

2005 Fellow Reports

Reports of the 2004-05 winners in Tau Beta Pi's 71st 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 in midsummer. 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 34 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 Fellow delayed his graduate study for a year.

Victoria M. Lopez, CA '04
Centennial Fellow No. 19

In May 2005, I received my master's degree in civil engineering in the area of structural engineering from the University of California, Berkeley. I feel extremely fortunate to have been blessed with the opportunity to work with such a diverse and talented group of individuals sharing the same passion for engineering as myself.

My year consisted primarily of coursework, with opportunity for individual research. I prepared several projects involving the seismic behavior of structures. For example, I worked on a project investigating the response of several moment-resisting-frame configurations to different types of ground motions—using the structural analysis software SAP2000 to produce an elastic modal analysis and static pushover curves. From the results and response spectra for several design earthquake events, I performed a dynamic analysis and assessed the performance of each frame configuration. I also worked on developing performance-based design evaluations, and probabilistic and deterministic site hazard analysis.

My plans include working for a civil/structural engineering consulting firm. My long-term goals include obtaining a position in project management and ultimately starting my own structural engineering consulting firm. I plan to contribute to so that the Society may continue furthering the practice of integrity and excellence in engineering. I thank for the honor of being named the Centennial Fellow and for encouraging academic and professional excellence among future engineers. I am grateful and proud to be a member and Fellow of .

Irene D. Chow, GA '04
Fife Fellow No. 61

This year, I have been working on completing my master's degree in electrical and computer engineering at Georgia Tech. Because I chose the non-thesis option, I did not do research but instead was able to concentrate on taking a myriad of classes that interested me. My specialization mainly focused on microelectronics and control systems with a minor in management. I thoroughly enjoyed having the opportunity to delve into so many in-depth topics that wouldn't be as readily available in an undergraduate program.

Beyond coursework, I worked as a teaching assistant for my department and was able to help mentor many students each week. I served on the ECE chair selection committee as well as the women of ECE advisory board. Other extracurricular activities included paddling in the sprint kayak club and rock climbing.

After graduating, I am spending the summer doing a mission trip in Jamaica and will begin working for National Instruments in August. I will start in its engineering leadership program and then move to the sales, marketing, or R&D sector. Graduate school has certainly better prepared me for working in industry and following my life goals, and I thank for this wonderful opportunity.



V.M. Lopez



I.D. Chow



M.M. Folkmann

Megan M. Folkmann, IL '04
Fife Fellow No. 62

Attending Stanford University and studying towards my M.S. in structural engineering has been an incredible opportunity. My knowledge of the discipline has deepened due to challenging education. Located in a hotbed of earthquake activity, I have been exposed to the impact of such events on structures and the quantification of earthquake risk and subsequent design. Moreover, my knowledge of the industry has grown tremendously and I have had countless opportunities to learn from guest lecturers and interact with role models in my field.

Beyond the classroom, I have had the privilege of carrying out research in the laboratory under the guidance of Professors Gregory Deierlein and Helmut Krawinkler. The research is focused on the development of a rocking mechanism for the base of a concrete shear wall. I have been involved with the design, fabrication, and cyclic testing of reinforced-concrete specimens for this effort.

Throughout the summer I will be working as an intern for Middlebrook & Louie Structural Engineers in San Francisco. I am excited to gain more work experience and look forward to the challenges this will provide. Upon completion of my education in March 2006, I plan to work in the structural engineering industry.

I am greatly honored to be recognized as a Fellow. This privilege has allowed me to explore the opportunities described above and fostered much growth. Undoubtedly, it will have an unending impact on my future and career.

Michele L. Holder, IL '03, E.I.
Fife Fellow No. 63

I express my genuine gratitude for the honor of being a Fellow; without it my transition into graduate education would not have been as smooth as it was. Everything is going well here at the University of Washington. I have taken many interesting classes, including advanced steel and concrete design, dynamics of structures, bridge design, structural analysis, and earthquake design.

I have also worked as a teaching assistant for the two quarters.



M.L. Holder, E.I.



J.D. Martin



D.H. Martz



K.B. Reese



C.A. Smithers



S. Zhou

During my first term I held office hours and graded homework and tests for the pre-stressed concrete class. This quarter I am assisting with the senior-design capstone class on the design of an eight-story building with two floors of parking below grade. I attend the class and walk among groups answering any questions they might have and guiding them through what to consider in their design.

This summer, I hope to receive an internship with a local firm. I'll have one more quarter of school and will graduate in December 2005. I hope to work for an engineering or consulting firm where I will finally be able to get my hands dirty and design a structure.

James D. Martin, CA '04
Fife Fellow No. 64

I thank for the amazing opportunity to earn my M.B.A. at University of the Pacific—my *alma mater*. In fall 2004, I worked under Dr. Cynthia Wagner-Weick and co-authored a journal article on independent inventors and the rise of the creative class. We surveyed inventors from across the U.S. and investigated similarities and differences between part-time and full-time inventors in terms of gender, education level, patent activity, and realized sales.

In January 2005, I organized a team of Pacific M.B.A.s, engineering students, and industrial professionals to enhance a business plan I developed for a new restaurant technology that appeals to patrons. My team was accepted in two top national business plan competitions: Wake Forest elevator competition and the Rice business-plan competition. These two events are essentially the NCAA championships for business plans and allowed me to use my M.B.A. and engineering degree when pitching the proposal.

In May 2005, I will travel to Lyon, France, as part of an international capstone course for one month. Here, I will consult with French M.B.A students and develop a comprehensive business plan on an emerging entertainment opportunity. In June 2005, I will graduate from Pacific and look forward to the exciting and unpredictable future that lies ahead. Thank you for your support!

Dale H. Martz, CO '04
Fife Fellow No. 65

This year I attended graduate school at the electrical & computer engineering department at Colorado State University. Specifically, I was working under Dr. Jorge Rocca, director of the new extreme ultra-violet (EUV) engineering research center developing EUV laser sources. I have had the opportunity to try and improve a 46.9nm desktop laser source by increasing the repetition rate. This involved changing the power, chilling, and triggering systems of the laser. I have successfully improved the electronics to accomplish this, and, even though we did run it faster, the laser proved impractical to reach our target speed.

After this I presumed to take on a new task for my thesis. Our lab has many laser systems, one of which needs a new stage of amplification. So, we decided to build a new pump laser for the stage. This is a solid-state laser amplifier for which I solely designed the pulse-forming network (the power system) and also the cooling unit. We will build both units and the laser head this summer.

I have also taken an introductory series of quantum physics and two other laser classes this year, one focused on ultra-short pulses

and the other focused on EUV laser sources. I enjoyed graduate school because I learned much and also had the opportunity to collaborate with students from the University of Colorado at Boulder and UC, Berkeley. My plans are to graduate in December with a master's in electrical engineering and earn a Ph.D. at a different school, or enter the work force, or both!

Kenneth B. Reese, UT '04
Fife Fellow No. 66

The year has been an interesting and exciting one. I started the master's program in electrical engineering at Utah State University with an emphasis in communications; taking challenging but rewarding classes, such as stochastic processes, mathematical methods and algorithms for signal processing, antennas, and error-correction coding theory. I am much better equipped with the knowledge I need to enter the workforce and make an immediate positive contribution as an engineer.

My master's project has involved working on satellite data processing and visualization with a professor and a team of other students. The SABER (sounding of the atmosphere using broadband emissions radiometry) instrument is one of four on NASA's TIMED (thermosphere ionosphere mesosphere energetics dynamics) satellite. Our team has been developing algorithms to effectively and accurately display the data that SABER has collected.

Finally, the one single event that has made this year more difficult and academically challenging than any other has been the fact that my wife gave birth to identical twin girls. While this has been an exciting and gratifying experience, it has indeed stretched my limits beyond what I thought was my capability. I am grateful to and its donors for the distinguished honor of being a Fellow. I am determined to give back to and the engineering community so that others may benefit as I have.

Charles A. Smithers, MS '04
Fife Fellow No. 67

I have attended Georgia Institute of Technology. While specializing in structural engineering, I have taken design classes, analysis classes, and also more specialized classes. Some of the design classes include reinforced concrete-members, advanced steel design, and pre-stressed-concrete design. Analysis classes included structural analysis II, finite-element methods, and structural dynamics. Other classes included earthquake engineering, rehabilitation of existing structures, and nonlinear frame design. These classes have helped me understand the way structures behave and how forces flow through structures. Also, learning the theory behind the formulas used in both the steel and concrete design codes has helped me understand both how and why these formulas are used. The variety of classes coupled with the outstanding professors have no doubt sent me in the right direction as I begin my career.

My wife and I have decided to stay in the Atlanta area as I will be working for Walter P. Moore, a structural design firm, beginning in May. I will continue to work for the company after graduating in August. Thank you very much for helping me attend such a fine university, which has enabled me to start my career in a positive manner.



L.A. Weitz



S.A. Roberts



G.F. Wells



P.J. Rossetti



J.F. Fuschetto, E.I.



M.A. Jeuland

Simin Zhou, MN '00
Fife Fellow No. 68

During my study at Harvard Business School, I became interested in globalization of companies. During my first semester, I worked under the guidance of the technology and operations management department to study effective supply chain practices involving international operations. This semester, I am working on a number of projects, including writing a school case for the entrepreneurship department. My projects have helped me learn about the complexity of growing a company in an emerging market, the dynamics of growth in a mature operation, and the driving forces in this global and evolving economy. Post graduation, I plan to join a growing private-equity firm to develop companies' competitive advantages through best supply chain practices and globalization. I am looking forward to my work and helping companies grow. Many thanks.

Lesley A. Weitz, NY '02
Spencer Fellow No. 49

Because of projected increases in air traffic, there are several governmental and industrial efforts underway to evaluate safe ways to increase the capacity of the national airspace system, while improving efficiency and reducing aircraft noise. At NASA Langley Research Center in Hampton, VA, two parallel research efforts have focused on terminal area research: one is airborne precision spacing (APS) to increase capacity without adversely affecting safety, and the other is the quiet aircraft technologies (QAT) project to develop noise- and fuel-efficient approaches.

The APS project has developed a cockpit tool called airborne merging and spacing for terminal arrivals. This tool issues speed commands to aircraft following other craft in order to maintain a desired spacing between each pair. The results of the QAT studies showed a reduction in the noise footprint and fuel consumption by creating efficient continuous descent approaches. The objective of my research is to explore methods to combine noise- and fuel-efficient approaches with APS. Three different approaches were evaluated for improved throughput without breaching aircraft-to-aircraft separation limits. These methods combined the merging tool with two different types of continuous descent approach (CDA) routes and the use of aircraft spoilers. Preliminary results show that efficient approach routes cannot be as precisely spaced as more traditional, inefficient routes. However, using a precision-spacing system does provide a throughput, noise, and fuel benefit over current CDA operations.

Scott A. Roberts, KS '04
King Fellow No. 43

I have begun my graduate studies in chemical engineering at the University of Minnesota. My required coursework has nearly been completed, and I have started working on my thesis research. I will study the stability of non-Newtonian fluid flows over polymer gels and their applications in microfluidic technologies. This research should allow for smarter designs of microfluidic devices that can avoid fouling and achieve better mixing properties.

While my next four years will be spent as a graduate student, I have plans to remain in academia when my Ph.D. is completed and become a professor. I can think of no better way to use the skills that I have gained through my undergraduate and graduate education and through involvement with organizations like than to help educate other aspiring students in search of similar experiences.

George F. Wells, TX '04
Sigma Tau Fellow No. 31

The year under my Fellowship has been a tremendous learning experience, as well as a lot fun! I've spent the past year at Stanford University beginning my Ph.D. studies in environmental engineering. Much time has been devoted to increasing my knowledge of a wide range of environmental engineering principles and applications, particularly in the fields of environmental biotechnology and environmental microbiology, through class work. Still, I've managed to spend quite a bit of time settling into some fantastically interesting lab work. My focus is on analyzing shifts in microbial community structure that might be linked to instability in nitrification, a key nutrient removal step in wastewater treatment. Although nitrification has been used for decades, a thorough understanding of the microbial community involved has eluded investigators. With the advent of molecular tools, such as the polymerase chain reaction and terminal restriction fragment length polymorphism, a more complete understanding is within reach.

I hope to apply the tools I've learned during the year to the study of a microbial community in a novel membrane bioreactor system currently under development in my research group. We hope to analyze the effects of various process parameters (SRT, HRT, membrane material and coating) on contaminant removal and microbial community structure. I plan to use the knowledge I gain in graduate school to pursue a career in academia focusing on applications of environmental biotechnology.

Paul J. Rossetti, CA '04
Stark Fellow No. 27

After finishing my bachelor's at UC, Irvine, I wanted to work experimentally on fluid mechanics. UCI has many distinguished faculty in this area and I began to work with Dr. Dimitri Papamoschou, NY '81. I took over a project on supersonic-jet mixing using a two-dimensional, variable geometry nozzle with an air system that can supply up to about 12 psig. This is enough to create shock waves in the nozzle in over-expanded configurations. Although the nozzle is small, it is very loud and can generate a considerable amount of thrust. My work centered on the mixing of the exhaust with the ambient air, trying to quantify the effect of the shock wave. The work has been frustrating at times but I have learned both from my advisor and the work itself that engineering research is a patient and detailed task. Graduate classes are definitely harder than undergraduate. But the challenge is worth it; my classes in fluid mechanics have provided me with a great fundamental understanding of the physics. I plan to have my master's thesis completed late this summer. Then I will move to Massachusetts to attend MIT to complete my Ph.D. with Dr. Karen Wilcox and Dr. Ian Waitz in the area of environmental design space and future

aircraft design. I am very grateful for the Fellowship. It has allowed me to concentrate on research and classes. I hope to contribute later to the Society.

**Jerry F. Fuschetto, FL '04, E.I.
Williams Fellow No. 25**

I received a Benton fellowship from the University of Michigan for the Ph.D. program in mechanical engineering. I arrived in Ann Arbor early in the summer to settle in and actually began assisting in heavy-duty diesel engine research. We began a U.S. Army-funded project to do alternative fuel testing for heavy-duty diesels. Some of the fuels to examine include JP-8 (jet fuel), biodiesel (B20), and synthetic JP-8 (S-8). When the fall semester started, I was appointed lab assistant for the intro to internal-combustion engines class, a position that is usually only given to someone who has taken the class. Although I had never seen some of the material before, my preparation at Miami, FL, was more than enough to lay the foundation for the class. I thoroughly enjoyed setting the labs, conducting the experiments, answering student questions, and grading the lab reports. I think this was a great first step toward my goal of becoming a professor after graduation. I hope later to teach the lectures as another senior graduate student was able to do. Besides class and research, I have been involved in preparing an online laboratory for the engines class. Currently, distance-learning students are unable to participate in the labs. We are setting up a single-cylinder CFR engine controller and data acquisition system that can be both controlled and monitored over the Internet so that online students can "run" the engine and virtually participate.

**Marc A. Jeuland, PA '01
Deuchler Fellow No. 25**

Marc began his first year of doctoral study in the department of environmental sciences and engineering at the University of North Carolina at Chapel Hill, where he is specializing in water resource allocation and management in developing countries. He supplemented his undergraduate background with more hydrology and water systems analysis courses, and worked to develop policy-research skills from courses in microeconomics, econometrics, and public investment theory. He joined a research team involved in analyzing the performance of rural water supply projects in Ghana and Peru. He will spend his summer doing empirical economics research in Mozambique or Bangladesh, with the aim of measuring demand for vaccines against water-borne diseases, such as typhoid and cholera. He received Kenan and Chanlett fellowships from UNC and a Lippincott fellowship from Swarthmore College, his *alma mater*. He is involved in the graduate orientation planning committee, the Engineers Without Borders chapter, and the student global health committee. He regularly speaks in middle and high-school classes about his experiences working on water and sanitation problems as a Peace Corps volunteer in Mali, West Africa, and is an avid runner training for his first marathon.

**Scott W. Schmucker, OH '04
Matthews Fellow No. 7**

During the past year, and under recognition of a Fellowship, I have continued my pursuit of a Ph.D. at the University of Illinois at Urbana-Champaign. I am studying electrical engineering and working at the Beckman Institute under the guidance of Prof. Joe Lyding of the scanning tunneling microscopy (STM) research group. My general focus within the STM lab is the study of molecular systems and devices on silicon, in hopes of discovering and developing future advances and alternatives to transistor electronics. Each microscope is constructed in-house, using a highly successful design pioneered by Prof. Lyding. One of my primary objectives throughout my first year of study has been the repair and reconstruction of an ultra-high vacuum STM system in which my future experiments on molecular electronics and nanotechnology will be



S.W. Schmucker



E.J. Gardner



B.C. Bundy

performed. In parallel with this procedure, I have constructed a system for controlled ion sputtering and have developed a previously unknown method for improving STM performance by selective sharpening of metallic tips, used for viewing and manipulating atoms with an STM. By combining the strong engineering education of Case Western Reserve University and my previous experiences in programming and simulation with the powerful experimental environment of the institute, I have worked to create both a theoretical and experimental foundation for this novel technique. Upon completion of my degree, I desire to continue my work in nanoelectronics, moving into industry to follow the research of today into the technology of the future.

**Eamonn J. Gardner, CO '03
Powell Fellow No. 1**

My experience as a Fellowship 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 intersects with the law. Along with my more traditional legal coursework, I continue to explore my interest in intellectual property law. Last semester I took a patent law course, a field in which I believe I can still contribute greatly to the work of engineers. On my own time, I am researching lawyer's roles in resolving disputes involving engineering, and the law's ability in such disputes to adequately address both the concerns of the public and the engineering community.

As my career moves forward, I hope to continue to work closely with engineers, protecting their interests, and helping uphold the duty that engineering owes to the public it serves. This summer I will be joining Cooley Godward, a firm with a strong background in all major technology fields, after which, I will return for my third and final year of law school.

Perhaps the greatest surprise of receiving the honor of a Fellowship was the respect that this organization holds with engineers practicing law. I have no doubt that this honor will help me to continue to help advance the field of engineering. I offer my sincerest thanks to the entire team for bestowing this honor on such an untraditional candidate.

**Bradley C. Bundy, UT '04
Tau Beta Pi Fellow No. 705**

I have completed my first year of graduate studies at Stanford University in the department of chemical engineering. During the year, I had the opportunity to work with Dr. Channing Robertson, CA '65, in collaboration with Genencor Inc. in developing a novel *in situ* technique for the detection of protease surface mobility and activity via microfluidic channels and fluorescence spectrometry. Recently, I successfully completed my qualifying exam enabling me to continue studies toward a Ph.D. Currently, I am starting to work with Dr. James L. Swartz, OH '59, of the National Academy of Engineering to develop a novel vaccination technique using cell-free technology. My career plans include graduating from Stanford University with a Ph.D. in chemical engineering and entering the drug development sector of the pharmaceutical industry. Eventually, I would like to return to academia as a professor of chemical engineering. Thank you for the honor of being a Fellowship.



Q.Q. Cheng



R.N. Davis



J.M. Grogan



Y. Huang



A. Malaviya



C. Mester

QiQi Cheng, NY '04
Tau Beta Pi Fellow No. 706

During my first year of Ph.D. study at the University of Pennsylvania, I explored different fields of bioengineering and determined my main area of interest for future professional study. Performing research at three different laboratories as a rotating student offered me with opportunities to study life science both at the level of tissue and the level of cells. During my first two rotations, I applied my knowledge of biomechanics to studies of orthopaedic tissue. For instance, I was able to design a device and develop protocols testing certain mechanical properties of annulus fibrosus, which is a major component of intervertebral disc. During my third rotation, I used tools of molecular biology to study the relationship between mechanical stimuli and intracellular mechanism of signal transduction on a cellular level. I was excited about the progress that I achieved in different projects. Because I became more interested in the intricate cell signaling mechanism, I decided to focus my professional study in cell engineering and joined the labs where I did my third rotation. Looking to my future, I will build my career as a research scientist and apply my knowledge to the engineering of cellular mechanisms.

Robert N. Davis, AL '04
Tau Beta Pi Fellow No. 707

During the previous year of graduate study as a Fellow, I have been fortunate to complete all the necessary course credits for my M.S. in aerospace engineering. All that remains is to complete and defend my thesis. This work is also proceeding well, because in the past year I have been happily successful in my research, completing my simulations of an autonomous component health management scheme applied to spacecraft attitude control and conducting an extensive Monte Carlo analysis to thoroughly evaluate the same. My colleagues and I have written a paper covering the development of the ACHM scheme that has been reviewed and accepted by the *Journal of Aerospace Engineering*. I aspire to have completed and defended my thesis—successfully—within the next few months, so that my M.S.A.E. will be accomplished by August. In anticipation of this event, I have accepted an offer from Orbital Sciences to join the launch-systems group in Chandler, AZ. I look forward to applying the knowledge gained from my GN&C coursework and IVHM research in support of our projects. I remain deeply honored and most appreciative of being selected as a Fellow. I hope that my graduate study and future contributions to the engineering profession and to society will be judged commensurate with the highest standards of . I have no doubt that being a Fellow has inspired me to work diligently in pursuit of my goals and to bear in mind always the engineer's responsibilities to the society that supports and depends upon him or her.

Joseph M. Grogan, NJ '04
Tau Beta Pi Fellow No. 708

I express my gratitude to for the fellowship opportunity presented to me. As I complete my first year of a five-year Ph.D. program at the University of Pennsylvania, I have found the

Fellowship to be a great source of motivation. My program in the mechanical engineering department focuses on nanobiotechnology and the study of motor proteins. My first year has consisted of core coursework along with the beginning stages of my long-term research. I have been working on a microfluidics project that achieves rapid mixing with minimal volume consumption. My group intends to use such a device for kinetic studies of proteins. One of the highlights of my year has been the opportunity to work with the wonderful faculty and fellow graduate students in my department. My advisor, Dr. Haim H. Bau, has been a source of support, encouragement, and inspiration to me as I continue to develop my research skills. I look forward to my second year of study when I will start with my teaching assistant responsibilities. Upon completing my program, I plan to work in industry before returning to academia.

Ying-zong Huang, CA '04
Tau Beta Pi Fellow No. 709

I began my first year as a Ph.D. student in the EECS program at MIT in September 2004. It has been an exciting year of classes and gradually more focused research. My interest falls in the areas of digital communication, signal processing, and perceptual coding. I have joined Prof. Greg W. Wornell's [MA '90] signals, information, and algorithms lab and began to work on some problems in lossy source coding (i.e. compression of data in which some loss is tolerable). The high-level goal is to develop theory-driven algorithmic tools and architectures that can improve the performance of systems that collect, process, and communicate data in applications such as streaming video or sensor networks. This summer I am working as an intern at Mitsubishi Electric Research Laboratories, near the campus. I thank for the honor of the Fellowship.

Arpit Malaviya, CA '04
Tau Beta Pi Fellow No. 710

I graduated from UC, Santa Barbara, and started my graduate studies in fall 2004 at Stanford University, which I chose for its renowned faculty and research, particularly in the field of analog and RF circuit design. My first year has consisted mainly of electrical engineering coursework, with an emphasis in analog and digital-design classes. I am concurrently holding a co-op position at a company and pursuing internship opportunities for the summer to complement my academic curriculum. On a side note, I was selected to attend this year's Academy of Achievement Summit in New York in early June. I am looking forward to working in industry upon completing my graduate education. I hope to work in a company that is not only aligned with my field of interest, but also one that provides me with the opportunity to improve the quality of life for human beings. I am proud to be a member of and thank the Society for awarding me a Fellowship.

Christina Mester, NJ '04
Tau Beta Pi Fellow No. 711

After graduating from Princeton University last summer, I moved to California and started graduate studies in the department of aeronautics and astronautics at Stanford. I spent most of the fall



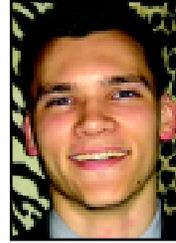
G.A. Mills-Tetty



R.W. Parkinson



S.E. Ross



D. Scepanovic



R.M. Turner



H.A. Wake

and winter quarters taking the core classes in my department, including courses in structures, fluids, dynamics, and controls. While these classes are required for the master's degree, they also provided me with a broad background in aeronautics and astronautics, and served as preparation for the Ph.D. qualifying exam, which I will take in the fall. After completing these requirements, most of my classes in the spring quarter are in dynamics and control, the field of study in which I am most interested.

I attended many research group meetings in my first few months here to find out what area I'd like to study, and have just started to do some research myself in the dynamics of pseudo-rigid bodies. While there are still many classes I want to take, I am also looking forward to spending more time doing research.

At the end of the spring quarter, I received my master's degree. I plan to continue in the Ph.D. program, and am also considering getting a second master's degree in electrical engineering along with the Ph.D. in aeronautics and astronautics.

G. Ayorkor Mills-Tetty, NH '03
Tau Beta Pi Fellow No. 712

My first year of the Ph.D. program at the robotics institute at Carnegie Mellon has been one of important growth and exploration. I have been working with Dr. Tony Stentz and Dr. Bernardine Dias on path planning for planetary rover applications, as well as exploring various ideas for the application of advanced technology for education and sustainable development—two nearly divergent interests, but a perfect illustration of the supportive culture and diverse interests represented here. With Drs. Bernardine and Thrishantha Nanayakkara of Sri Lanka, I had the opportunity to co-author a paper on "Robotics, Education, and Sustainable Development" and to attend the 2005 International Conference on Robotics and Automation in Spain, where this paper was presented.

In addition to starting research, I spent time taking several of the core course requirements for the Ph.D. program, including kinematics, artificial intelligence, and computer vision. This summer promises to be a busy period of interesting research—a good ending to a fulfilling year. My career goals are still to work in research and education, especially targeted towards developing communities. My remaining time here will be geared towards developing the requisite skills.

Robert W. Parkinson, NJ '02
Tau Beta Pi Fellow No. 713

With the aid of , I have completed my M.S. in financial engineering at Columbia University's Fu Foundation school of engineering. Financial engineering is a field that combines the disciplines of engineering, mathematics, programming, and finance. During the past year, I have rigorously studied the application of engineering and quantitative methods to financial problems in this burgeoning field. 's generosity enabled me to immerse myself in both the theories and application of asset and derivatives pricing. Courses in simulation, data analysis, equity derivatives and volatility skews have furthered my knowledge. This summer, I will begin employment with D.E. Shaw & Co., a specialized investment and technology development firm with a quantitative focus, as a secu-

rities trader. I am eager to begin work with the knowledge that my studies have prepared me well for this experience. It was the Fellowship that allowed me the time to excel in my studies.

Shani E. Ross, DC '04
Tau Beta Pi Fellow No. 714

I have just completed my first year of graduate study in biomedical engineering at the University of Michigan. It was an insightful and experience-filled year, during which I gained a great deal of knowledge and skills to help me both in my studies and in my research and future career. I had the opportunity to work in a neural engineering lab on neuroprosthetics and cortical control and will continue to work in this lab during the summer. After completion of my master's, I will continue to pursue a Ph.D. in biomedical engineering in the area of cortical control. In the future, I would like to enter in industry and continue to do research in this area. I look forward to continuing my research and studies. I am grateful to both the university and for the support they have given and for their recognition of my abilities. Thank you,

Danilo Scepanovic, MD '04
Tau Beta Pi Fellow No. 715

I entered my master's planning to design a better signal processing algorithm for use in hearing aids. I quickly learned, however, that in order to make a useful biomedical device an engineer must have a deep understanding of and intuition about the biological system he plans to affect. At that point, my plan changed from a straightforward engineering problem to an aim focused more on science. I am currently designing stimuli with desirable properties for studying speech encoding by normal and hearing-impaired listeners. The need for new stimuli arises because of naturally occurring correlations in the structure of human speech that complicate the analysis of the corresponding neural code. More specifically, we want to study the effect of hearing impairment on the coding of the second formant (F2, the spectral feature that carries the majority of speech information), and, in order to do this correctly, we need a stimulus in which the formants are independent but which still sounds speech-like.

By the end of the summer, I expect to have generated and evaluated desirable stimuli. The effectiveness of the stimuli will be studied with simulated auditory nerve responses, and general methods for quantifying the amount of F2 information contained in a neural population will be developed and implemented.

This work will set the stage for a series of experiments which will elucidate the way that the brain codes speech information and will lead to more effective hearing aid algorithms. Following my master's, I will attend the Harvard-MIT division of health sciences and technology to obtain a Ph.D. and eventually I plan to enter the biomedical device industry.

Ryan M. Turner, NY '04
Tau Beta Pi Fellow No. 716

This year was the first year I have been at Caltech and, as such, I have spent most of the year doing coursework. In the fall quarter,



C.A. Yeago



K. Yu



N. Zaborenko

I took the three required core graduate chemical engineering classes in transport phenomenon, thermodynamics and kinetics as well as a class in complex analysis. These courses were really foundational courses for all my future graduate work and were especially good preparation for the qualifying exams I took in the spring. During the fall term, I also attended faculty presentations for the research groups in the chemical engineering department in order to decide on one. Although I did not get my first or second choice, I managed to join the Kornfield research group, which was my third choice. The group's research focuses are primarily in experimental work with polymer physics and complex fluids. Despite the fact that the group has an experimental bent, I will be doing theoretical work.

In January, I passed all three of my qualifying exams the first time. I also took a full load of courses in the spring, including statistical mechanics, linear algebra, a course in stability of differential equations, and another course in transport phenomena. I am about to start my third term in which I will be doing research in the deformation of an artificial lens using finite element methods as well as taking several more courses. Career plans are to enter academia as a professor.

Heather A. Wake, SC '04
Tau Beta Pi Fellow No. 717

My year as a Fellow has been enlightening as well as challenging. I started graduate school in the electrical and computer engineering department at Duke University after graduating from the University of South Carolina with a degree in computer engineering. I spent the year mostly focused on classes while becoming oriented in my research group. I have found the workload for classes to be more intense and the demand for excellence greater than I expected. In addition, the ECE department places emphasis on completely different topics than those my background covers. However, I am learning a lot and have had the opportunity to work on several projects involving custom VLSI circuits and mixed-signal designs. The research group I have joined focuses on multi-disciplinary, team-oriented collaborative research involving co-design and co-development of hybrid analog, digital, and optoelectronic information processing systems that can be used for medical purposes. My project involves implementing and testing a chip that performs electrophoresis, a process that usually occurs over several meters of capillary tube, in a 2mm length. I have also been elected to serve as president of our engineering graduate-student council. Next year, I plan to continue my research and advance toward my Ph.D. degree, while getting more involved on campus. I thank and both my undergraduate and graduate advisors for getting me where I am today.

Carolyn A. Yeago, NC '04
Tau Beta Pi Fellow No. 718

I have been involved with several course projects during my first year of graduate school in the joint biomedical engineering department at Georgia Tech and Emory. Many of the projects required computer modeling of human and cellular systems; one in particular simulating the delivery molecular tags to cell nuclei via the cytoskeletal network. I have also completed two research rotations.

One focused on the degradation of intervertebral discs (IVD) and the other on mouse embryonic stem cells. The IVD research utilized a microCT to acquire images of young and old rabbit IVDs to compare their characteristics, including porosity. As porosity changes, so may the ability of the body to supply IVDs with nutrients, therefore leading to deterioration. Understanding why these discs degrade may lead to preventions and treatments for the pain associated with aging spines. My other rotation examined methods of controlling mouse embryonic stem cell differentiation. Stem cells offer exciting new therapies to medicine; however, it is unknown how to control their differentiation and maintain their in vivo characteristics. By applying engineering philosophies and knowledge, more controlled bioreactors and three-dimensional environments can be created to mimic in vivo conditions, thereby directing and maintaining stem cell differentiation. These two rotations have helped direct my decision for future research. I hope to incorporate the techniques I learned with the stem cells, especially 3-D scaffolds, along with the microCT technology to evaluate how cells differentiate and occupy biocompatible and biodegraded materials. Studying this will allow analysis of potential implantable devices seeded with cells that may repopulate damaged tissues.

Kai Yu, CA '04
Tau Beta Pi Fellow No. 719

As a graduate student in electrical and computer engineering at Carnegie Mellon University, Kai has been working on a project that hopes to make high-quality speech recognition ubiquitous by implementing it in custom hardware. Although some modern cell phones have speech-recognition programs, the tasks that can be performed are quite limited due to power and resource constraints. A custom hardware approach potentially will have a similar boost in performance that graphics chips have achieved over software implementations, making high-quality speech better suited for mobile devices.

He began by profiling CMU's SPHINX 3 software, one of the most accurate speech recognizers, to better understand the resource usage and bottlenecks. Afterwards he began the design, synthesis, and layout of feature scoring, one of the major components of speech recognition. He hopes to have a complete speech recognizer written in a hardware description language by the end of the summer, and also calculate preliminary chip area and power requirements. Besides research, Kai has also been taking classes and preparing for the doctoral qualification exam. He plans to pursue a career in industry after completing his degree.

Nikolay Zaborenko, NJ '04
Tau Beta Pi Fellow No. 720

This year was my first year in graduate studies at Massachusetts Institute of Technology in chemical engineering towards a Ph.D. The first semester primarily consisted of taking core classes and selecting a thesis research advisor. After listening to informative presentations from nearly all departmental faculty members and talking with several of them, I joined the research group of Prof. Klavs Jensen, who works with microfluidic reactors.

After the first semester, I had a fun, diverting winter break. Or so I would have liked. In actuality, it was spent studying for the Ph.D. qualifying exams, which, I'm proud to say, I passed. And so the second semester began, again consisting of mostly coursework. I have begun familiarizing myself with our research group, intending to focus my thesis research on heterogeneous catalysis in microfluidic reactors.

In the fall, I will attend chemical engineering practice school, a program that sends students to various companies to work on four one-month projects, acting as consultants. This is intended to provide industrial experience to an otherwise wholly academic education. Upon completion of my Ph.D., I intend to remain in academia, doing research first as a postdoc and then joining a university faculty. Eventually, I intend to be a tenured professor in chemical engineering.