

2006 Fellow Reports

Reports of the 2005-06 winners in Tau Beta Pi's 72nd Fellowship Program are presented here. One 2004-05 Fellow delayed his graduate study for a year and also reports below. 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 35 fellowships awarded a year ago, 15 of the students have been paid cash stipends totaling \$150,000. The others did not need the stipend.

Bijun Tan, NY I '05 Centennial Fellow No. 20

After I graduated from Cooper Union with a bachelor of electrical engineering, I started a Ph.D. program in signal processing at the University of Michigan. It was quite a change of environment: moving from New York. I took quite a while to get adjusted to life. Moreover, I was challenged by the graduate curriculum of the E.E. systems program. I thought I had a good understanding of math and did not expect the level of abstract thinking and rigor required of my work. I had to build math skills by taking fundamental courses in probability and advanced calculus.

This summer, I am starting a research project on constructing Bayesian networks for discovering pathways to prostate cancer. We are collaborating with students and professors from the electrical engineering, chemical engineering, and bioinformatics programs. I started to get interested in biology/bioinformatics research last summer during my internship at a Boston start-up company called Helicos. It was founded by an alumnus of Cooper Union, Stanley Lapidus, who hired me to analyze micro-array experiments and some breast-cancer studies. I think working there was a life transforming experience. I would like to become a researcher in system biology and apply engineering principles and mathematical techniques to high-throughput biology experiments.

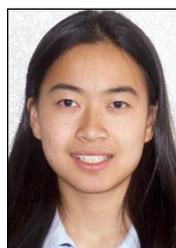
When I look back on my undergraduate education, I think it taught me how to work hard and challenge myself. I was immersed in a positive and encouraging environment including my friends, professors, and tennis coach. The TBPI Centennial Fellowship encouraged me and gave me more confidence towards graduate study. I am grateful for the honor.

Aureus E. Griffith, DC A '05 Fife Fellow No. 69

As I reflect on the last year of my life, I am thankful for the honor and opportunity that the TBPI Fellow has granted me to pursue my lifelong goals of managing my own research facility in the West Indies. I am also grateful for the critical thinking that I've learned as an engineer and which I know has allowed me to be as successful as I am while pursuing my M.B.A. at the Howard University Business School. After receiving my bachelor's in electrical engineering in 2005, I have studied supply chain management, an experience that has undoubtedly both relied on and enhanced the analytical and problem-solving skills that I've learned from engineering.

Apart from the extensive classroom experience, I've had the opportunity to explore supply chain management through executives from numerous Fortune 500 companies as a part of the program. In the next week I will be attending the Institute in Supply Management Conference in Minnesota to gain even more first-hand experience about the industry from those who know it best.

In the future my intentions are to complete my degree and



B. Tan



A.E. Griffith



D.A. Hall

continue exploring the industry as a supply/purchasing officer. I am grateful to the university and to TBPI for the support and tremendous opportunities to further my studies. Thank you TBPI.

Drew A. Hall, NV B '05 Fife Fellow No. 70

My first year as a graduate student at Stanford University exceeded my expectations. While studying electrical engineering, I focused primarily on completing the necessary required coursework for my degree. I had initially planned to specialize in digital systems. However, the school's coursework requirement dictated that I take classes in a wide variety of topics unrelated to my desired area of concentration. It was during one of these mandatory breadth courses that I actually decided to change my specialization from digital systems to circuits. I am now highly interested in the medical-electronics field and am currently exploring possible long-term research projects. In my upcoming years, I plan to decrease my number of academic classroom credits in order to concentrate more heavily on research. Upon graduation, I hope to continue my work in medical electronics in an effort to further benefit and advance the field. I am continually grateful to the Tau Beta Pi Association for its support and recognition. Without it, the transition to graduate school could not have been nearly as seamless and effortless.

Robert G. Hennessy, CA A '05 Fife Fellow No. 71

As a first year M.S/Ph.D. electrical engineering student at Stanford, I am extremely busy but enjoying every minute of it. My focus is MEMS, micro electromechanical systems, and my breadth areas are circuits and physics. I have completed many challenging courses including solid-state sensors and actuators, principles and models of semiconductor devices, and analog integrated circuit design. Additionally, I passed the qualifying examination in January.

Last fall, I joined Professor Roger Howe's research group. The goal of my research is to dramatically reduce the power consumption of MEMS by replacing dc voltage sources with electrets, a charged dielectric. Additional applications for electrets that I am investigat-



R.G. Hennessy



M.S. Lorence



L.A. Parchment



C.L. Pipkin



C.M. Rosenthal



A.J. Rovnan

ing include energy scavenging and wake up sensors. Currently, I am designing a prototype. I plan to have the prototype fabricated by the end of June.

During the summer, I will be interning at the Bosch Research and Technology Center in Palo Alto. While working in its MEMS division, I will gain industrial experience and receive training that will help me with my research.

After finishing the Ph.D. program, I plan to become professor because I want to conduct rewarding research and share my knowledge with others. Finally, I am proud to be a member of TBPI, and I thank TBPI for the opportunity to attend Stanford.

Michael S. Lorence, VA Δ '98

Fife Fellow No. 72

This year at the Darden School has been an extremely rewarding experience for my family and me. Most importantly, my wife Erica and I found out that we are expecting our second child, a girl, who is due in April. Academically, I was exposed to the world of commerce. I have begun to master the dialect and mechanics of business through a rigorous course load of corporate finance, operations management, financial and managerial accounting, marketing, global economics, entrepreneurial thinking, and data analysis and optimization. On April 5, I was awarded the Genovese fellowship which is given to the top students at Darden based on leadership, entrepreneurial potential, and academic success.

Next year, I will be taking a more unique set of electives centered on entrepreneurial ventures including entrepreneurial finance, the consulting process, acquisitions of small enterprising, managing technical innovation, and a capstone offering called the Darden business project. Under this full semester project, I will be writing the business plan and conducting the necessary research to launch my venture after I graduate.

Professionally, I have secured an internship this summer with L-3 Communications Vertex Aerospace. I will be working in the business development section and evaluating growth possibilities in different business segments and writing the business plan for a new venture for the firm. I offer my sincere thanks for Tau Beta Pi's help and interest in me. I feel humbled to be a part of such a prestigious group of professionals.

Luke A. Parchment, MD Γ '05

Fife Fellow No. 73

I am pursuing my M.S.E. in electrical engineering at Johns Hopkins University. My focus has been in communications systems. Last fall I took basic communications, information theory, digital signal processing, and image processing. This semester I am taking digital communications, analog integrated circuits, and wavelets and filter banks. I will complete my degree this fall semester by taking digital communications II, optical communications, and principles of radar. During the summer I have a temporary assignment to Naval Research Labs' laser communications lab. Upon completion of my degree, I will report to NAS Pensacola to begin training as a naval aviator. Long term, I hope to work either as a test pilot, or a member of the design/production team for future military aircraft. Thank you for your support.

C. Leigh Pipkin, AL A '05

Fife Fellow No. 74

Try to find a mix between mechanical engineering and medicine and you might find yourself where I've been the past year—studying prosthetics and orthotics at the Georgia Institute of Technology. Prosthetics is the profession of designing and fabricating artificial limbs. In orthotics, practitioners create devices that support weakened or abnormal limbs to restore functional ambulation and activities of daily living. As students preparing for these professions, my classmates and I have studied anatomy, biomechanics, gait analysis, pathology, and lower limb orthotics and transtibial prosthetics. I have learned how to take plaster impressions of limbs and residual limbs, create appropriate recommendations for orthoses and prosthetic components, and fabricate and fit such devices. This promises to be a rewarding career in which I can use my engineering skills, interact with people, and affect lives every day. How amazing will it be to know that I helped someone walk who never could before? As well as being a clinical practitioner, I hope to contribute to research in the field of O&P. In addition to my studies, I have a job as a research assistant at the center for assistive technology and environmental access. There, I use pressure sensors and buttock models to test wheelchair cushions that are used by wheelchair-bound people to prevent sores caused by excessive pressure. Although busy, the past year has been very rewarding, and I have learned a lot that I know will be very useful in my career.

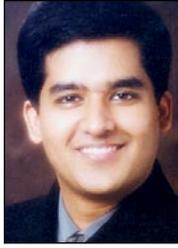
Christopher M. Rosenthal, IL B '05

Fife Fellow No. 75

The TBPI Fellowship has enabled me to further my education by pursuing a graduate degree in mathematics education at the Illinois Institute of Technology. Throughout the 2005-06 school year, I have maintained a 4.0 GPA as I worked towards this degree. My coursework has included a professional internship, independent study and courses on advanced strategies and assessment. The strategies course has made me more proficient in implementing multiple teaching models in the classroom. The course on assessment has completely changed the way that I will create assessment pieces for my students. In upcoming semesters, I will be taking more graduate mathematics courses, educational psychology, and clinical supervision. Beyond my coursework, I was also invited to the American Association for the Advancement of Science conference poster session to present my research from Argonne National Laboratory last summer. My research paper is in review for publication in the Department of Energy's *Journal of Undergraduate Research*. With the financial support I received from this fellowship, it became possible for me to work towards my graduate degree which will ultimately make me a more effective teacher. I will not only teach mathematics, but also plan to uphold Tau Beta Pi's standards and challenge students toward integrity and excellence.



A.J. Sabet-Peyman



K. Singh



K.P.Thieu



R.P.Throckmorton



R.R. Foltz, E.I.



G.S. Burrell

Alexander J. Rovnan, PA B '04 Fife Fellow No. 76

I have pursued research projects in the field of power systems. Among these is a joint effort between the University of Pennsylvania and Penn State University to develop power electronics for the suspended-load backpack, a device that converts the kinetic energy of walking with loads into electrical energy. The backpack, developed by University of Pennsylvania biologist, Dr. Larry Rome, is capable of generating a raw power output of approximately 7.5 watts. This level can be maintained at normal walking speed with carried loads in the range of 20-35kg. This power output is more than sufficient to power simultaneously a variety of portable electronic devices, such as cellular phones and global positioning systems. The backpack can also be used to recharge batteries in the field, when alternate energy sources are unavailable.

Under the direction of Dr. Heath Hofmann, a leader in power electronics at Penn State, current research includes the development of an efficient energy-harvesting system to convert the maximum available kinetic energy into usable power for electronic loads. Our eventual goal is to design an intelligent system that will not only control the flow of power into electronic loads and rechargeable batteries, but will also actively control the mechanical damping of the suspended-load. The objective is to create an ergonomic energy-harvesting backpack that is both efficient and comfortable to wear. Future aspirations include continued work on the suspended-load backpack and other power electronics systems, with anticipated graduation from my master's program in May 2007.

A. Justin Sabet-Peyman, CA Γ '05 Fife Fellow No. 77

As a first-year graduate student in electrical engineering at Stanford, I worked on completing my M.S.E.E. with a focus in communication systems, which helped me discover information theory, a subject that resonates well with my passions and talents. Information theory applies probability and statistics to complex problems and was born within the field of electrical engineering to better understand communication systems; it is a highly mathematical topic that is inherently applicable in the sense that it serves as the underpinning for every communication system in the world. Furthermore, while information theory is relevant to every communication system, it also has applications to a wide variety of other topics as diverse as gambling and finance.

Besides discovering my passion for information theory, I have also enjoyed befriending my peers. The sheer intellectual energy of my peers has impressed me a great deal, and I have learned a tremendous amount from my interactions with them. Lastly, I have been most impressed by the international nature of the graduate program that I am in. The vast majority of students come from all around the world. Over the past year, I have met students from Korea, Sweden, Israel, Iran, and Chile just to name a few. Students from all these countries have impressed me, not just with their intelligence and drive, but with their congeniality and integrity, convincing me that regardless of our perceptions of time, place, and culture, integrity and excellence in engineering could have the same meaning everywhere.

Karan Singh, LA A '05 Fife Fellow No. 78

This coming May marks the end of my first year as an M.S.-Ph.D. student in computer engineering at Cornell University. Before starting, I interned during the summer at Lawrence Livermore National Labs in Livermore, CA. Working with my future advisor, Dr. Sally McKee, I had the opportunity to get a head start on gaining the knowledge and skills to do productive research. I learned about high-performance computing and high-performance architectures, related applications, performance analysis and prediction, and architectural modeling. Since then, I have been working on applying machine learning techniques to a variety of problems related to computer architecture design and performance evaluation. This led to my first publication with more to follow. I have also been taking classes in machine learning, along with courses related to computer architecture. This semester, in addition to doing research, I am a teaching assistant for an introductory course in computer organization and architecture. I teach a section that supplements the information taught in the main lecture, hold office hours, and grade homework and projects. It has been an interesting and rewarding experience. This summer, I plan to take the qualifying exam and start writing my master's thesis. I hope to finish my master's degree by the end of the summer and continue in the Ph.D. program. I express my gratitude to TBI for bestowing me with the honor of being a TBI Fellow. Thank you!

Khanh P. Thieu, PA Δ '05 Fife Fellow No. 79

My study at Harvard Medical School as a TBI Fellow has been an exciting learning experience. As this is only the first year, I have spent most of the year taking classes, such as anatomy, physiology, and pharmacology. Yet, it has not been the lectures but rather the clinical experience that makes the medical education truly rewarding and deeply introspective. From making the first incision on a human cadaver to interviewing my first patient to shedding tears in commiseration with a patient, my venture into medicine has been full of self-reflections and has made me appreciate the opportunity to enter a field that will have the potential to alleviate suffering, whether through research or clinical care.

Outside the classroom, I have been involved in several community activities. During the first semester, I volunteered at a student-run clinic that offers free medical care to the underserved and uninsured in Boston. This spring and summer, I am coaching Little League baseball for a team comprised of seven-to-nine year old inner-city kids. I am a mentor to undergraduate students through Harvard's Asian American Health Organization, and, with three other students, I will be leading this club in my second year.

Meanwhile, I have also continued to explore the intersection between technology, research, and clinical medicine. I organized a research talk on the future of cancer treatment and technology. I also started doing research in telemedicine, which seeks to apply wireless biomonitors, imaging devices, and communication technology to long-distance patient care. I plan to continue this research project into the summer before looking for a more laboratory-oriented research experience in my second year. Thanks TBI for helping to make this year an amazing educational adventure!

Ryan P. Throckmorton, VA B '05

Fife Fellow No. 80

Aside from the honor of being a TBPI Fife Fellow, the award has aided in the pursuit of my M.S. degree in aerospace engineering. Through the fellowship I was able to pursue more freely my own interests in the area of high-speed, air-breathing propulsion systems with focus on the design of scramjet inlets. My research concerns an innovative method for starting high-speed inlets at off-design flight speeds. The basic problem is that an inlet has trouble swallowing the desired amount of air at flight speeds below the design speed, and this leads to decreased engine performance. I have conducted experiments in the Virginia Tech supersonic wind tunnel and am using computational fluid-dynamics software to support experimental findings and help aid in future inlet model designs. This summer I will work for Aerojet in Gainesville, VA, and will return to Tech to finish my master's in the fall. I am getting married in early December and then plan to start a job in the area of aircraft propulsion. I hope to return to school later for a doctoral degree so that I might become a college professor in the future. Thanks.

Raymond R. Foltz, E.I.. SC Γ '05

Spencer Fellow No. 50

It has been a distinct honor and privilege to have been awarded a TBPI Fellowship. With the support of TBPI, I have spent the past year working on my master's degree in structural engineering from the University of Illinois at Urbana-Champaign. There, I have had the opportunity to work with very talented professors and students who share a similar passion for the advancement of both engineering and the profession.

My first year has been primarily dominated by coursework; however, I have had the opportunity to begin research in the field of blast-resistant design, and it is my intention to pursue this topic while working toward a doctorate here. Upon completion of my education, I intend to work in industry as a structural engineer, and it is my intense hope that I will be able to make an impact on the profession similar to the impact TBPI has had on my career pursuits. Without the support of TBPI, the opportunities with which I have been blessed may not have been possible, and I am sincerely grateful.

Geoffrey S. Burrell, CA O '05

King Fellow No. 44

After graduating from Loyola Marymount University in Los Angeles with a bachelor's degree in civil engineering, I moved across the country to experience life on the East Coast. I am halfway through my master's program in structural engineering at the University of Delaware. I have taken classes in structural dynamics design, earth retaining structures, advanced steel design, and two courses in finite-element analysis. Next fall I plan to take classes in advanced mechanics of materials, structural stability, and advanced bridge design.

In addition to coursework, I am working on research for my master's thesis. My research is investigating the interaction between the various buckling modes of steel beams. I have been classifying experimental beam data using two different buckling classification methods. The next step will be performing a parametric study of various beam geometries and loading conditions with a finite-element analysis. The final goal of my research is to develop a design equation that relates beam geometry and material parameters to moment capacity.

After I graduate, I plan on joining an innovative structural engineering firm and working towards obtaining my P.E. and S.E. licenses. I am grateful for the support from my professors at both Loyola Marymount and the University of Delaware and to TBPI for this significant honor.



H.T. Beier, E.I.



D.C.L. Judnick



S. Davila

Hope Thomas Beier, E.I.. TX Δ '05

Sigma Tau Fellow No. 32

This past year I continued work on a Ph.D. degree in biomedical engineering at Texas A&M University. I have nearly completed my coursework and have continued working in the optical bio-sensing laboratory with the main focus of my research being the development of a biosensor that consists of a fluorescently labeled chemical assay to determine glucose concentration through changes in fluorescent emission. Throughout the year, I have gained a better understanding of the chemical assay function and also a clearer idea of the project goals for the completion of my Ph.D. research. I was an author on four publications and was able to present my work at three conferences, which provided me with invaluable presentation experience and with the opportunity to discuss my work with experts from other institutions. I hope to complete my degree within the next three years and plan to continue in academia as professor with research focused on combining elements of medicine, biology, chemistry, and optics to create new and convenient methods of sensing physiological phenomenon and monitoring biological analytes. Thank you for the honor of being a TBPI Fellow.

Daniel C. L. Judnick, CA O '05

Stark Fellow No. 28

Because I hope to design manned spacecraft for planetary exploration in the future, I have chosen to take courses that would help me develop the necessary skills to achieve this goal. I have helped design a logistics hub architecture to be used at the Earth-Moon Lagrange Point 1, a replacement for the Space Shuttle main engines, and a mobility system extensible to the Moon, Mars, and Earth.

In addition, I volunteered my time on the Mars Gravity Biosatellite. The project goal is to launch 15 mice in a spinning spacecraft that simulates Mars gravity into low-Earth orbit to study how the 0.38 g affects them biologically through various scientific experiments. I am the assistant bus and systems team lead.

The topic I selected for my thesis is a mechanical counterpressure spacesuit (BioSuit). The base layer of the BioSuit is pieces of material pulled taut over the astronaut's limbs (a "second skin"), which produces pressure. This design is safer and allows significantly greater mobility than the Apollo suits.

I am part of the Habitat for Humanity executive board, and have taken part in three work days during my time at MIT. Also, I am a member of a new student group that aims to help teach engineering skills to elementary and junior high school students. This has been an amazing experience, which was made possible partially through TBPI's generous fellowship.

Saylisse Davila, PR A '05

Williams Fellow No. 26

Changing Puerto Rico's tropical weather for Arizona's heat was a huge change of scenery. However, after being offered the opportunity to work with leading researchers in my area, as well as with the authors of many of my undergraduate industrial-engineering textbooks, coping with the heat was no issue. Last August, I started the industrial-engineering direct Ph.D. program at Arizona State



E.K. Oneida



K.E. Jackson



D.L. McCollum



M.M. Kasliwal



J.N. Mehler



D.J. Abbott

University. My first year was remarkably interesting. As an undergraduate, I was used to managing several demanding classes in a single semester, but I had not the slightest idea what it was like to manage coursework, prepare lectures, and deal with 100 students. I learned of this venture the evening before I was supposed to start my TA assignment for a basic probability and statistics course for engineering majors, and I think my students would agree that it took me a couple weeks to actually figure it out. The opportunity was challenging, but there were many lessons learned.

After I finish my degree, I will be working as a professor at the University of Puerto Rico. Being a good professor involves practice, dedication, and being there for your students more than what your contract specifies. Nonetheless, it is a challenge I like to think I can manage. Meanwhile, I am excited to be able to get my hands on interesting research problems with Intel Corporation during my summer internship assignment.

Erin K. Oneida, CA Λ '05
Deuchler Fellow No. 26

I have spent the past year focusing on structural engineering at Cornell University. My time here has provided me with opportunities to take numerous classes both in my field of focus and in other departments. My structural engineering classes have built nicely upon my background and allowed me to look at advanced topics. Classes in other departments have given me additional tools to use for structural engineering, as well as provided me with opportunities to explore different topics that I will possibly be incorporating into my eventual research. In addition to classes, I have been devoting time towards examining potential research topics and developing ideas. I am interested in using computational modeling to study fracture in materials and will be working with Prof. Tony Ingraffea and the Cornell fracture group. I am pursuing a Ph.D., and eventually I would like to have a research position or become a professor. I am honored to have been named a Tau Beta Pi Fellow and am thankful for the opportunities that I have had as a member of TBPi.

Keith E. Jackson, NY Θ '05
Matthews Fellow No. 8

I have spent this year studying for my M.S. in aerospace engineering at the University of Illinois in Urbana-Champaign. My concentration is in astrodynamics and spacecraft dynamics and control, which is a nice change since my last school focused solely on airplanes. Most of this year I was simply taking classes to get my coursework out of the way, but recently I started working on my actual research. I am working with Dr. Victoria Coverstone on a project involving using a genetic algorithm to search for optimal trajectories in space. The actual path I'm seeking for my problem is one that goes from the moon to the first libration point of the sun-earth/moon system. I have enjoyed learning more about the mechanics of space travel and look forward to applying my knowledge in future years. My current plans are to finish my master's degree in December and test the job market. If I find a job I like I will probably take it; otherwise I will remain at Illinois to continue work with my Ph.D. I hope to enter the space industry by either working with a private corporation or at a government/NASA research lab.

David L. McCollum, TN A '04
Nagel Fellow No. 7

After living and working in Sendai, Japan, for one year following my graduation from the University of Tennessee, I returned to school in September 2005 to begin graduate studies in transportation technology and policy at the University of California, Davis. I sincerely thank TBPi for awarding me the Nagel Fellowship and for supporting each of my post-graduate endeavors. It has truly been an honor to represent TBPi around the world.

My current major is both broad and interdisciplinary, which has afforded me the opportunity and flexibility to pursue my own interests and, to some degree, craft a unique program of study. Throughout this first year, I have enjoyed learning about the interplay between public policy and transportation/energy by sampling courses offered through the mechanical engineering, civil engineering, economics, statistics, and environmental science and policy departments. Given the all-encompassing nature of the field, my goal has been to conduct study in a variety of fields so that I can best understand the far-reaching effects that transportation and energy issues have on all of us. It is for these reasons that I am completely satisfied with the graduate program that I have chosen and am thankful for the opportunity to be a part of it.

In addition to coursework, I have also had the chance to work on several different research projects during my first year of graduate school. Each of these projects has been centered on the idea of using hydrogen as a transportation fuel. In fact, I am a member of the hydrogen pathways program in the Institute of Transportation Studies and have researched the potential role that certain industries (e.g., industrial gas, petroleum refining, and coal) could play in the future "hydrogen economy." I have also conducted techno-economic analyses of carbon dioxide compression, transport, and storage, as part of a larger study to assess the feasibility of producing hydrogen from fossil fuels and storing the climate-warming CO₂ underground. Future research that I may get involved in could include biofuels, coal- and natural gas-derived vehicle fuels, or possibly other areas. I welcome the opportunity to survey a diverse range of research topics early in my graduate career, as this will surely benefit me in the long term—especially when it comes time for me to develop my own research plans to satisfy both the master's and Ph.D. degrees.

It is difficult for me to predict where my career will ultimately take me. But with an interdisciplinary background, I am hopeful that there will be opportunities in academia or either the public or private sectors. My only wish is that I will be fortunate to receive as much support as I have from TBPi during the past several years. Thanks to all those who make the Fellowship Program possible.

Mansi M. Kasliwal, NY Δ '05
Nagel Fellow No. 8

My experience as a TBPi Fellow has been, I am sure, quite different from other honorees. As a law student, my study of engineering has been limited to the way that science field of engineering. I offer my sincerest thanks to the entire TBPi team for bestowing this honor on such an untraditional candidate.



N.R. Ballor



A.-D.N. Celestine



L.A. Crenwelge



E.E. Gassman



R.S. Gillis



C.J. Goergen

Daniel J. Abbott, NC Δ '05 Tau Beta Pi Fellow No. 721

Throughout the year as a TBPI Fellow, I have had the opportunity to study and complete a majority of the coursework towards an M.S.M.E. at Purdue University. My time has also been split between working as a teaching assistant and making strides in my personal research on minimally invasive surgical robotics.

As minimally invasive surgery progresses, it is becoming more vital that surgeons have the ability to perform complicated actions, such as suturing, remotely. This need has led to the introduction of surgical robotics and their rapid advancement in both the medical and engineering fields. Surgical robots act to extend the abilities of the surgeon, allowing for procedures in confined spaces, very small motions, and reduced patient discomfort through minimally invasive procedures. During the past year, my research has been focused on the design and manufacture of a new type of robotic tool to be used in endoluminal surgery. This surgery is a procedure where a tool is passed endoscopically into the stomach or upper intestine and allows the surgeon to diagnose and correct many gastric illnesses. Soon, tool prototypes will be completed, and initial clinical trials will begin to determine the efficiency of the tools and any control challenges they present. After that, the plan is to develop an endoscope which will make more effective use of the new tools.

Nicholas R. Ballor, MI B '05 Tau Beta Pi Fellow No. 722

I have begun my doctoral studies in the biochemistry and molecular biophysics option at the California Institute of Technology. I rotated through three laboratories to decide which to join to complete my research. In Dr. Raymond J. Deshaies laboratory I investigated the factors necessary for the assembly of the 26S proteasome (the cell's highly selective garbage disposal) from its 16S and 19S subunits. In the laboratory of Dr. Robert Phillips, I constructed a recombinant lac promoter and completed initial analyses of its performance. The completion of this project has been a first step toward the in vitro evaluation of the validity of a statistical mechanics model of gene regulation that has been developed in the lab. I was accepted into the laboratory of Dr. Frances H. Arnold after completing a rotation during which I worked with a postdoctoral scholar to engineer an E. coli bacterium suitable for use in an in situ selection system for engineering Cytochrome P450 enzymes to oxidize alkanes; for example, ethane to ethanol.

I am working in the field of synthetic biology to develop the knowledge base and tools necessary for the design of microbes and microbial communities with novel developmental, metabolic, or behavioral traits. This work will have a broader scientific impact through facilitating a quantitative understanding of the logic and operation of genetic circuits, both on the scale of individual cells and of cell communities.

I volunteer monthly with the Caltech Y at Union Station in downtown Pasadena to prepare a meal for the residents, individuals leaving dysfunctional domestic situations or overcoming drug addictions. I am a teaching assistant. I participated in a performance of Mrs. Farnsworth by the Caltech Playreaders group, am active in the Biotechnology Club, and have joined the faculty club.

An article reporting my work with Dr. Donald Lueking at Michigan Tech. has been published, an article reporting my work with Dr. Robin Gerlach at the Center for Biofilm Engineering is forthcoming, and I have received an NSF fellowship, Caltech Rosen fellowship, and Phi Kappa Phi fellowship. It is my goal to pursue a career in academia in an interdisciplinary department allowing me to draw upon my strengths in molecular biology and chemical engineering.

Asha-Dee N. Celestine, DC A '05 Tau Beta Pi Fellow No. 723

This past academic year I began my graduate studies in the department of aeronautics and astronautics at Stanford University, and it has been a wonderful experience. I completed the required courses, which included analysis of aircraft structures and aircraft and rocket propulsion. For the next two quarters I'll be focusing on technical electives in areas of interest to me, namely structural analysis and biotechnology. I'll also engage in a research project during the spring which will focus on mechanical sensors.

I've had the opportunity to attend research group meetings in the structures division and seminars on materials science and guidance and controls which have been informative. I've become involved in the work of the TBPI California Gamma Chapter and will be an officer in 2006-07.

I shall complete my master's degree in the fall of 2006 and during that time will attempt the qualifying exams to gain admittance to the Ph.D program in the aeronautics department. Upon completion of my doctoral studies, I would like to work in industry and then return to academia as a professor. I am indeed grateful to TBPI for support throughout this academic year.

Laura A. Crenwelge, TX Δ '05 Tau Beta Pi Fellow No. 724

Laura is enrolled in the mechanical engineering department at Stanford University, has taken a wide range of classes, and remains undecided in her area of specialty. She completed courses in cardiovascular bioengineering, linear algebra, statistics, feedback control design, and intermediate German.

This quarter, she is assisting Dr. Sheri Sheppard on an academic pathways study. The NSF-funded study is following and surveying selected engineering students at four universities: Colorado School of Mines, Howard, Stanford, and University of Washington. The multi-year study investigates engineering education from the student's perspective to understand how students: identify themselves as engineers, interact with faculty, overcome challenges, decide on their career choices, and transition into professional engineering careers.

Laura is also a Stanford graduate fellow and an American Association of University Women selected professions fellow. She hopes to mentor young women, especially those who enjoy math and science, about making educational and career decisions as well as about balancing academics and personal life. She will be working as a co-op student in the engineering directorate at NASA Johnson Space Center in Houston, TX, during summer 2006, and plans to graduate with an M.S. in spring 2007.



E.A. Hager-Barnard-



C. Lim



O. Nikolayeva



J.D. Reeves



M.A. Wachs



M. Zboray

Esther E. Gassman, IA B '05 Tau Beta Pi Fellow No. 725

This May, I will successfully complete my master's degree in biomedical engineering at the University of Iowa. The title of my thesis is "A Validation of an Automated Image Segmentation Technique for the Development of Anatomic Finite Element Models." The goal of this study was to create and validate a "gold standard" for image-segmentation routines. Furthermore, artificial neural networks were used to identify bony regions of interest automatically. This tool decreases the amount of time and manual effort required to create three-dimensional finite element models. In the future, this tool will allow patient-specific decisions to be made regarding orthopaedic conditions. I presented this work at the Orthopaedic Research Society Conference held in Chicago in a poster entitled, "Automating the Identification of Bony Structures Using Artificial Neural Networks." Next fall, I will begin the Ph.D. program in biomedical engineering at the University of California, Davis. I will continue to focus my research efforts in the biomechanics field. In the future, I hope to continue to research in an academic setting.

Rachel S. Gillis, AL B '05 Tau Beta Pi Fellow No. 726

I graduated from the University of Alabama in May 2005. In September, I moved across the country and began my first year of graduate school in the department of chemical engineering at the University of California, Santa Barbara. My first year has consisted of taking the core engineering classes along with elective classes in systems biology and human physiology that will supplement my research. I am working on a research project to develop a control system for an artificial pancreas to be used by patients with type I diabetes mellitus. Our team involves researchers from the Sansum Diabetes Research Institute in Santa Barbara and the university and brings together a diverse group of graduate students, M.D.s, and Ph.D.s, including my advisors, Dr. Dale Seborg and Dr. Frank Doyle. I look forward to spending the summer here in sunny California and continuing my research. In the future, I plan to enter industry and contribute to research in biotechnology.

Craig J. Goergen, MO Γ '05 Tau Beta Pi Fellow No. 727

After graduating with my B.S. in biomedical engineering from Washington University in St. Louis last May, I was able to travel in Europe before starting an internship at a small medical-device company in Plymouth, MN. StarFire Medical designs, manufactures, and sells minimally invasive interventional neuroradiology devices. I worked in the research and design section helping to develop new ideas for aneurysm occlusion and coil placement. The experience was fantastic and really opened my eyes to how engineers can contribute to the success of small start-ups with great ideas.

In September, I moved to Palo Alto, CA, and began the bioengineering Ph.D. program at Stanford University. Core engineering and biology classes have filled my first year, but I have also begun research in a cardiovascular biomechanics laboratory. I am working on a project that will combine computational modeling, non-invasive

magnetic resonance imaging, and small animal genetic models in order to gain a better understanding of elastin and vascular development. So far, my experiences here have been everything I hoped for. This summer I plan to continue my research, assist in a study to image aneurysm patients, and learn to surf.

TBPI has given me the opportunity to develop my leadership skills, connect with engineers in other disciplines, and improve my community through volunteer opportunities. Being a TBPI Fellow has been an incredible experience, and I remain very grateful to the Fellowship Board for this honor.

Elizabeth Hager-Barnard, MA B '05 Tau Beta Pi Fellow No. 728

After graduating from MIT last June, I began the Ph.D. program in the department of materials science and engineering at Stanford. I have enjoyed delving into material I was only cursorily familiar with and learning about the research interests of my faculty. Because my main interests lie in biomaterials, I have also been thrilled to see all of the interactions between the university's outstanding medical school and various departments on campus. I think these types of interactions will benefit me greatly in the future.

During the fall quarter I began my research with Prof. Nicholas Melosh. My project aims to use drug-delivery technology both to study basic signaling of cells and to apply knowledge gained from basic studies in order to differentiate cells. Though I have done research on biomaterials before, I have never done much work with electronic materials. I am very excited about this project, which combines my interests with another exciting field that I was not as familiar with.

After I graduate, I plan to do work in the field of medical device technology. I participated in a program at MIT where I had great fun teaching "everyday" math and science concepts to middle-school children, so I could see myself either entering industry or academia. During my Ph.D., I want to do similar programs and be a T.A. so I can figure out what I most love.

Christopher Lim, CA E '05 Tau Beta Pi Fellow No. 729

This year is my first year as a graduate student at the University of California, Los Angeles (UCLA). I am pursuing a doctorate degree in mechanical engineering with an emphasis in systems and control. In mechanical engineering, control is the implementation of an algorithm, usually a computer code, to improve the performance of a mechanical system.

I set two main goals for myself this year. First, I plan to take the Ph.D. qualifying exam in June. I spend most of my time preparing for this exam, and I want to not just pass, but to perform at the highest level. Second, I want to start my research project. My research involves the application of control theory on nanometer-scale positioning. I am setting up a preliminary experiment to control the positioning of a piezoelectric x-y stage. After I develop a successful control scheme for this experiment, I will replace the x-y stage with an atomic force microscope. An AFM uses a cantilever probe and piezoelectric stage to produce 3-dimensional profiles of surfaces. AFMs can give high resolution images but at slow scan

rates. Control is a practical way to achieve faster scan rates without compromising image quality. My experimental setup with the AFM poses many more challenges than the x-y stage, but I hope to address these issues in my research.

I credit much of my accomplishments this year to TBII. Thank you for believing in me and making me a Fellow. I strive to represent the society with honor and distinction.

Olga Nikolayeva, MA H '05

Tau Beta Pi Fellow No. 730

The TBII Fellowship gave me a wonderful opportunity to do my graduate studies in Switzerland, where I have joined the first year of biomedical engineering master's program at Swiss Federal Institute of Technology in Zurich. Because of differences in the U.S. and Swiss academic calendars, I have just began my second semester of graduate school. Last semester I chose to specialize in medical instrumentation. In addition to attending track-specific lectures, I interacted with many Swiss and international students, learn Swiss German (oh yes, it is a language of its own), and go skiing! This semester I am looking forward to doing a neuromorphic electronics research project at the institute of neuroinformatics, specializing further, and, of course, traveling. I thank TBII for this delightful experience and wish a happy summer to all of its members.

Joshua D. Reeves, CA Γ '05

Tau Beta Pi Fellow No. 731

This past year has been very eventful for me as I have delved deeper into my academic studies while also making some important career decisions. I began the year by continuing my research in the Stanford neural prosthetics lab while also taking classes toward my master's in electrical engineering. I finished my B.S.E.E. in June 2005, and, through the support of fellowships, I was able to stay on campus to continue my studies.

I am passionate about many different technologies and how they impact society and people's lifestyles. For many years, I have had a very strong interest in the web and how increased opportunities for, not just communication, but also content creation and consumption would transform the way people live all around the world. It has been wonderful to study at Stanford University because the campus is uniquely positioned in the heart of Silicon Valley. The melting pot of ideas, peoples, technologies, and cultures make the region constantly re-invent itself and also empower people to follow their dreams. I made the decision to join a start-up this year while also continuing my academic studies part-time. It was a very well-thought-out decision based on a number of factors, including the importance of working on a product/technology I was truly passionate about and also having the chance to learn at a tremendous pace. Working at Zazzle has been a wonderful journey, and I have no doubt in my mind that the future will be full of continued learning and ongoing participation in the vibrant academic life here and in the valley.

Megan A. Wachs, RI A '05

Tau Beta Pi Fellow No. 732

I am in my third quarter at Stanford working toward my doctoral degree in electrical engineering. My first two quarters I took coursework in electrical engineering and computer science, but am now starting on more independent projects. Last quarter I worked on a hardware accelerator for networking in virtual machines, and I am continuing that project to polish it up for publication. I have also joined the Stanford SmartMemories project to assist with validation of the design as it nears completion. I passed my Ph.D. qualifying exams in January and look to settle in here for the long haul as I work towards becoming a professor. On the fun side of things I have joined the Stanford Cooking Club and the Dragonboat team, and am currently taking a social-dance class.

I am planning a break from my studies this summer before returning here in the fall, as I will be working for an electronics manufacturing company in Shanghai. I am honored and grateful to be named a TBII Fellow and look forward to the rest of my time here in Palo Alto.

Michael Zboray, NJ B '05

Tau Beta Pi Fellow No. 733

After graduating from Rutgers University in May 2005, I have gone to pursue my Ph.D. in chemical engineering at UC, Berkeley. The fall semester consisted of core chemical engineering courses in thermodynamics, reaction kinetics, and mathematical methods. I decided that my research interests lied in the field of catalysis and reaction kinetics, and I am grateful I have been given the opportunity to work with Professors Alexis Bell and Enrique Iglesia. My semester break was spent studying for the preliminary examinations testing our knowledge of undergraduate chemical engineering principles.

My research project investigates the production of light olefins from paraffins via oxidative dehydrogenation. Current industrial production uses steam cracking of longer hydrocarbons found in crude oil. This is an attractive route for production of high-value products such as ethylene and propylene from natural gas because natural gas is more readily available and in larger supply relative to consumption rates. I will be studying the catalytic properties of mixed metal oxides for this reaction mechanism whose role is not well understood.

After completion my doctoral degree, I will pursue a research position in industry. The field of catalysis has a number of practical applications that are important to industry, and I would like to apply the techniques I have learned here to solving some of the problems encountered in the field. I thank TBII, for the opportunities it has provided and its support while attending graduate school.

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