeronautics and astronautics at MIT, my studies have primarily focused on autonomy (artificial intelligence, learning algorithms, search algorithms). My focus should shift to control systems next year. At Lincoln Laboratory, while working under Dr. James Kuchar, I developed code to recreate actual radar track data in a simulation that my group has developed. In addition, I have begun work on my thesis, which involves the evaluation and effectiveness of *partially observable Markov decision process-based* collision-avoidance algorithms compared to currently used methods. I hope that this work will contribute to the development of new types of aircraft collision-avoidance systems, which might be used on future commercial or unmanned aircraft.

Following graduation in June 2009, I will be stationed at Pensacola, FL, to begin training for flight school, which will take place in Corpus Christi, TX. I hope to fly tactical aircraft (F/A-18s in particular). Eventually, I hope to attend Naval Test Pilot School. I would also like to participate in the astronaut program, if possible, during my career. Following the conclusion of my naval career, I intend to continue to pursue my interest in aerospace engineering in private industry or government.

Alan D. Berger, PA B '07 Anderson Fellow No. 3

During the past year, Alan has constructed and utilized an experimental setup for measuring the charge-carrier mobilities in organic-nanocrystal hybrid solar cells. Mobility describes how well electrons and holes respond to an electric bias, and it is linked to how efficiently the material allows carriers to move from one electrode to another. The goal of this research is to develop a method for reliably measuring the mobility of carriers in these new polymer-quantum dot solar cells in order to help characterize new materials and evaluate their effectiveness for device applications.

Essentially, the research involves shining laser light on a solar cell and applying a voltage so that electrons or holes are forced to



Alan D. Berger



Ryan M. Boehler



Qike K. Chen



Craig M. Dana



Jennifer Ehrhardt



G.M. Gallagher

drift across the entire length of the sample. By determining the time taken for this travel, mobility can be calculated.

One problem with this material system is that the RC decay of the measurement setup can interfere with the data. The group has fabricated thicker samples and reconfigured the setup to combat this, and measurements of the RC decay show that they should not greatly affect results. Still, he is currently investigating two alternate methods of mobility determination for a comparative study to validate the data collected so far.

After completing this work, he plans to pursue a Ph.D. in a related field and would eventually like to be involved in developing and/or deploying renewable energy technologies to combat the looming energy crisis.

Ryan M. Boehler, KS A '07
Tau Beta Pi Fellow No. 746

In my first year as a Ph.D. candidate at Northwestern University, I have chosen to work on spinal cord regeneration under Dr. Lonnie Shea. I joined the lab in January and began to learn techniques and perform literature searches in the area. My first three quarters of school have been primarily filled with ten classes and a quarter as a teaching assistant. I am currently learning techniques in DNA patterned transfection, microsphere scaffold fabrication, cell culture, and animal model in vivo studies. As far as future career plans, I have not decided whether I plan to target opportunities in academia or industry. I am currently applying to a biotechnology predoctoral training program that would require a three-to-six month internship during the course of my studies. This will provide me with a view of industry along with my current academic studies. I hope to pursue chances to teach classes here before I graduate to get a better idea what a professor's job would be like.

Qike K. Chen, NY P '07
Tau Beta Pi Fellow No. 747

The past year at Princeton has been a challenging but fruitful year for me. I am finishing the core courses and have started to work on my thesis project on developing a fibrosis genesis model by studying the roles of biochemical and mechanical signals on Epithelial-mesenchymal-transition (EMT), a characteristic phenotypic alteration in which epithelial cells detach from their neighbors and become invasive. We have used micropatterning approaches to investigate how the biochemical and mechanical properties of the microenvironment contribute to EMT. Mouse mammary epithelial cells are able to undergo EMT in response to MMP3 when cultured on fibronectin, but only if the underlying substratum permits cellular extension. Altering the identity of the extracellular matrix (collagen I, laminin-111, etc.) changes the EMT response. Understanding these microenvironmental controls will permit construction of an in vitro model of fibrosis genesis, and could reveal novel therapeutic strategies.

Craig M. Dana, NJ B '07
Tau Beta Pi Fellow No. 748

It has been a truly exciting year for me! I have had the privilege

of working under the mentorship of Douglas S. Clark and Harvey Blanch, professors of chemical engineering, at the University of California, Berkeley, in pursuit of my Ph.D. in chemical engineering. Recently, I have become a member of the Energy and Biosciences Institute, a partnership between BP, the University of California, Berkeley, the Lawrence Berkeley National Laboratory, and the University of Illinois. EBI is a new R&D organization that harnesses advanced knowledge in a multitude of disciplines with the goal of exploiting biotechnology to further efforts to discover alternative renewable sources of energy. In particular, I am thinking about how to improve cellulases, enzymes that break down plant matter into their constituent sugars which can be readily transformed to biofuel. To this end, I will use a technique called *directed evolution*, which is a way of mimicking and improving upon nature's method of enhancing enzymes. I feel incredibly privileged to have received the TBPI Fellowship and have also been lucky enough to receive an NSF graduate research fellowship to support this work.

Jennifer Ehrhardt, PA Θ '07
Tau Beta Pi Fellow No. 749

This year at Clarkson University I have been part of the beginning of a study entitled "Characterization of the Ambient Air Quality in Syracuse, NY," under the advisement of Dr. Philip Hopke. Because this is a new study, my main focus has been developing the sampling system that will be implemented and used by future graduate students working on this project. I have been outfitting a trailer to measure the composition of air at multiple heights in downtown Syracuse at the center of excellence site. We hope to have this system up and running by the beginning of this summer. This project also involved quarterly intensive sampling campaigns in which we sample the air at ground level at various sites that were selected strategically in order to get a complete picture of the system for analysis. I completed one of these intensive campaigns and will complete one more before I finish my degree. I hope to complete my master of science in chemical engineering by the end of this summer. I am planning on working in industry related to the environment after this is completed; however, I am wholly focused on completing my research project to the best of my ability, so I have not determined where I will be working in the fall.

Garratt M. Gallagher, CA Λ '07
Tau Beta Pi Fellow No. 750

My first year as a master's student in Carnegie Mellon's robotics program was filled with great research opportunities and cool robots. Although my background at my undergraduate institute was in physics and electrical engineering, I have focused my graduate education on machine learning and AI.

Most of my research is in conjunction with the Personal Robotics lab at the Intel Pittsburgh branch in Carnegie Mellon's collaborative innovation center, which has granted me access to the "robo-butler," a robot consisting of a Barret WAM arm and a Segway. My work has focused on using a LiDAR (Light Detection and Ranging), a planar laser scanner, which is mounted on the Segway to perform simultaneous localization and mapping in dynamic environments. So far, the software I developed can take raw laser-scan data and



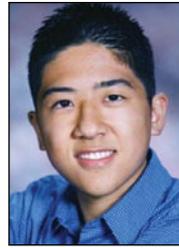
Pavel Gershteyn



Nikolce Gorevski



Bradley C. Hansen



Kevin S. Tang



Luke J. Venstrom



S.I. Fraley, E.I.

identify the static objects like walls, occasionally moving objects like chairs, and constantly moving objects like people. Identifying dynamic objects has already resulted in vast improvements in the robot's localization, and I am currently working to use the dynamic object information to make better maps of the environment. I am also using the dynamic object data to predict human behavior and future actions.

My experience has not been all work, however. In my spare time, I have been elected RoboCzar, the head RoboOrg, the robotics graduate social organization. Overall, my first year has been a deeply rewarding and fulfilling experience. I look forward to my next year with enthusiasm.

Pavel Gershteyn, OK B '07
[Tau Beta Pi Fellow No. 751](#)

As my first year of graduate study, this year represents a gateway into my professional career. My classes were the bread-and-butter of the graduate curriculum: networking and network security, search-engine algorithms, computer security and policy, and artificial intelligence were my topics of study. My research is focused on the computer forensic potential of using cutting-edge RAM analysis techniques to defeat full-hard-disk encryption techniques.

My career goal is to work at a prestigious laboratory such as Microsoft Research, Lawrence Livermore, or NIST, designing security and forensic solutions for next-generation network architectures. I believe that advances in embedded devices and wireless networking will make ubiquitous computing a reality. But, with the benefits will come myriad threats, which will require robust security mechanisms and sophisticated techniques for investigating security breaches.

Nikolce Gorevski, PA E '07
[Tau Beta Pi Fellow No. 752](#)

In retrospect, I find my first year as a graduate student at Princeton University everything I was hoping for and more. In seven short months I truly managed to delve into the theoretical foundations of chemical engineering through the academic courses that comprise my program. Simultaneously, I was given ample opportunity to explore my research interests and their compatibility with the research conducted here, through an elaborate thesis project matching process, planned by the department.

In the second semester, I was matched with an academic advisor and with a thesis topic that is a unique and rare combination of experimental and computational work, continuum mechanics and developmental biology. More specifically, I began researching the role of mechanical gradients in the branching morphogenesis of the mammary gland, as a part of the group led by Dr. Celeste M. Nelson. The goal of my project is to provide physical understanding of the morphogenetic processes that drive normal tissue development, which can then help elucidate the events that lead to pathologies such as fibrosis and tumorigenesis within epithelial tissues. I find it extremely exciting and stimulating to work at the interface of disciplines, and I feel fortunate that I am able to pursue my primary interests as a chemical engineer and simultaneously make a contribution to society in the form of very relevant cancer research.

In addition to a fulfilling academic life here, I enjoy the benefits of living in a socially, culturally, and intellectually vibrant environment that is graduate school in general.

Bradley C. Hansen, UT A '07
[Tau Beta Pi Fellow No. 753](#)

My first year of graduate school at UCSD began last August with a rotation in the cartilage tissue engineering lab led by Dr. Robert Sah. Here I was assigned to a team that is setting up a robotic mechanical test system, automating biomechanical test procedures. This was the perfect transition for a mechanical engineer into bio-engineering and my work evolved into a formal position in the lab. Aside from this mechanical test project, I have also assisted with joint contact pressure tests, mentored a senior design team, and organized outreach events to get high-school students interested in engineering.

Here, Ph.D. students spend the bulk of their first year in classes. I have studied a broad range of topics; biochemistry, linear systems, heat and mass transport, and tissue engineering, just to name a few. Particularly interesting have been the mechanics and biomechanics classes. In fact, my first teaching assistantship was for an undergraduate biomechanics class taught by Dr. Andrew McCulloch.

Soon classes will be over for the year, and my focus will shift to the departmental qualifying exam. This oral exam will cover topics from the life sciences and engineering and serves to ensure my abilities to perform at a doctorate level. Talk about stress! I will be excited to have this first year behind me and then concentrate on researching orthopedic biomechanics.

Kevin S. Tang, NJ B '07
[Tau Beta Pi Fellow No. 754](#)

Since September 2007, I've been studying at Yale University as a biomedical engineering Ph.D. candidate. My first year is primarily focused on finding an appropriate research investigator to work with through mandatory laboratory rotations. Each semester, I am required to undergo one rotation and by the end of the first year, choose one of the two laboratories to work in. In my first rotation, I worked in an immuno-engineering lab under Dr. Tarek Fahmy. I was involved in a project investigating the use of unique PLGA nanoparticles as a potential vaccine delivery system.

For my second rotation, I am currently working in a bioimaging lab under Dr. Erik Shapiro, whose research focus is using magnetic resonance imaging for molecular and cellular imaging. In his lab, I am involved in a project investigating the ability of mesenchymal stem cells to reduce brain tissue damage caused by stroke in a rat model. In addition to my research, I have also been taking required coursework such as physiological systems, physical and chemical basis of biosensing, and advanced engineering mathematics. My current goals are to complete my Ph.D. program and afterward gain some work experience in industry. I am much obliged to the TBI Fellowship Board, the Association, and donors for being named a TBI Fellow, and will continue to represent this society honorably.

Luke J. Venstrom, IN Δ '07
Tau Beta Pi Fellow No. 756

During my first year of graduate study, I completed quintessential courses in the thermal sciences while actively participating in renewable energy research. I broadened and deepened my understanding of the mechanical engineering discipline by studying topics such as conduction, radiation, fluid mechanics, and chemical reactor analysis. The knowledge I gained enables me to more critically analyze complicated engineering systems, and it has already proven valuable in a sustainable energy research project.

For this project, my colleagues and I are studying the second step of a two-step thermodynamic cycle for splitting water. In the first step, concentrated solar energy is used to split zinc oxide, and in the second step, called hydrolysis, the zinc product reacts with steam to produce hydrogen, one potential alternative energy source. In a laboratory scale reactor, I helped perform experiments to elucidate the kinetics of the hydrolysis reaction when the zinc reactant is in a solid or vapor form. Using tools gained in my conduction and chemical reactor analysis course, I analyzed data to determine intrinsic reaction kinetics free from the effects of mass and heat transfer.

After obtaining a Ph.D. from the University of Minnesota-Twin Cities, I plan to pursue an academic career, and will look to join the faculty of a small college or university where a significant emphasis is placed on undergraduate teaching. There I will engage enthusiastic undergraduate students in the research of solar inspired sustainable energy.

Stephanie I. Fraley, E.I., TN Z '06
Tau Beta Pi Fellow No. 757

My first year of graduate school has been inspiring and rewarding. In October I joined Dr. Denis Wirtz's lab at the Johns Hopkins University. The goal of the lab is to use engineering principles to develop novel techniques for quantitative analysis of human disease causing cells and use the techniques to gain fundamental knowledge of cell biology.

I specifically study cancer cell motility and extracellular matrix (ECM) signaling interactions in hopes of deepening the understanding of tumorigenesis and metastasis. I am developing a model system to mimic the *in vivo* microenvironment, complete with a three-dimensional ECM, chemotactic gradients, and tunable mechanical properties. Using human fibrosarcoma and osteosarcoma cells with various known motility genes knocked down, I measure how much cells move and pull on the matrix, how the local stiffness of the cytoplasm changes, and how the stiffness of the matrix is modulated. This work involves video imaging live cells and measuring properties of cell motility by tracking embedded-bead refraction and motion through high-resolution microscopy.

I am fortunate to have received a JHU Heath fellowship this year in addition to the TBP award. I am very thankful to TBP for its continued support. I owe much of my success to my experiences in TBP. This is a wonderful organization, and I am very proud to be a part of it.