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FROM THE DEAN

From Where I Sit

The vibrancy of our School is vividly expressed by the entirety of this issue of Penn Engineering. I hope you will read it from cover to cover, but you will be able to sense the effervescence by just thumbing through the pages packed with compelling stories about the activities of our students, faculty and staff.

It is difficult, however, to convey the excitement one feels from inside this community, a place that infects its people with fervor for teaching, learning and creating technology. As dean, I have an enviable vantage point that is particularly valuable at this time of the year, when seniors are wrapping up their capstone projects. The limitless succession of imaginative designs makes us proud and allays any concern about our country’s edge in innovation. I am moved by the passion that has driven these young people to their results. As the phrase goes: “One could sell tickets!”

Our teaching and research programs have never been stronger. You will read about the bench-to-bedside research of Brian Litt and his collaborators in engineering and medicine, who are designing therapeutic devices to anticipate and even override epileptic seizures. These researchers are transforming the management of epilepsy by literally playing with our brains. You turn around—or you turn the page—to learn about Ben Taskar, a recent recipient of a prestigious Sloan Research Fellowship, whose group is looking for robust ways for computers to do what humans do effortlessly.

This issue of Penn Engineering will also show you the boundless energy of the brothers McGill, three undergraduates in our School, and will also help you appreciate outstanding graduates like Overseer Sean McDonald. Sean is leading a clinical technology company dedicated to fighting cancer, and notes, “Penn Engineering gave me the training to analyze and solve problems, even in fields that did not exist at that time.”

You will learn about the global dimension of our School. We have a very high-profile presence in Asia, particularly in India. In January we recognized an engineer and world business leader, Mukesh Ambani, awarding him the Penn Engineering Dean’s Medal. His efforts as Chairman of Reliance Industries exemplify the large-scale use of technology that is dramatically transforming Indian society.

I am also delighted to announce that the University Trustees have approved construction of the Krishna P. Singh Center for Nanotechnology. Groundbreaking is set for this fall and completion is slated for spring 2013. The facility will be located on the 3200 block of Walnut Street and will provide a vibrant gateway to the campus.

Last but not least: We are at record highs in enrollment at all levels and our undergraduate applications rose by 33 percent this year. This is a great moment to be an engineer and is a particularly great moment for Penn Engineering.

Dean Eduardo D. Glandt
“We started out asking a simple question: How and where do seizures begin and what does an epileptic network look like? And we ended up with new medical technologies and commercialization, new training programs, and a ton of ideas.”

Brian Litt’s Quest to Bring Moore’s Law to Therapeutic Devices

Though his work promises to transform medical care for the brain and heart, Brian Litt is motivated by a less scientific realm: his soul.

Memories of patients with epilepsy whose lives were tragically altered by uncontrollable and unpredictable seizures drive Litt’s determination to find new therapeutics. Recalling, for example, the mother who drowned in the bathtub she filled for her child, part of the one percent of the world’s population who suffers from epilepsy, Litt asks, “How can you not be compelled by that? Ninety-eight percent of the time they spend their lives just like we do, except for that unpredictable two percent when they’re suddenly unconscious or having convulsions.”

Urgently-needed devices that would anticipate and override epileptic seizures are currently under review for approval by the FDA. These devices integrate patents by Litt and were developed by NeuroPace (a privately-held company). The firm’s technology development team includes former Litt graduate students.

“When people look back on Brian’s research, he will be viewed as a real pioneer in advanced biomedical devices,” says John A. Rogers, professor of Materials Science and Chemistry at the University of Illinois at Urbana-Champaign, MacArthur Foundation “genius grant” recipient in 2009 and Litt collaborator.

Litt joined the Penn faculty in 2000 and became the first dually-appointed professor in both Penn’s School of Engineering and Applied Science and School of Medicine in 2007. He received tenure in both schools in 2008. An associate professor of Neurology and Bioengineering, Litt juggles at least four professional lives: translational research, teaching, patient care, and mentoring graduate students and clinicians-in-training.

Commercializing his work doesn’t count as a separate professional life, says Litt. His focus is on bringing therapeutics to patients as quickly as possible. Initially, he intended to devote himself to full-time epilepsy patient care in Baltimore, his hometown. Five years into clinical practice, Litt redirected his career after a painful realization. “For the most severe epilepsy cases, nearly 30 to 40 percent of our patients, I could do everything I was taught to help them, and I wasn’t affecting the natural history of their disease,” he says.
Litt then began a career-long quest to use engineering techniques to improve patient outcomes, focusing on outdated technologies that created diagnostic and therapeutic bottlenecks in epilepsy care. He holds an undergraduate engineering degree from Harvard, a medical degree from Johns Hopkins University, and completed a neurology residency and fellowship in epilepsy and clinical neurophysiology at The Johns Hopkins Hospital.

While he isn’t a neurosurgeon, Litt designs operations for epilepsy surgeries at Penn. The challenge is, says Litt, “You have to find a way to disable seizure networks without resecting a hunk of brain that’s going to cause deficits.”

Standard procedure to identify seizure-affected, treatment-resistant regions of the brain involves placing arrays of electrodes one centimeter apart directly onto brain tissue (accessed through the skull via a burr hole or craniotomy). This protocol has remained virtually unchanged for decades: each electrode was previously hand-soldered to a wire connecting to a cable outside the head. “People being monitored have a spaghetti of wires coming out of their head,” says Litt. “Sometimes you have 256 plugs that you have to manually put in the right place. Imagine the potential for error.”

Four years ago Litt asked graduate student Jonathan Viventi to find a way to place thousands of smaller electrodes on the brain that would connect with a single USB plug. In addition to reducing error and pressure on the surface of the brain, smaller electrodes would allow clinicians to obtain more detailed data, better reflecting the scale of functional units in brain tissue.

After hearing Rogers give a talk to Penn’s Electrical Engineering department, Viventi suggested the two labs collaborate. In partnership with a research team from Tufts and Northwestern, they have since developed flexible, stretchable microelectronics for clinical use. Rogers, who hadn’t previously worked on biomedical devices, says, “Brian’s group has been absolutely essential to defining the most clinically relevant modes of use for our advances in electronics. Together, we have laid the groundwork for something that could be a really big deal. I don’t think there is anything approaching this level of sophistication in bio-integrated electronics. Our collaboration has opened up a whole new world for doctors and researchers alike.”

Compared to 40 years ago, consumer electronics are virtually unrecognizable. Clinical and surgical devices look primitive by comparison, says Rogers. “However, our work on biocompatible electronics may eventually enable Moore’s Law types of advancements to map directly to biomedical devices. Even if you could do that only to some degree it would be a huge win.”
In February, Litt received a $6 million grant from the National Institutes of Health (NIH) to create an international database to understand seizure generation and epileptic networks—linking a diverse group of investigators from Penn’s medical and engineering schools.

Litt reflects, “There is such a desperate need for the application of engineering to everyday medical problems. We started out asking a simple question: How and where do seizures begin and what does an epileptic network look like? And we ended up with new medical technologies and commercialization, new training programs, and a ton of ideas pending patent disclosure. There has been a tsunami of ideas because Penn has tremendous scientific strengths and is a medical powerhouse. We need more conduits like me.”

That idea is circulating at the highest levels. George J. Pappas, Deputy Dean for Research for Penn Engineering, says, “Strengthening the ties between engineering and the medical school through more such dual appointments will give us a competitive advantage over other universities and lead to medical breakthroughs. We’re working to create an environment between engineering and medicine that would help people who are dually appointed to be intellectual leaders.”

The Litt Lab is a hub for broad collaborations, a small subset of which includes a customizable cognitive neuroprosthesis to compensate for damaged brain tissue, working with Michael J. Kahana, director of Penn’s Computational Memory Lab; organic neuroprostheses with Cherie R. Kagan, associate professor of Electrical and Systems Engineering; and a cortical auditory prosthesis with Yale Cohen, associate professor in ENT and Neuroscience.

David J. Callans, electrophysiologist and Penn Medicine professor, is exploring ways to use Litt’s advances to increase the functionality of cardiac devices such as pacemakers. “We started thinking about heart disease because of its prevalence, but there’s certainly a lot that could be done with Brian’s approach in many different organ systems,” says Callans.

Having just turned 50, Litt thinks about his legacy. “There’s so much to accomplish. I plan to train as many good people as I can in this collaborative image.”

Litt’s protégés are influential in academia, government and industry. And his postdoc trainees are being offered joint positions in Neurology and Bioengineering. “Perhaps the idea is catching on a little,” says Litt. His 15-member research team is comprised of bioengineering graduate students paired with neurology and neurosurgery residents and junior faculty.

Amidst the deadlines and the pulls between medicine and engineering, the patients and the science, Litt strives to keep it all in perspective. He still makes house calls to terminally ill patients and tries to balance work with family—his wife, Lisa, an occupational therapist, and sons (twins) Dan and Brad, 17, and Ben, 15.

And he remembers the advice of his late father, who never went to college: Do work you enjoy, that can support a family, and that will leave the world a better place after you are gone. “If I could just take the refractory rate of people who have epilepsy down from 38 to 28 percent, that would be a life well spent,” says Litt.

“More recent discoveries by the Litt Lab and research collaborators include flexible active electronics that could serve as a biocompatible platform for new diagnostics and therapeutics for the brain, heart and other organs.”
Kathleen Stebe believes that the best questions yield transformative answers.

The chair of Chemical and Biomolecular Engineering (CBE) encourages her students and colleagues to think twice. She aims to inspire “creative tension,” thinking in terms not only of reality but of vision.
Kathleen Stebe, the Richer and Elizabeth Goodwin Professor of Engineering and Applied Science, is the first female chair of CBE at Penn. Joining Penn Engineering from Johns Hopkins University, Stebe brings a guiding principle: “To harness the talents of people to move society forward.”

As chair of CBE, Stebe leads “an excellent department with one of the best faculty in the country,” says Penn Engineering Dean Eduardo Glandt. Stebe believes her “real work” is to shine a spotlight on CBE’s students, faculty and their achievements. The faculty features leaders in catalysis, cellular engineering and materials assembly. “I walked in the door to superlative educational and research programs,” says Stebe. “I want to help increase external attention to the excellence here.”

Dean Glandt considers Stebe’s leadership “a natural fit.” Glandt said the search committee knew that Stebe was a “great teacher, a great academic leader and a scholar of the first cut,” yet her letters of recommendation added something more—“a half page saying ‘you are hiring one of the most beloved people in the field.’”

Twenty-five years ago, Stebe nearly chose another path.

The Almost-Poet

A student so accomplished that she skipped senior year of high school to start college early, Stebe found herself drawn to the lilt of the French language and the music of poetry. “I simply knew I was going to be a poet,” she says. Then, on course for a liberal arts degree at the City University of New York (CUNY), Stebe took a required economics class. The French would call what happened next le coup de foudre—the lightening bolt.

Stebe was struck by the beauty of scientific inquiry. The course featured careful model construction to predict real-world phenomena. Peppered with engineering majors, the economics class encouraged Stebe to ask “curiosity-driven questions.” So taken by this model and by the inspiration of an inquisitive, exciting professor, Stebe changed her major and earned a B.A. in economics in 1984.

Prompted by what she calls “drawing-to experiences” with engineers as an undergraduate, Stebe then earned her M.S.E. and Ph.D. in engineering at CUNY. The daughter of a dancer and a mathematician, Stebe took particular pleasure
in the creativity of applied science, approaching problems grounded in “very beautiful facts and constructs” not only to find the correct answer, but to do something new.

With the mentorship of chemical engineer Charles Maldarelli at CUNY, Stebe began her career-long interest in capillary phenomena. Stebe studies problems dominated by surface tension, from the shapes of drops and bubbles to interactions between floating objects. Her research yields results with real-world applications. Understanding how drops become elongated and break in a flow field is important in lab-on-a-chip devices. Understanding how particles assemble into structures is useful in nanomaterials assembly.

CBE has always been known as a technically-difficult and highly-rewarding discipline. Eager to prove herself in this arena, Stebe calls her decision to go into chemical and biomolecular engineering “a macha moment.” Stebe has seen tremendous progress for women in CBE over the course of her career. Today women make up 30 percent of the doctoral ranks.

With colleagues like award-winning polymer researcher Karen I. Winey and nanotechnology pioneer Dawn A. Bonnell, Stebe sees Penn Engineering at the forefront for cultivating high-achieving female engineers. Yet she is aware that women are still sparse in the engineering fields in general. “My big fear,” she says of the effort to achieve gender equity in engineering, “is that it will be declared done before it’s done.”

Involve Me and I Learn

In training the next generation of CBE scientists, Stebe takes a page from her own education. She draws from the teaching style of her thesis advisor, who valued curiosity and creativity and made his classroom and laboratory safe spaces to ask questions, not to know the answer and to figure it out.

“Dr. Stebe never imposes her ideas on her students,” says graduate student Moniraj Ghosh. “She encourages the free and fearless exchange of ideas. Thus meetings with her transcend into a learning process rather than just merely
reporting results and moving on to the next experiment. I consider myself lucky to have someone like her whom I can call on anytime without reservations and ask for help for academic or other reasons even after I graduate.”

Stebe calls teaching fun, and jokes that “it’s like the theater where no one is allowed to leave.” Yet as she talks seriously about her graduate students, Stebe says she most enjoys “reconstructing why things are the way they are. Being in the classroom keeps you grounded and honest.” She also appreciates the “seriousness” of Penn students. “They are very eager to move themselves and their institution forward,” says Stebe.

Students are indeed learning from a master. Stebe has set milestones in the field of physio-chemical hydrodynamics and directs her attention to cutting-edge problems at the nanoscale. Active in her lab are projects on how to organize nanoparticles on surfaces for such novel applications as coatings, energy conversion and artificial membranes.

Stebe’s vision is to help the CBE department, with faculty experts using materials, processes and technologies, to better society and further leverage their expertise. The cellular engineering group features leaders in controlled delivery, cellular biomechanics, stem cell differentiation and molecular discovery. This group is uniting in the Center for Engineering Cells and Regeneration (CECR) to seek major grants to support new collaborative research. The catalysis group is working in concert with the Penn Center for Energy Innovation (“Pennergy”) to develop sources of sustainable energy. The materials assembly group is highly integrated into the Laboratory for Research on the Structure of Matter (LRSM), a center which develops novel materials with faculty from engineering and the sciences.

“My role,” says Stebe, “is to bring attention to these efforts, so the department achieves the international renown deserved for such achievements.”

“We share a view that this department is exceptional,” says Dean Glandt. “Kathleen has started to promote our faculty, to nominate them for awards, to optimize the visibility of what we already have. It takes a selfless leader to invest endless time promoting other people.”
Sean McDonald grew up believing that science could make a tangible difference in people’s lives. His father’s work as a professor of medicine gave him a firsthand understanding of the complex problems prevalent in medicine. His interest in finding solutions led him to apply to engineering schools. While he was admitted to the traditional “pure” engineering schools, Sean found that the breadth of disciplines and diversity of students at Penn offered the best match for his educational and personal growth. Although he could not have known it at the time, Penn was also the ideal environment in which to prepare for his revolutionary, cross-disciplinary career.

At Penn, McDonald studied chemical engineering and went on to earn master’s degrees in electrical and computer science engineering from the University of Florida before attending Carnegie Mellon University’s Tepper School of Business. There, in a class project focused upon applying established technologies to growing industries, McDonald’s first business, Automated Healthcare, was born. The company was the first to offer a robotics-based solution to the management of hospital pharmacies. As the company grew to over $150 million in revenues, it was acquired by McKesson Corporation, and Sean became Group President of several operating companies and skilled at raising venture capital.

As he was looking for a new challenge, Sean uncovered research suggesting that technology could offer personalized health care solutions for cancer patients. Starting such a venture would require a leader who could inspire, inform, build bridges between business, technology and medicine, and who could raise the considerable capital needed to fund the research. In short, it would require someone exactly like Sean McDonald, a two-time winner of the Ernst & Young LLP Entrepreneur of the Year award.

In 2001, Sean became the President and CEO of Precision Therapeutics, Inc. with the goal of “optimizing each patient’s quality of life and chance for survival by designing superior technology that offers the best hope for control of cancer.”

Cancer had touched the McDonald family, so Sean knew from personal experience that patients armed with tangible information would make better decisions. McDonald says, “Almost everybody has had firsthand knowledge of the disease, and yet we continue to treat people as patients and...
“I became an engineer to solve problems, and healthcare has some of the most compelling problems to work on. The solutions to those problems can have a very positive impact on people’s lives.”

statistics instead of as individuals. That perspective needed to be changed.”

Precision Therapeutics offers diagnostic services to doctors and patients. Their ChemoFx® test measures a patient’s tumor cell response to an array of chemotherapy treatments being considered. As McDonald explains, “Treatments need to be individualized because patients can respond very differently to the same drug.” Prior to the concept of personalized medicine, treatments were determined by probability, in spite of the fact that 75 percent of the patient population will experience ineffectiveness with any given drug. McDonald notes, “Personalized medicine is the concept that managing a patient’s health should be based on the individual patient’s specific characteristics and molecular knowledge. In cancer treatment, one size does not fit all.”

McDonald’s forays into the life sciences field have led him to master incredibly diverse and complex issues in the area of oncology. He says, “I became an engineer to solve problems, and healthcare offers compelling ones. Each day I hear terribly sad stories from people about their experience with cancer, and if I weren’t working on solutions, it would be unbearable. The solutions to these problems can have a real positive impact on people’s lives.” McDonald notes, “I remember a meeting I had with my advisor while I was at Penn. I was complaining about my summer job, which had seemed so unrelated to my major, and his response has stayed with me for all of these years. ‘Sean,’ he said, ‘We’re not teaching you how to be a chemical engineer; we are teaching you how to think and solve problems.’”

“Penn Engineering gave me the training to analyze and solve problems, even in fields that did not exist at that time. I also learned how to communicate with people from many different fields and those experiences have been invaluable.”

To help other students prepare for a future we cannot even imagine, McDonald is a member of the Board of Overseers of Penn Engineering and Chairman Emeritus of the Pittsburgh Technology Council. He is also Chairman of the Board of Aethon, and serves on the boards of numerous technology companies.
Engineers design. They create. They implement to meet needs and by doing so, create a greater enterprise that changes the fabric of the world.

From the first prehistoric being who fashioned a tool to today’s modern-day engineers who populate the fields of technology, business, medicine and law, the profession has been defined by individuals that understand the value of teamwork to solve problems. These are the individuals who use the qualities of entrepreneurship and initiative to delve into details to advance society. And it is these qualities, and the results achieved by engineers around the world, that Penn Engineering recognizes as worthy of merit.

The Dean’s Medal recognizes the exemplary and outstanding contributions of leaders in private enterprise, public service or academia for visionary leadership in the application of engineering and technology for the betterment of mankind.
This January, the Dean’s Medal was awarded to a world-class chemical engineer, the Chairman and Managing Director of Reliance Industries Ltd., India’s largest private sector enterprise. “Mukesh Ambani embodies what the engineering profession can contribute to a country, as someone who seeks to apply technology for the betterment of the people around him,” said Dean Eduardo Glandt. “He expertly unlocks the promise of technology, characteristically defining his success by the amount of good he can do.”

“World class” aptly describes both the man and the event at which he was honored. The Mumbai gala ceremony was set against a backdrop as rich as the culture of India: the rustle of lavishly embossed silk saris, the bustle of news camera crews recording arrivals along a red carpet, the spicy a cappella resonance of Penn Masala and the vibrancy of over 400 distinguished guests from around the world.

“All of us on the dais tonight have made the journey from Pennsylvania to Mumbai with expectations of the heart that have been overwhelmingly met,” said Joseph Sun, Vice Dean for Academic Affairs at the School, who welcomed the attendees to the event. He enumerated the important ties between India and Penn, particularly the shared values of pursuing and exchanging ideas that have led to deeper understanding and change. “It is a pleasure to be able to boast that the University of Pennsylvania has the strongest ties with India of all American universities,” he said. “Our alumni from India are prominently positioned to play vital roles in the growth and progress of the world. We share a common pride in them.”

To demonstrate the depth of that pride and those ties between Penn and India, Penn Masala, the university’s renowned Hindi a cappella group, added exuberant punctuation to the serious evening by performing for Ambani and the audience. Their tableside serenade to Ambani was a sincere tribute to the guest of honor and to the host country, as was their rendition of Vande Mataram, the national song of India, which was so well received that it elicited an encore performance at the end of the evening.

Penn Masala’s performance provided the audience with a personal connection to Penn, and Mitchell Quain, Chairman Emeritus of the Penn Engineering Board of Overseers, took the opportunity to offer a glimpse into the School of Engineering. “I am honored to be able to tell you the story of how the School of Engineering and Applied Science has helped define engineering as a field of study,” he said. Calling engineers “extraordinary men and women who choose science and technology as tools to better serve humanity,” he recognized Ambani for “his dedication, passion and commitment as an engineer and his understanding that the core responsibility of leadership is to actively use knowledge and leverage technology to benefit the greater good.”

Mumbai native and Penn graduate Hital R. Meswani, a member of the Penn Engineering Board of Overseers, called it his privilege “to represent the School to India, and India to the School.” He drew a parallel for the audience between the school’s strategic goals and those of Ambani: to map out a better future for the world. “Penn Engineering provides a transformative educational experience, effectively delivering today what tomorrow’s engineers will need to learn in order to be productive and exemplary world citizens,” he said. He also drew on his
Creative energy defines the essence of engineering. Therefore, it was no surprise that the creative musical output from Penn students especially touched the hearts of the guests assembled for the Dean’s Medal award ceremony in Mumbai.

Penn Masala, the world’s first and premier Hindi a cappella group, performed live during the event, and transfixed attendees with their richly-blended singing sans accompaniment.

“We were honored and incredibly humbled to be invited to perform at the prestigious event,” said Dhruv Batura, School of Engineering and Applied Science student and the group’s vice president. “It was thrilling to see that such respected people were giving us their undivided attention and smiling and really enjoying our music. It really shows that music can reach people.”

The group’s performance included the Bollywood hit Maa Tujhe Salaam and Aicha, with English, Hindi and Arabic verses. “These songs perfectly represented our feelings for the occasion. Maa Tujhe Salaam demonstrated our excitement and pride in being part of the event,” said Batura. “In the same way, Aicha represented the unique diversity of cultures found within Penn Masala, and how music transcends cultural barriers.”

Since its inception in 1996, the group has performed worldwide, including a White House performance for President Obama’s celebration of Diwali, and a United Kingdom tour over spring break, which included three shows in London. And while some of the group’s 13 members call India home, “For some of the guys, this was their first time in India and it made it even more special to the group,” said Batura.

While Penn Masala dazzled the audience at the award ceremony, the group was surprised when the guest of honor requested a private performance after the event. “It was absolutely amazing to be able to perform for Mr. Mukesh Ambani,” said Butara. “He requested that we stay after the event and sing for a select table at which were seated some of the most influential people in India. Needless to say, it was a surreal experience.”
Ambani was met with resounding applause as he accepted the award in his trademark modest style. “For me, it is much more than recognition of the modest contribution as a chemical engineer from India. Rather, it recognizes the collective achievement of over 100,000 members of the Reliance Family. It recognizes the creativity of over 25,000 engineers in Reliance,” he said. He dedicated the medal to the memory of his father and company founder Dhirubhai Ambani, and “to each and every member of the great Reliance Family.”

He also took the opportunity to share his abiding intellectual interest in the School’s programs and news that will affect future educational opportunities in India. “It gives me great pleasure to share with you this evening that the Reliance Foundation, the new philanthropic initiative of the Reliance Group, has decided to set up a world-class university in India,” he said. “In the fabled tradition of great American universities like Penn, it will promote education and research in all disciplines of knowledge from science and technology to liberal arts. It will be international in scale, forging partnerships with reputed universities around the world, but it will have an Indian soul.”

Penn Engineering
The McGill brothers’ defining moment at Penn Engineering came when all three of them filed into Professor Katherine Kuchenbecker’s Introduction to Mechanics Lab on the first day of class. Having reviewed her fall ’09 MEAM 147 student roster, Dr. Kuchenbecker was expecting three students with the last name of McGill, but was it possible that they were actually all related? Call it a curious curricular coincidence or happy accident, brothers Steve, a senior; Will, a junior; and Nick, a freshman, had all enrolled in the same lab.

On that first day, Dr. Kuchenbecker and the rest of her students could not have been faulted for secretly wondering how this fraternal relationship would play out in a close academic setting: Would fights break out? Would alliances be formed? Would they still be speaking at the end of the semester?

As a teacher, Dr. Kuchenbecker has a reputation for building community and creating an atmosphere of ease while encouraging excellence in her classes, and it soon became obvious that the McGills were naturals in this environment. Their classmates soon witnessed a kind of McGillian synergy. Will describes their brotherly dynamic as “collaboratively competitive.” In other words, while each may strive to “win,” they at the same time inspire one another to do their own personal best.

MEAM 147 is designed to improve students’ skills in conducting experiments and emphasizes connections between theoretical principles and practical engineering applications. Each week, students form into groups of three to investigate an assigned problem, and several times the McGill brothers found that they were a team. Their collective goal in these situations was “to have the most fun doing the lab, while maintaining a sense of decorum and academic prowess and learning as much as possible. We also know each other’s strengths. We’ve been doing projects together our whole lives.”

Their intellectual focus and strong work ethic was recognized and nurtured throughout childhood. Mr. and Mrs. McGill observed early on that Legos® and K’nex were a highly-prized commodity in the household. The budding engineers were encouraged to further explore the world of technology that the three found so fascinating. Their grandfather built them a workshop in the garage and the
Growing up we just couldn’t get enough engineering!

Playing with the band at the first football game was a big deal. Steve and Will were right there with me.

tinkering marathons began. Along with the beach, summer vacations often fell into the category of “educational,” wherein the family, over time, traveled to 42 states, and visited uncountable colleges, universities, and cultural and historical sites. No surprise, really. Their mom trained as a chemist and is currently a reading teacher, and their dad is a businessman.

As students at Malvern Prep, Steve, Will and Nick were drawn to the school’s FIRST (For Inspiration and Recognition of Science and Technology) robotics team. FIRST was founded by inventor and entrepreneur, Dean Kamen, and the organization’s vision is “to transform our culture by creating a world where science and technology are celebrated and where young people dream of becoming science and technology heroes.” Mr. Kamen would, no doubt, be gratified to learn that the FIRST experience had the desired effect on the McGill Brothers. With their FIRST robotics team they began, as Steve puts it, to “experience engineering.” The die was cast!

One by one, they came to Penn Engineering. As the first to be accepted, Steve’s “Pennthusiasm” was, evidently, highly contagious. Will and Nick remember well his communiqués from campus during his freshman year: All kinds of exciting things were happening! Throughout his
Almost four years here, Steve has been dynamically engaged with all things Penn. He is majoring in Electrical Engineering and Computer Science and has submatriculated into the Robotics master’s program. He has served as president of CommuniTech, a service organization dedicated to bridging the digital divide domestically and internationally, and traveled to Ghana to set up labs for students and entrepreneurs. He is a member of the Engineering Dean’s Advisory Board (EDAB) and served as editor-in-chief of the Pennsylvania Triangle, a campus science magazine. When he wasn’t in class, in a meeting, or preparing for a RoboCup robotic soccer competition, he was most likely playing pick-up basketball in the Pottruck gymnasium.

Some psychologists theorize that birth order determines personality. While Steve may fit the profile of the eldest child as the “doer” and the leader, Will does not fall into the stereotype of the “less connected” middle child. His brothers describe him as epitomizing familial loyalty and dedication, and his love of Penn is one and the same as his love of the community he has found here.

Will also was not shy about becoming involved with a diverse menu of extracurricular activities. Presently a Materials Science and Mechanical Engineering major, he is the second McGill brother to enroll at Penn Engineering. He is a member of Sigma Pi, a rechartered, new fraternity at Penn, and is on the boards of the Materials Science & Engineering Society, the Technical Entrepreneurship Club, Pennsylvania Triangle and the Undergraduate Sports Business Club. He is a huge Philly sports fan.

The birth order/personality theory describes the youngest child as creative and one who loves the spotlight. Nick, according to his brothers, is an “awesome writer,” plays trumpet in the Penn Band, and advises his brothers on the latest music and Internet news sites. At Malvern, Nick was recognized for having the highest cumulative GPA throughout his four years of high school. When he applied early decision, he was not following his brothers as much as he was following his instinct. Penn Engineering would be the best school for him. He will be concentrating in both Materials Science and Mechanical Engineering. Like Steve, he is a member of EDAB and, like Will, he is pledging Sigma Pi. Nick hit the ground running at Penn and has been having a great deal of fun along the way.

One of the FIRST Foundation’s tenets the McGills learned at Malvern Prep is called “Practicing Gracious Professionalism.” It is defined as “a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.” It is one thing to recite and quite another to practice. To the benefit of Penn Engineering, Steve, Will and Nick McGill appear to have adopted “Gracious Professionalism” as a guiding principle. 

Throughout the semester, Steve, Will and Nick continued to meet up and walk into Professor Katherine Kuchenbecker’s Introduction to Mechanics Lab together. The logistics were not that challenging—the three brothers are all residents of Kings Court English House, where Steve is House Manager and Will is manager of Mirage, the House coffee shop.
Over 200 alumni from the University’s first coordinated dual degree major in engineering and management, the Jerome Fisher Program in Management and Technology (M&T), returned to Philadelphia for two days in November to celebrate 30 successful years. The festivities began with a session for alumni to meet current students, followed by a 30-year retrospective of the M&T program provided by Dr. William Hamilton, the Ralph Landau Professor of Management and Technology and director of the program.

The second day of the celebration commenced with Wharton Dean Thomas Robertson and Engineering Dean Eduardo Glandt welcoming the returning alumni with updates from their respective schools. Dean Glandt provided an overview that focused on Penn Engineering’s interdisciplinary collaborations in science and technology. Glandt recognized and thanked Drs. Joseph Bordogna and William Hamilton for their participation in the program since its inception in 1980.

Alumni were fortunate to hear from two engineering faculty members and an alumni guest lecturer. Dr. Daniel Lee, the Evan C Thompson Term Associate Professor and Raymon S. Markowitz Faculty Fellow in Electrical and Systems Engineering, presented his research in artificial intelligence and robotics, and spoke on the complex robotic facial recognition technologies currently being researched by the General Robotics, Automation, Sensing and Perception (GRASP) Lab.

Dr. Christopher Murray, the Richard Perry University Professor of Chemistry and Materials Science and Engineering, discussed the University’s current nanoscale research activities and initiatives, which are creating interdisciplinary collaborations and research centers. These efforts are transporting Penn to the next technical level to tackle nanotechnology’s greatest challenges.

Moving the focus from the tiniest nanoparticles to the vast reaches of space was alumnus Dr. Garrett Reisman, (M&T ’91), a NASA astronaut who has flown two missions as Flight Engineer aboard the International Space Station. Dr. Reisman presented the alumni keynote address entitled *Space Adventures*. He credited Penn and the M&T program with providing a strong foundation for solving problems and communicating across disciplines. In May 2010, Dr. Reisman will serve as a member of the last crew of the Space Shuttle Atlantis before it is decommissioned.

The 30th anniversary celebration culminated in a gala dinner, where former Engineering Dean Joseph Bordogna addressed alumni, and William Hamilton was recognized for his dedication to the M&T program over the last 30 years. ▼
Integrating Strengths in Computer Engineering

André DeHon’s wide-angle perspective on computer architecture has drawn him to different spheres of computing research and earned him a bit of a bleeding-edge reputation. He is also an innovator in higher education. DeHon, associate professor of Electrical and Systems Engineering (ESE), was instrumental in developing Penn’s undergraduate major in computer engineering, a new discipline that prepares students to explore the space where hardware and software meet.
DeHon’s familiarity with this tricky territory goes back to his undergraduate days at MIT, where he earned bachelor’s, master’s and Ph.D. degrees in electrical engineering and computer science, clearly recognizing the need for the intellectual toolset and body of knowledge that spanned both degrees. He explored the area further in his postdoctoral research at the University of California, Berkeley, and later as an assistant professor at the California Institute of Technology. Since arriving at Penn Engineering in 2006, he continues to investigate the relationship between programming and the physical architecture of computers. Says DeHon, “If I decouple these things, I won’t know if I’m making good choices at the computational level and I may wind up designing something that doesn’t solve people’s problems.”

In the physical area, DeHon is shaping bold approaches to computer design for a world beyond the lithographic silicon chip. Along with smaller chip features and greater capacity, emergent nanotechnology creates imperfections in chip fabrication. DeHon compares the latest chips to snowflakes. Because each one is unique, he says, “We have to adapt how we map the computation to the chip on a per chip basis.” On the programming end, DeHon is taking on the challenge of parallel processing, orchestrating different processors to perform multiple operations at the same time in order to lift computers from their current performance plateau.

DeHon has straddled the hardware/software divide in the private sector as well as in university research labs. While consulting for a startup company, working on what is now called “Voice over Internet Protocol” (VoIP), he encountered a troubling hole in the skill sets of his colleagues. DeHon recalls, “There were people educated as electrical engineers who weren’t software engineers, but they knew the math. Then you had software engineers—computer scientists who were implementing algorithms, but they didn’t understand the math. Everything that resulted was a compromise.” And no one wants to recruit or be a compromise team member.

To help future engineers avoid these compromises, Penn Engineering and a relatively small group of schools now offer degrees in computer engineering. DeHon views this as a natural stage in the development of knowledge and pedagogy. “Think back to the time of Newton,” he says. “The new thing was the physical scientist.” Physical scientists did everything from calculus to optics experiments, perhaps with a little alchemy on the side. When scientific discoveries proliferated, offshoot disciplines such as chemistry and biology had to be created to handle the volume. “I think we are on a similar cusp of inventing information sciences,” says DeHon. He notes that when Eckert and Mauchly built ENIAC at Penn in the 1940s, they were engineers, not computer scientists. Computer science appeared after computing became sophisticated enough to branch out of electrical engineering, and a gap grew between the two areas. Computer engineering, the latest limb on the knowledge tree, is covering that gap.

In planning the educational program, DeHon and other members of the computer engineering major development committee agreed that computer engineers are fundamentally engineers. “Your car has a dozen computers in it,” he says. “If the computer that’s running your antilock brakes fails, potentially people die.” Therefore, computer engineers must understand how to design and validate systems with absolute timing constraints, (i.e. real-time systems), including those systems where correct operation is life-critical. On the fun side, cool computation technologies such as smartphones, MP3 players, and networked video games attract talented teens to fields that foster real innovation, jobs, and wealth creation.

The lab and lecture course ESE 250, Digital Audio Basics, designed by DeHon and taught by Daniel E. Koditschek, ESE department chair, gives students an enticing taste of the discipline and a chance to “feel the bits.” Unlike most courses open to freshmen and sophomores, ESE 250 covers a range of topics including sampling, human perception, and even intellectual property. A survey course can push faculty and teaching assistants beyond their comfort zones, but it lets students experience the real-world value of fundamental subjects such as discrete math.

The long-term success of the computer engineering major will be measured in more opportunities in industry and academia for Penn Engineering undergraduates. Freshman Johnathan Mell plans to join them. “I was debating heavily between engineering and computer science,” says Mell. “And the major just seems like a really good way to mix the two.” That’s one less compromise for this student.
Despite their impressive aptitude for crunching numbers and processing text, computers have a lot to learn before they can handle intelligent tasks that are relatively simple for a two-year-old child. As Ben Taskar, Magerman Term Assistant Professor of Computer and Information Science, can attest, getting computers to recognize people, actions, locations, objects, and concepts represented in the digital data they store is harder than it seems.

“We are trying to figure out robust ways for computers to do what humans do effortlessly,” says Taskar, who was recently awarded the prestigious Alfred P. Sloan Foundation Research Fellowship, which recognizes and supports his unique potential to make substantial contributions to the field of computer science. To illustrate the complexity of a seemingly-simple problem, Taskar offers the example of a child reaching for a cup that’s sitting on the tray of his high chair. The child is demonstrating an understanding of the cup as something he can manipulate—a discrete, relatively permanent object, separate from the surface of the tray, composed of a handle, a container, and hopefully, some contents. It seems simple. But, because computers lack evolutionary-honed capacities for contextual reasoning and highly-specialized “hardware” for perception, Taskar points out that, “These things are not simple when you’re starting from a blank slate.” Teaching a computer to understand what a toddler has mastered requires a new twist on some of computer science’s foundational methods. “The standard paradigm of writing a program doesn’t work with these perceptual problems that are essentially trivial for humans, but extremely difficult for machines, because the real world is too messy,” Taskar explains. “Machine learning requires a different paradigm.”

Rather than writing a program to get a computer to accomplish a specific task, Taskar is developing algorithms that provide computers with basic building blocks to learn by correlating labels with images, and identifying commonalities among multiple examples of a particular concept. Because machines learn primarily by rote, teaching them that a particular combination of pixels corresponds to a face, or that a predictable pattern of colors correlates to a location such as a beach, requires tens of thousands of examples, all of which must be labeled in order to provide the context needed for accurate recognition. As recently as ten years ago, this was a painstaking process that could be done only on a small scale.
and videos were relatively scarce, and the time-consuming process of creating repositories of labeled, or supervised data slowed researchers’ progress. As Taskar explains it, “Every time I wanted the computer to detect a new type of object, or a new action—somebody running versus somebody skipping, for example—as long as they’re somewhat different, I had to go out there and label more examples, essentially from scratch.”

But vast stores of data in the wild, or digital files which are becoming more plentiful on the Internet every day, are facilitating Taskar’s efforts to accelerate the process of machine learning. “Before the advent of the Internet, you would have to find thousands of examples of every particular object and every particular action,” Taskar says. “But now people are spending a lot of time posting images, videos and text on the web, creating this vast repository of digital knowledge.” Harvesting video episodes of popular television shows such as LOST, Alias and CSI, along with screenplays and scripts, commentary from fan sites, and text from closed captions, Taskar is able to create sets of unsupervised, or weakly-labeled data that provide a large enough set of examples from which a computer can learn to identify characters, actions, objects, and locations. In order to do this accurately, however, it must resolve ambiguities between visual and textual inputs.

Many challenges remain, particularly in terms of resolving variations in lighting, facial expression, camera angle, or pose. The successes Taskar has had in his work with weakly-labeled data include near perfect precision in identifying the key characters from LOST and CSI, and over 90 percent accuracy retrieving video results based on textual queries for actions such as grab, cry, kiss, shout, or sleep. These are key steps toward the goals of auto-generating textual summaries of videos and using words to search...
across unlabeled collections of video and images in much the same way that text documents are currently searchable. Taskar is also working to teach computers to analyze and aggregate textual information from a vast array of digitized news sources, thereby quickly exposing trends in public opinion and connections between current events and people in the news.

In addition to his research, Taskar teaches graduate students, covering topics such as machine learning, artificial intelligence and reasoning under uncertainty.

Research and Joseph Moore Professor of Electrical and Systems Engineering. “But the PRiML Center is the first formal research bridge across the two schools.” Making the most of synergies between Wharton’s strong program in mathematical analysis of machine learning, and expertise in computational aspects of machine learning at SEAS, PRiML brings together faculty and students from both schools to address emerging problems of prediction and analysis based on large amounts of high dimensional, weakly-supervised data.

“My hope is that my research can help solve some of the long-standing problems in computer vision and natural language processing,” Taskar says of his work in teaching machines to process language and perceive digital images. From organizing family photos on a hard drive, to searching across terabytes of digital video to find a specific clip, or aggregating news stories told in massive collections of text files, Taskar is transforming the way we access digital information. His research is bringing us beyond the keyword search for needles in haystacks to discovery and retrieval of targeted, multimedia information culled from data in the wild.
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Bequests and beneficiary designations have been fundamental to the stability and expansion of Penn Engineering for more than 150 years. Through both prosperous times and periods of uncertainty, alumni and friends of the School have provided for our future in this meaningful way. Including Penn Engineering in your estate and financial plans will help ensure our long-term strength and vitality.

Help keep us strong.

“Penn Engineering gave me the skills to pursue a successful career, for which I am deeply grateful. More importantly, the School provides our world with much needed engineers, scientists, and technically-grounded entrepreneurs.”

Dolph Simons, EE’42

For more information on gift planning to Penn Engineering, please contact Colleen Becht Rotindo at 215-898-6564 or crotindo@seas.upenn.edu or visit http://www.seas.upenn.edu/giving/planned-giving.php
One of Penn Engineering’s most illustrious alumni also happens to be considered the American ambassador for the deep space program, the branch of astronomy and space technology that conducts space exploration by human spaceflights and robotic spacecraft.

John Casani (EE’55), Special Assistant to the Director at the Jet Propulsion Laboratory (JPL) at the California Institute of Technology, has made pioneering contributions in robotic spacecraft engineering and project management which have impacted the first four decades of planetary and deep space exploration.

But all those accomplishments stemmed from his first job out of college: working at the Jet Propulsion Laboratory on guided missiles used for military purposes. “I was working at JPL a few years before the Space Age started, so in a sense, the Space Age came to me,” he says. Once JPL became part of NASA, he began developing spacecraft, a heady assignment for a young man.

“We were doing things right from the start that had never been done before; things that, at that time, no one really knew how to do. We were all kids, with no one to tell us how or what to do. That is what excited me and everyone working at JPL at that time,” he says. “Unlike the military work which was all classified and pretty much kept out of the spotlight and out of public view, we were working with the eyes of the world upon us, which also made it scary.”

Nothing captures the world’s attention so much as a spacecraft launch, and Casani found himself in charge of giving the go-ahead for the launch of Pioneer 3, only four years after graduation from Penn Engineering.

“I was the engineer in charge of Pioneer 3, responsible for giving the spacecraft the ‘ready to go’ signal with less than a minute before lift-off. It was near midnight with wind and rain blowing hard—a truly dark and stormy night. I had to call ‘Hold’ and eventually ‘Abort,’ because the spacecraft would not accept my command from the blockhouse to switch to internal power,” he says. Shortly upon his call, he found himself face-to-face with Wernher von Braun, international rocket pioneer in charge of the entire crew, and had to justify his call. “It was pretty intimidating for a 27-year-old, who had been captivated reading a series of articles by Werner von Braun in Life magazine seven or eight years earlier.”

Casani had to help the technicians remove the spacecraft from the top of the launch vehicle to troubleshoot and repair it. “We got it back out to the launchpad the next day for a second launch attempt, which was successful,” he said. Subsequently that mission discovered a second radiation belt around Earth.

Casani credits his all-encompassing engineering education as significant in his success in rocket science. “My training at The Moore School was general and broad-based, focused on the fundamentals in a wide range of engineering disciplines. Because of that, I found myself able to deal comfortably across the full spectrum of the fields of study needed for spacecraft development,” he says.

That training continues to mark a career distinguished by historic accomplishments: management of major flight programs including Voyager, Galileo and Cassini; the Mariner spacecraft missions that obtained the first close-range images of Mars; the Voyager missions that continue to explore Jupiter, Saturn, Uranus and Neptune; and the Galileo project that sent back important images of Jupiter and its moons over a 14-year period.

What captured the American imagination in the 50’s has continued to capture Casani’s imagination and dedication. “Initially, it was very exciting to be part of the organization that was given the assignment to develop spacecraft,” he says. But continuing scientifically-rewarding work that has been in the public eye has kept Casani engaged. “Things that spark the interest of the public and inspire young people into careers of math and engineering have kept me interested and motivated all these years.”

From Penn Engineering to DEEP SPACE

BY AMY BIEMILLER
John Casani (EE’55), Special Assistant to the Director at the Jet Propulsion Laboratory (JPL) at the California Institute of Technology, has made pioneering contributions in robotic spacecraft engineering and project management which have impacted the first four decades of planetary and deep space exploration.
Penn Trustees Approve Construction of the Singh Center for Nanotechnology

Following approval by the University’s Board of Trustees, construction for the $80 million Krishna P. Singh Center for Nanotechnology is set to begin this fall, with full completion slated for the spring of 2013. This state-of-the-art research facility will serve as a prominent gateway to the eastern edge of Penn’s campus and will usher in a new era of nanotechnology research for the University and the region.

Made possible by a $20 million naming gift from Dr. Krishna Singh, a Penn alumnus and Engineering Overseer, the center will house microscopy labs, 10,000 square feet of environmentally-controlled clean rooms, general labs and optics labs for research and collaboration spaces. The building will provide needed facilities to nanotechnologists from Penn Engineering and the School of Arts and Sciences, allowing for the exchange and integration of knowledge that characterizes the study of this emerging field.

Dr. Singh is the founder, president and chief executive officer of the energy-technology company Holtec International based in Marlton, N.J. “We are pleased that Kris has so generously contributed to making Penn a leader in nanotechnology,” said Dean Eduardo Glandt. “Those who know him understand that this is a gift from the heart. His wise counsel and investment in the future of Penn Engineering will leave an indelible mark. The Singh Center will serve not only Penn but the entire Philadelphia region as a crossroads of multidisciplinary, fundamental and translational research, education and innovation.”

With the gift from Dr. Singh, the School has secured a total of $60 million in committed funds for the facility, with the remaining funds to be raised through donor contributions and naming opportunities (see inset).

The University has selected the award-winning architectural design firm Weiss/Manfredi, and M+W Zander, an engineering and construction firm specializing in clean room construction, to design the Singh Center.

The building will be located on the 3200 block of Walnut Street, next to the Laboratory for Research on the Structure of Matter (LRSM), making it the first building seen by pedestrian and vehicular traffic entering campus from the Walnut Street corridor.

“We’ve selected a design that is forward-looking and guided by sustainable principles, but more importantly, one that clearly articulates its purpose while meeting its programmatic needs,” said Glandt. “This center is indispensable for prototyping new devices for the next wave of nanotechnology creation. It will have an iconic presence [at] the University, and it will be revolutionary for Penn and for the region.”
New Faculty

Andreas Haeberlen
Raj and Neera Singh Assistant Professor of Computer and Information Science
Ph.D. in Computer Science, Rice University; Postdoctoral appointment at the Max Planck Institute for Software Systems
Dr. Haeberlen works on large-scale distributed systems that span multiple administrative domains, such as cloud computing platforms or the Internet’s interdomain routing system. His research leverages the social and economic connections between the participants to improve the reliability and the efficiency of such systems.

Andrew Jackson
Practice Professor of Mechanical Engineering and Applied Mechanics
Ph.D. in Tribology, Imperial College, London
Dr. Jackson is an international leader in lubrication science, with 35 years of industrial research and service to the technical community. His interests are in elastohydrodynamic lubrication, traction, gear efficiency, automotive fuel economy and lubricant effects on automotive emissions. Dr. Jackson was inducted into the National Academy of Engineering in January 2009.

Arjun Raj
Assistant Professor of Bioengineering
Ph.D. in Mathematics, New York University; Postdoctoral appointment at Massachusetts Institute of Technology in Systems Biology
Dr. Raj’s research examines how gene regulatory networks function in single cells. Using an interdisciplinary approach, his research involves using single molecule detection methods to quantitatively evaluate models of cellular behavior.

Naming Opportunities:
- Clean Nanofabrication Facility: $7.5 million
- Forum (cantilevered event space): $3 million
- Walnut Street Plaza: $2 million
- Research Laboratories: $100,000 to $1 million
- Lower Concourse Lobby: $400,000
- Offices: $25,000

For additional information, contact George Hain, Vice Dean for External Affairs, at 215-898-6564 or ghain@seas.upenn.edu
Honors and Awards

Christopher S. Chen, Skirkanich Professor of Innovation in Bioengineering, has been named a fellow of the American Institute for Medical and Biological Engineering (AIMBE). This is the leading advocacy group for the field’s 1,000 top practitioners in academia, industry and government.

Nader Engheta, H. Nedwell Ramsey Professor of Electrical and Systems Engineering, has been elected Fellow of the American Association for the Advancement of Science (AAAS) for contributions to “the fields of metamaterials, plasmonic nano-optics, biologically-inspired imaging, and electrodynamics, and for developing the concepts of metaconductors and metamaterial-inspired lumped nanocircuits.”

Roch Guerin, Alfred Fitler Moore Professor of Telecommunications Networks, is the 2010 recipient of the IEEE INFOCOM Achievement Award, presented by the IEEE. This prestigious award recognizes Dr. Guerin’s “pioneering contributions to the theory and practice of QoS in networks.” The award was presented at the 2010 IEEE INFOCOM Conference, the IEEE conference which addresses key topics and issues related to computer communications.

Daeyeon Lee, Assistant Professor of Chemical and Biomolecular Engineering, is the 2010 recipient of the Victor K. LaMer Award for outstanding graduate research in colloid and surface chemistry. Dr. Lee is being recognized for his Ph.D. research on “Surface Engineering Using Layer-by-Layer Assembly of pH-Sensitive Polymers and Nanoparticles.” Dr. Lee will present the LaMer plenary lecture at the 84th American Chemical Society Colloid and Surface Science Symposium at the University of Akron on June 20-23, 2010.

George Pappas, Deputy Dean for Research and Joseph Moore Professor of Electrical and Systems Engineering, has received the 2009 George Axelby Outstanding Paper Award for “Approximation Metrics for Discrete and Continuous Systems.” This award is given to a paper in the IEEE Transactions on Automatic Control and is based on originality, potential impact on the theoretical foundations of control, importance and practical significance in applications.

Prashant Purohit, Assistant Professor of Mechanical Engineering and Applied Mechanics, is a 2010 recipient of the ASEE Ferdinand P. Beer and E. Russell Johnston, Jr. Outstanding New Mechanics Educator Award. This award is given annually to up to three individuals who have shown a strong commitment and exceptional contributions to mechanics education.

Ben Taskar, Magerman Term Assistant Professor of Computer and Information Science, has been awarded a prestigious Sloan Research Fellowship. The Sloan Research Fellowships seek to stimulate fundamental research by early-career scientists and scholars of outstanding promise. These two-year fellowships are awarded yearly to 118 researchers in recognition of distinguished performance and a unique potential to make substantial contributions to their field.

Ben Taskar has also been named a 2010 Young Investigator by the Office of Naval Research (ONR). He is one of 17 recipients this year to be part of the Young Investigator program, which invests in academic scientists and engineers who show exceptional promise for creative study. Recipients for this highly competitive award were selected from 211 proposal submissions. Winners will receive a three-year research grant of up to $510,000.

Vasek Vitek, Professor of Materials Science and Engineering, has been elected an Honorary Member of the Japan Institute of Metals (JIM), an organization in Japan dedicated to the promotion and development of science and technology of metals and materials. The JIM is one of the most active members of the International Organization of Materials, Metals & Minerals Societies.

Beth Winkelstein, Associate Professor of Bioengineering, presented her work at the 2009 National Academy of Engineers “Frontiers in Engineering” Conference. The program brings together a select group of emerging engineering leaders from industry, academy, and government labs to discuss cutting-edge research.

The CAREER Award is the National Science Foundation’s most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Competition for CAREER Awards is fierce, and we note with pride the research of the following recipients:

Ani Nenkova, Aravind Joshi Term Assistant Professor of Computer and Information Science, has received an NSF CAREER Award for her research in “Capturing Content and Linguistic Quality in Automatic Extractive and Abstractive Summarization.”

Prashant Purohit, Assistant Professor of Mechanical Engineering and Applied Mechanics, has received an NSF CAREER Award for research on “Entropic Elasticity of Fluctuating Filaments and Networks.”

Andrew Tsurkas, Stephenson Foundation Term Assistant Professor of Bioengineering, has received an NSF CAREER Award for research on “Molecular Imaging Training Program.”

Ravi Desai, Bioengineering doctoral student, is the recipient of the 2009 JCS Prize from the Journal of Cell Science for his paper, “Cell polarity triggered by cell-cell contact via E-cadherin.” The $1,000 prize is awarded annually to the author of the paper judged by the editors and editorial board of JCS to be the best it has published that year. Authors must be students or postdoctoral researchers to be considered for the prize.

Jason Merrin, Penn Engineering freshman in the Digital Media Design Program, won both second place and Audience Choice Award at 2010 Penn Student Film Festival for his film, Yin/Yang. The festival showcased short films submitted by Penn students. Merrin summarizes his film as “a happy girl and an unhappy boy meet somewhere in the middle.”

Skirkanich Hall, already recognized as the “Best Building in Philadelphia,” has received a coveted 2010 Honor Award for Excellence in Architecture from the American Institute of Architects.
Teaching Awards

Zachary Ives, Associate Professor of Computer and Information Science, has been awarded a Christian R. and Mary F. Lindback Award for Distinguished Teaching, the University’s highest teaching honor. Dr. Ives has been recognized for outstanding teaching of project-oriented courses in databases and Internet and web systems, and has generated high enthusiasm for the profession of computer science among Penn students.

Sanjeev Khanna, Rosenbluth Family Fellow and Professor of Computer and Information Science, has been awarded the S. Reid Warren Jr. Award, which is presented annually by the undergraduate student body and the Engineering Alumni Society in recognition of outstanding service in stimulating and guiding the intellectual and professional development of undergraduate students.

Bruce Kothmann, Lecturer in Mechanical Engineering and Applied Mechanics, has been awarded the Dean’s Award for Excellence in Teaching in the Lecturer and Practice Professor Track. The award recognizes outstanding teaching ability, dedication to innovative undergraduate instruction, and exemplary service to the School in consistently inspiring students in the engineering and scientific profession. In addition to his teaching, Dr. Kothmann works with the Boeing Rotorcraft Division in Philadelphia.

Katherine Kuchenbecker, Skirkanich Assistant Professor of Innovation in Mechanical Engineering and Applied Mechanics, has been awarded the Ford Motor Company Award for Faculty Advising. The award recognizes dedication to helping students realize their educational, career and personal goals.

Lecture Notes

George H. Heilmeier Faculty Award for Excellence in Research

Rajeev Alur, Zisman Family Professor of Computer and Information Science and director of Penn Engineering’s Embedded Systems master’s program has been selected as the 2010 recipient of the George H. Heilmeier Faculty Award for Excellence in Research for his “fundamental contributions in software verification for real-time systems.” Dr. Alur’s seminar, “Software Verification: From an Unsolvable Problem to Useful Tools,” was presented on March 4, 2010. The Heilmeier Faculty Award was established by Penn Engineering for the purpose of recognizing excellence in scholarly activities of the faculty.

Named in honor of George H. Heilmeier, the award recognizes his extraordinary research career, his leadership in technical innovation and public service, and his loyal and steadfast support of Penn Engineering.

The Harold Pender Award

Robert E. Kahn, Chairman, CEO and President of the Corporation for National Research Initiatives, and Vinton G. Cerf, Vice President and Chief Internet Evangelist of Google, were selected as the recipients of the 2010 Harold Pender Award, the School’s most prestigious honor. The award was presented following a joint lecture given by Drs. Cerf and Kahn on February 23, 2010, “The Internet: Lessons from the Past and Implications for the Future.” Drs. Cerf and Kahn were recognized for their pioneering and seminal contributions to network-based information technology, and especially for the design and implementation of the TCP/IP protocol suite, which continues to provide the foundation for the growing Internet.

The Harold Pender Award is given by the faculty of The Moore School to outstanding members of the engineering profession who have achieved distinction by significant contributions to society.

From left to right:
George H. Heilmeier, Penn Engineering Overseer
Michael Zisman, Penn Engineering Overseer
Rajeev Alur, Zisman Family Professor of Computer and Information Science

“Fathers of the Internet” Vinton G. Cerf and Robert E. Kahn
What is your role in Penn Engineering? As a lecturer, my formal responsibilities are teaching courses and advising undergraduate projects. My goal is to make the students’ academic experiences as challenging and fun as my professional aerospace engineering experiences at Boeing have been. Students are assigned homework problems and design projects that are relevant and interesting, while at the same time emphasizing that success in engineering comes from thoughtfully applying the fundamental concepts and analytical methods that they are learning in their core curricula.

Tell us about your career prior to joining the faculty at Penn. For over 10 years, I worked in the “Flying Qualities” group at Boeing Rotorcraft in Philadelphia, with the goal of making helicopters easy to fly so that pilots can devote cognitive energy to other mission tasks. This wonderful job combined intense analytical and computational work with a variety of flight test programs. A colleague once said that we had a unique ability to “see / hear / feel” our accomplishments flying right over our heads!

How do you bring real-world engineering problems into the classroom? Laboratory exercises are the essential bridge between theory and practice. Real design problems confront students with the tension between creative passion and analytical precision. But computer simulation and online resources have also enabled wonderful “virtual experiments” which expose students to a greater variety and larger scale of engineering data than we can practically achieve in the laboratories alone. For example, sophomores in the class Introduction to Flight analyzed the aerodynamics of an Airbus A320 jetliner, using real data recovered from the “black box” onboard U.S. Airways Flight 1549—the miracle landing in the Hudson River.

What other skills from your industrial experience motivate you in the classroom? The programs I worked on at Boeing were all partnerships with other companies. We were constantly navigating among multiple corporate, as well as personal, cultural backgrounds. Early on, a colleague helped me see that my success would depend at least as much on my ability to work well with others as it would on getting the “right answer.” This perspective directly motivates many project and teaming assignments, with the goal of developing these skills in students before they get into the professional world.

What keeps you busy outside of the office? I spend a lot of time with my family. My two children, ages 8 and 12, are both enjoying piano lessons and a variety of sports activities. My family teases me for my occasional obsessions with random topics, such as a recent intense fascination with the morphology of snow crystals. I am also the co-inventor of a variation on the traditional dreidel game, called “Staccabees.”

Bruce Kothmann
The University of Pennsylvania values diversity and seeks talented students, faculty and staff from diverse backgrounds. The University of Pennsylvania does not discriminate on the basis of race, sex, sexual orientation, gender identity, religion, color, national or ethnic origin, age, disability, or status as a Vietnam Era Veteran or disabled veteran in the administration of educational policies, programs or activities; admissions policies; scholarship and loan awards; athletic, or other University administered programs or employment. Questions or complaints regarding this policy should be directed to: Executive Director, Office of Affirmative Action and Equal Opportunity Programs, Sansom Place East, 3600 Chestnut Street, Suite 228, Philadelphia, PA 19104-6106 or by phone at (215) 898-6993 (Voice) or (215) 898-7803 (TDD).