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John Fry is Drexel's fourteenth president inside

special issue Women in engineering
CoE welcomes President John Fry

Drexel University’s College of Engineering proudly welcomes John A. Fry as the 14th president of Drexel University. Fry was unanimously selected to succeed the late Constantine Papadakis following the latter’s untimely passing.

Fry has served as president of Lancaster-based Franklin & Marshall College since 2002 after demonstrating visionary leadership as executive vice president and chief financial officer of the University of Pennsylvania.

During his tenure at Franklin & Marshall he demonstrated a commitment to raising the quality of academics and academic life. Incoming classes’ scores rose by 63 points and an aggressive hiring program reduced the student-faculty ratio to 10:1. He also oversaw a significant increase in student financial aid and inaugurated a plan to double the school’s campus area.

In joining Drexel, he embraces a culture that also has enjoyed a continual rise in the quality of students and has emerged as an ambitious center of need-driven research.

In 2009 Fry completed six years on the NCAA Division III Presidents Council including two terms as chair, and serves on the boards of Lancaster General Hospital, the Havertford School, Damon Runyon Cancer Research Foundation and the Pennsylvania Academy of the Fine Arts. He is President of the Board of Trustees of Lancaster County Day School and a Director of Community Health Systems, Delaware Investments and Ecore International.

The College of Engineering looks forward to taking part in Drexel’s continuing progress under President Fry’s leadership.

Top: Drexel’s new President John Fry addresses a gathering of faculty and students in the Great Court
Left: CoE Dean Selçuk Güçeri greets the President-elect and his wife Cara at the announcement of President Fry’s appointment

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*Anonymous* documents may reveal your identity

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FROM THE DEAN

As we prepare to embrace another academic year, we review our college’s current standing and how we arrived here.

Drexel’s College of Engineering is a different place than it was a decade ago. Our incoming freshman class is not only our most talented, but has increased by 18% in comparison to last year. Including the students from our sister college, Biomedical Engineering and Health Sciences, our freshman class is likely to reach 1,100 students—an all time high.

The most recent issue of FSKEE Guide to Colleges 2011 identified Drexel as a “Best Buy,” singling out the College of Engineering: “Drexel’s greatest strength is its engineering college, which churns out more than 1% of the nation’s engineering graduates, B.S. through Ph.D.” The interest in our college stems largely from our leadership in offering the most innovative programs created by some of the finest minds in the country. We offer a broad range of opportunities for our students to prepare for the workforce and meet the challenges of tomorrow by continuously developing new relevant programs, modifying curricula and establishing new targeted minors, such as Global Engineering, Engineering Policy Analysis, Nuclear Engineering and even Entertainment Engineering.

The initial challenge to attract students is to develop a value proposition, the next test is retaining these students. Retention reflects their satisfaction with the program, the faculty and the support they’re receiving. Having achieved 86.7% retention, Drexel’s College of Engineering leads the university by example, affirming the quality of our programs and their success in meeting our students’ expectations. This is attributed in large part to the hard work and dedication of our faculty and staff in providing guidance and support. We are constantly striving to improve this number even further, with the goal of approaching 100% retention.

The College of Engineering leads the drive to fulfill Drexel’s promise as a top research institution as mandated by the university’s Strategic Plan. Our spectacular research portfolio is rapidly earning national and global recognition, with many of our faculty and students receiving prestigious awards. Measures for scholarship and research productivity include the number of publications by faculty; the number of citations they receive; the external funding our researchers attract in support of generating scholarships; and their ability to produce the doctoral talent that will join the research community in addressing the challenges facing society. We’ve become a world-class research operation that excels in all these categories.

A quick glance at our productivity in research publications and the citations our faculty has earned captures the dramatic transformation we’ve accomplished during the last decade. With annual research expenditures over $35M and a phenomenal increase in new awards, our college is at an all time high and is poised to take another major step up in the coming year. Our 2011 fiscal year started with over $10M in new awards in the first month alone—a great start for any year thus far as engineering as a profession has its own set of dynamics.

Today, engineers work on different programs using different tools and methods than their predecessors. What’s changing in engineering is not only the work engineers do and how they do it, but who is doing the work. For a long time, engineering has been viewed as a profession mostly for men. Women pursuing engineering careers were the exception, rather than the rule. My mother was the first woman engineer in Turkey, so I was able to see firsthand the kind of difficulties and challenges she faced. Drexel’s College of Engineering has a long history of supporting women in engineering. The Society of Women Engineers (SWE) was founded on Drexel’s campus over 50 years ago, long before women were widely encouraged to enter the fields of science and technology. We have worked diligently to continue that tradition.

Women comprise 24% of the College’s faculty, one of the highest percentages—if not the highest—for a Research-I university. We’ve increased our female faculty by 100% over the last five years alone. It follows that with such stellar role models, we have one of the highest percentages of female graduate students in the nation at 30%. The success of students such as Regina Eagle, Kata Spiller and Karen Miller who received the prestigious Fulbright Fellowship reflect the quality of our student body. Student leaders such as Sylvia Herbert, Leila Abolarb, Danielle Jacobson, Liz Floydman and Eleanor Small will make their impact on society. Many of our female staff members have also been integral and instrumental to our outstanding progress. This issue of our magazine is dedicated to our female colleagues and engineers. Their stellar scholarship, research productivity and intellectual contributions serve as an important inspiration for younger generations.

Drexel’s College of Engineering is at an all-time high in every aspect of academic operation. Our college’s new Strategic Plan, developed in collaboration with all constituents, will further spark our college’s accomplishments and conquer many of the challenges we face, sealing our place among the top engineering programs in the world. While we enjoy our phenomenal success, we will not lose sight of the fact that moving up is difficult but coming down is easy.

Many people have contributed to our college’s outstanding accomplishments, and I thank every stakeholder—alumni, faculty, students, parents, staff and friends of the college—for being an integral part of our college’s story. To learn more about the College’s Strategic Plan, visit www.drexel.edu/ce/about

Selçuk Güçeri
Dean, College of Engineering
CoEvents

Page 4 top Dr. Monique Cooper '89 (BM) is doing her post-doc at NASA-JPL, exploring planetary protection against extreme bacteria found on spacecraft-associated surfaces.

Page 5 top Drexel’s RePlay gaming lab has earned a high ranking from the Princeton Review.

Page 5 center Drexel’s Advanced Energy Leadership Conference brought large energy consumers up to date.

National Lab Day 5.12.10
President Obama issued a call to action last year urging educators to engage students in science and engineering at a young age. In May, the College of Engineering answered the challenge, inviting the Drexel community to help celebrate the kickoff of National Lab Day. CoE supports NLD by building local communities that foster collaborations among volunteers, students and educators. Educators beginning a project can take advantage of the College’s expertise to assemble the needed resources. Send your talents to this year-long initiative—info at www.drexel.edu/coe/news.

Alumni Night with the Flyers 3.11.10
Philly pride overflowed the Drexel alumni box during the Flyers’ battle against the Boston Bruins at the Wachovia Center. A 5-1 final score didn’t dampen spirits as Dean Selcuk Güçeri hosted a festive evening with an all you can-eat buffet, beer, raffles and quality time with fellow Dragons. You’ll find pictures from the evening on CoE’s Facebook page.

Habitat for Humanity Contest 4.17.10
Area fifth graders turned Drexel’s basketball arena into a dazzling showroom during Delaware Valley Habitat for Humanity’s 8th annual “Build a House… Build a Dream! Contest for Kids” in April. More than 400 contestants displayed imaginative, colorful dream-home models reflecting their ideals and passions. Prizes recognized excellence in originality, creativity, use of materials, adherence to design guidelines and other attributes. Habitat for Humanity provides information on the contest at www.dvhabitat.org.

Advanced Energy Leadership Conference 4.8.10
Showcasing leadership in advanced grid technology, the Drexel University Advanced Energy Leadership Conference premiered in the Bossone Research Center April 8 and 9. Title sponsors Viridity Energy and Lutron Electronics co-hosted the event which gathered regional and national policy, technology and business leaders to discuss changes in the energy landscape and their impact on large power consumers.

Game program one of nation’s top three
The Princeton Review recently placed Drexel University’s RePlay video game design curriculum among the top three in the US and Canada. Developed jointly by the CS Department’s Research on Play or “RePlay” Lab and the Digital Media Program in the Antoinette Westphal College of Media Arts & Design, the interdisciplinary program beat out some 500 competing programs. CoE’s Dr. Frank Lee (CS) leads RePlay efforts with Dr. Paul Diefenbach of Westphal, teaching game development through projects that extend beyond traditional interfaces and applications. The rankings appeared in the April 2010 GamePro magazine.

CoEAA Beerfest 6.3.10
Cheers all around! CoE alums met for a night of libations and levity in the Bossone Atrium. Tankards clanked as attendees toasted old friendships, new friendships and great times at CoE. See photos on CoE’s Facebook page.
CoEvents

Sea Perch Challenge 4.24.10
More than 600 middle, high school and community college students made a splash in the Daskalakis Athletic Center pool in April as they squared off in the Greater Philadelphia Sea Perch Challenge underwater robotics competition. The teams maneuvered handbuilt Perches—remote control submersibles sporting plastic tubes, propellers, sensors and flotation orbs—to retrieve weighted objects and deposit them to collection buckets. Prizes rewarded design excellence, presentation and teamwork. CoE hosted the event with the US Navy to increase interest in math, science, technology, engineering and of course, robotics. Details and photos at www.coe.drexel.edu/seaperch.

Steel Bridge Team Finishes Strong 4.21.10
The Drexel Architectural Engineering Institute’s 2010 Steel Bridge Team placed first at the regional competition against nine other colleges and universities. The team placed in five of the six possible categories and was first overall, before moving on to the national competition in Purdue where they placed 10th out of 46 teams.

Alumni Weekend 4.30.10 - 5.1.10
Alumni experienced a blast from the past as they met for a weekend of Drexel fun! A “blast-off” theme accented the festivities, which included a champagne breakfast, formal dinner receptions on campus, tours of Philly and a 5k run. Recap and photos at www.drexel.edu/alumni/weekend.asp.

FIRST Robotics 3.25.10 - 3.27.10
Robots stormed the Daskalakis Athletic Center during CoE’s 10th annual FIRST Robotics competition in March. More than 40 teams from across the US came to test their robots’ mettle in an indoor soccer match. Teams vied to design and deploy robots able to dribble a soccer ball, knock it into the goal and navigate tough terrain. Winners in this “varsity sport for the mind” advanced to the regional level, with their sights on the national competition. You can follow their progress at www.usfirst.org.

Commencement 6.11.10
Family and friends gathered June 11 to congratulate the Drexel University Class of 2010. We salute all of our new alumni and welcome them to our growing network of Drexel Engineers!

CoE Golf Competition 6.28.10
The challenge of Huntingdon Valley Country Club’s golf course didn’t keep CoE students, faculty, staff, alumni, friends and industry partners from taking their game to the turf. More than 100 golfers tested their skills in friendly rivalry with proceeds benefiting student programs and scholarships. CoE’s Facebook page features pictures from the event.

Top left: Heeding an advisor’s last-minute instructions, the crew of a Sea Perch team prepares to launch their craft.
Top right: Smiles brightened an already sunny day for Drexel’s Commencement ceremonies.
Bottom right: Designing, building and deploying robots of dizzying ingenuity, the Miracle Workers team showed off their creation at the DAC in March.
Left: Drexel’s Steel Bridge team placed first in the regional competition.
Egg Drop Competition
A perennial favorite of Engineers Week, the Egg Drop brought teams of Drexel students, faculty and staff to the Great Court to see whose eggs would survive a 31-foot drop. A boisterous crowd (and the Philly Phanatic) enjoyed the festivities as the squads launched contraptions of cardboard, Popsicle sticks, plastic toys and of course, duct tape. Congratulations to first place winner Patrick Sweeney (MEM) of the Azurum team!

Honors Day Awards Ceremony and Reception
Honoring students who have excelled in research and academics, the ceremony was followed by a reception in the Great Court where family and friends reconnected. Congratulations to our students for their exceptional work!

High School Day
More than 200 area high school students joined CoE faculty, staff and students to experience the challenge and rewards of engineering. Hands-on math and science experiments, demonstrations and lectures fed their curiosity. Then, gloved, goggled and divided into groups, the students mixed borax and polyvinyl alcohol to create slime and try their hand at concocting the polyurethane foam commonly used in home insulation.

Engineers Week  February 15-19, 2010

Top Left: The Egg Drop Competition spotlighted the CoE community’s imagination and inventive spirit
Below left: High school students get acquainted with Jaemi HUBO, an anthropoid robot under development by Drexel and Korean universities
Top Right: Local and national employers recruited Drexel engineering students at the Career Fair
Bottom right: Dean Güven presents Dr. Charles M. Vest with CoE’s Engineer of the Year award

Engineering Student Showcase
CoE student organizations dedicated to innovative construction hosted a reception and information session in the Bossone Atrium. Keynote speaker Bob Francis presented the new Papadakis Integrated Sciences Building as an example of Drexel’s commitment to sustainable, innovative design. Participating student organizations included ASCE Concrete Canoe, AIE Steel Bridge, Engineers Without Borders and Drexel SmartHouse.

Engineering Career Fair
CoE and the Steinbright Career Development Center co-hosted the annual Engineering Career Fair at Bossone. Nearly 100 companies, engineering firms and government organizations presented career options to some 600 undergraduate and graduate students.

Sustainability Seminar
KYW Newsradio and CoE hosted a breakfast seminar exploring sustainability. An expert panel representing academia, government and business explained the concept of sustainability and discussed ways to build a sustainable business. Attendees also learned about the numerous sustainability initiatives under development within the local community.

Engineer of the Year Dinner & Awards Ceremony
Dr. Charles Vest, president of the National Academy of Engineering since 2007 and president emeritus of the Massachusetts Institute of Technology, was honored at CoE’s Engineer of the Year Dinner and Awards Ceremony at Philadelphia’s Rittenhouse Hotel. More than 300 students, faculty, staff, alumni and industry leaders celebrated Dr. Vest’s many significant contributions to the field of engineering. Dr. Vest addressed the crowd with a review of the most significant challenges facing the engineering community—including climate change, resource depletion and less-familiar issues such as the growing instability of the planet’s vital nitrogen cycle.
Bachelor of Science in Engineering

Launched in fall 2009, the BSE is a unique, customizable program that gives exceptional students a broad education rooted in engineering, but also encompasses interdisciplinary studies.

Students receive a study plan tailored to their own interests, combining the engineering core with their choices from pre-medicine, pre-law, business, media arts, humanities, entrepreneurial activities, environmental studies, and other courses.

The BSE offers a five-year degree with co-op and a four-year plan without. In the first two years, students take the essential engineering courses that lead to traditional engineering degrees. With that grounding, they expand their later studies with courses from the various engineering disciplines, sciences, business, and the humanities appropriate to their career objectives.

BSE students receive four years of academic advising and must complete a total of 180.5 credits in order to graduate. The highest-caliber applicants are considered for the BSE program. Eligible for significant scholarships, they also enjoy priority in selecting classes and qualify for automatic admission into the Pennoni Honors College. “With a combination of problem-solving and critical thinking skills associated with an engineering degree, plus flexibility to pursue aspirations in non-engineering fields, students can leave the program with a wide range of professional and educational options,” says Bruce Eisenstein, Program Director. “Many students who earn this degree will continue their education in professional or graduate schools, start a business or make a career in industry, media, arts, medicine, law or the humanities.”

With high technology’s growing influence on human interaction and new trends sweeping the globe at the speed of light, the BSE empowers students to address multi-disciplinary challenges not yet foreseen.

Minor in Engineering Management

This new minor welcomes business students who want to gain an understanding of engineering concepts, and engineers who seek management skills. Students with a science background will also benefit from its flexible curriculum.

Five core courses anchor the program’s 27-credit requirement, complemented by three engineering or non-engineering elective courses. Tailoring the elective cycle to their professional development interests, students enjoy the flexibility to include additional courses that serve their professional development goals.

Graduate Certificate in Infrastructure Engineering Management

Built on the College of Engineering’s excellence in areas such as environmental risk analysis and engineering management, this certificate enables engineers to work effectively with external stakeholders on large-scale infrastructure projects.

Courses focus on decision-making, management and planning, and explore the impact of regulations and contractual relationships on publicly-funded projects. Students complete 18 credits in face-to-face, online and hybrid courses.

“The structure is unique,” says Mort Rabonowitz, Director of the Engineering Management Program. “It’s designed to be career oriented and flexible, but also practical and highly interactive. Students can use the certificate as a step toward advancing their careers in Engineering Management.”

Program graduates will acquire skills in managing public resources, integrating an array of projects into a long-term program and incorporating public values and participation in infrastructure decisions.

—Chris Hennessy

Engineers and non-technical professionals increasingly find themselves in close collaboration. The College of Engineering has launched three new ways to bridge the knowledge gap.
Vascular disease has long been the United States’ most prolific killer.

World Health Organization data indicate that cardiovascular and cerebrovascular disorders account for some 40% of American deaths.

People who smoke, exercise too little, or overindulge in saturated fats suffer increased risk. But one group merits particular concern: more than two-thirds of people with diabetes die of vascular maladies. Despite extensive research, no explanation has been found for that statistic.

At Drexel’s College of Engineering the quest to unravel this causal web has taken a novel turn. Funded by an NSF CAREER Award, Alisa Morris Clyne applies the principles of fluid mechanics to examine intra- and extra-cellular processes that may hold the key.

“Atherosclerotic plaque tends to build up at locations where a vessel branches or turns sharply,” notes the P.C. Chou Assistant Professor of Mechanical Engineering. “Why is that? We don’t know, but the evidence suggests that flow irregularities are a key factor.”

Her research has revealed that blood sugar imbalances caused by diabetes can significantly affect vascular tissues, compromising their structural integrity.

Could this explain diabetes’ link to atherosclerosis? “It’s one of the avenues we’re investigating,” confirms Dr. Clyne. “We still have a lot of work to do.”

That work proceeds amid a labyrinth of countertops, cabinets, equipment and instruments in room 529 of the Bossone Research Center. Greeting members of her research team, Dr. Clyne pauses at a laptop displaying a fibrous network that resembles mattress springs. A microscopic view of vascular structure.

by Colleen Rzucidlo and Mike Norris

going with the flow

Alisa Clyne’s biomechanical approach diabetes creates the preconditions for vascular disease.
therosclerosis occurs when fatty substances such as cholesterol accumulate in blood vessels. Diabetes contributes significantly to its onset. Unchecked, it leads to deadly cardiovascular diseases. Exploring biomechanical and biochemical interactions at the cellular level, Dr. Clyne’s team has revealed a potential pathway.

“Ther are different forms of diabetes,” continues Dr. Clyne. “Type 1—childhood or juvenile diabetes—occurs when the body fails to produce insulin. In Type 2, insulin may be present but for some reason the cells ignore it.”

The resulting hyperglycated state is clearly associated with vascular disease, but their exact mechanism has eluded researchers.

**Dr. Clyne’s dual interests in biology and fluid mechanics provide an ideal background for exploration of those mechanisms.** After earning a BS in Mechanical Engineering from Stanford University, she joined General Electric’s Aircraft Engines Technical Leadership Program in 1996 while working toward a master’s in Mechanical Engineering from the University of Cincinnati.

“I always liked building things with my dad,” she recalls, “but it was only after a summer program at the University of Illinois that I decided to become an engineer. I was fascinated by Autocad, and I had dreams of designing cars, airplanes and space shuttles.”

**Gly** offered the potential to realize those dreams, but her interests veered earthward and she left to seek a PhD in Medical and Mechanical Engineering at the Harvard-MIT Division of Health Sciences and Technology. “I wanted to study one of the most fascinating engineering systems—the human body.”

At Drexel, Dr. Clyne teaches a popular course in fluid mechanics while exploring its role in vascular pathology. The project brings mechanical techniques to bear on the complex world of cells and their associated structures.

**Needles in a moving haystack:** cellular processes occur in a complex environment where cause and effect defy observation. Worse, common testing methods may affect the properties they’re measuring.

Dodging that roadblock, Dr. Clyne’s team invented a device that employs dielectrophoresis to minimize the prospect of such contamination.

**Dielectrophoresis** creates mechanical force using an asymmetric electric field. Researchers can adjust the field to snare and manipulate any polarizable particle, including cells.

**Rewarding its creators, The dielectrophoretic tool has begun to yield findings that Dr. Clyne describes as “interesting.” In 2009, her team used it to document a previously unseen effect of glycation.**

At the laptop, Dr. Clyne clicks a mouse to swap the bedsprings for a quilt of red and blue globules. “This is a group of endothelial cells. Now let’s see what happens when they’re glycated.”

The quilt is replaced by a mass packed with sinister black voids. “Endothelial cells and the basement membrane have to be flexible. Normally the integrins can adjust so the cell can realign, for instance when it’s subjected to shear stress.”

“But we’ve observed that glycation prevents this realignment. The dark areas you see are gaps that have opened between cells. That’s one result of the cells’ inability to align with changing flow.”

“Lipids can penetrate the cell layer through the gaps and collect underneath. It’s possible that this is stage one in the buildup of plaque.”

“We’re now studying some possible biomechanical explanations for the effect of glucose on shear stress response in the cells, and in the in-vitro unit. With the data we’re gathering in this lab, we can create a quantitative mechanistic model of those interactions.”

That model will give Dr. Clyne and fellow researchers a promising foothold toward defeating diabetes’ assault on vascular tissues.

Follow Dr. Clyne’s research at: [http://www.drexel.edu/vascularkinetics](http://www.drexel.edu/vascularkinetics)

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**SUGAR SHOCK**

The Phillies’ 2010 opener filled Citizens Bank Park with fans washing down ballpark snacks with soft drinks. But for many of them, sodas and other sugary fare present a mortal threat.

On average, 3,500 of the 44,000 fans in the stands have diabetes and must monitor sugar intake with care. If these 3,500 clapped hands they could form an unbroken line more than three miles to City Hall. And all of them south of Washington Avenue—2,500 men, women and children—could expect to die of cardiovascular disease.

Dr. Clyne’s research may help quell what the Centers for Disease Control and Prevention have labeled an epidemic. International Diabetes Federation data show that 285 million people worldwide had diabetes in 2009. Less than 25 years ago, the best data counted 30 million cases.

The American Diabetes Foundation estimates that diabetes costs every American $13300 annually—$174 billion in 2007 for medical bills, lost productivity and other expenses.

The rise in diabetes mirrors increasing consumption of sugar. A “lifestyle” disease, diabetes has long afflicted wealthy nations. But as globalization enables more people to adopt sugar-laden diets, diabetes rates have risen proportionately.

India and China, which rank first and second in world sugar consumption, each count roughly a billion people. It’s estimated that up to fifteen percent of them may be diabetic now or soon—three hundred million people, or nearly the population of the United States.
is it still uphill?

“My high school chemistry teacher really motivated me: she told me I wouldn’t amount to anything,” Ann Luciani announces with a wave of her hand. “I decided to prove her wrong.”

It’s hard to imagine this spirited self-starter—now an accomplished engineer and business owner—as anything but successful. After watching her husband toil away for more than a decade with little time for a personal life, Luciani meshed her talents with his to launch First Capital Engineering, Inc. Fourteen years later, First Capital serves clients in three states and has earned praise for excellent work, superb customer service and generous community involvement.

A study released in February by AAUW suggests that Luciani’s outstanding success in a technical field—no thanks to her chemistry teacher—is the exception rather than the rule. “Why So Few?” transcends the simplistic remarks often heard these days about women’s increased involvement in the Science, Technology, Engineering and Math (STEM) fields. Yes, there are more women than ever in typically male-dominated fields, but the problem persists: men outnumber them by a landslide.

Despite leaving high school with the same math and science courses under their belts, fewer women enter these fields in college. Fewer still pursue a STEM focused graduate degree and then dwindle in number in the various STEM professions. The report suggests the disparity, previously attributed to a fundamental biological difference in men and women’s makeup, is culturally based—and amenable to cultural solutions.

There are more women than ever in traditionally male-dominated fields, but men still outnumber them by a landslide. [●] While girls and boys take the same math and science courses and finish high school equally prepared, fewer women enter these fields in college.

[●] Even fewer pursue STEM in grad school, and fewer yet choose careers in the STEM professions. [●] Yet many Drexel women engineers have achieved considerable success.

Why?

by Christine Haas
Female postdoctoral applicants must publish at least three more papers in prestigious journals, or twenty more in lesser-known journals, to receive the same peer-review scores as men.

THIRTY YEARS AGO THERE WERE 13 boys for every girl who scored above 700 on the SAT math exam. Today the ratio is three to one. This immense increase is a flashing arrow pointing to nurture, not nature. While some may think our post-feminism world has minimized explicit bias and opened equal opportunity for men and women, the truth is that implicit bias still persists. People tend to assume that science and math are masculine fields and the arts and humanities are feminine.

Often we’re not aware of this inherent belief until it’s called to our attention, something Harvard’s implicit bias test (https://implicit.harvard.edu) accomplishes through a series of simple exercises. “Why So Few?” suggests that simply pointing out implicit bias helps us to interrupt the unconscious thought process that accompanies it. The report also recommends actively countering perceptions. For example, assuring girls that they can match boys’ math skills boosts their performance and reduces differences between their scores and boys’ to a negligible level. When girls realize their abilities are not hard-wired, they respond by showing more persistence.

RECENT DREXEL GRADUATE DR. KARA Spiller (CE/Beaver) stresses the importance of effort. “I don’t know how well expected I am in the field just yet, but I work hard—not only to get the job done, but also to earn respect.” Dr. Patricia Gallagher, Associate Professor of Civil Engineering at Drexel University, credits her broad interests and willingness to push her limits. “I did my job carefully and conscientiously, worked independently, met deadlines, wrote well, got along with people, and was willing to take on additional work and help co-workers. I was always interested in learning to do new types of projects, and I asked my supervisors to challenge me.” Across town Evelyn Cruz, Technology Teacher Leader at Roberto Clemente Middle School, confirms Dr. Gallagher’s emphasis on challenges. She urges all students to take an active role in technical activities.

“Usually, the girls take a back seat. The boys are always curious and jump right in. But it depends on how you frame it. We push everybody to get involved. This is not for boys, it’s not for girls, it’s for students.”

The report points out that girls tend to hold themselves to a higher standard than boys, believing they need to show exceptional ability before pursuing an area of interest. Compounding the pervasive message that they aren’t equipped for STEM, this expectation may deflect them to less-threatening pursuits. Early encouragement can motivate young women to pursue math, science and engineering in school, though it doesn’t address the issue of returning them once they’ve entered the field.

In 2005, WOMEN MADE UP 40% OF THE faculty in degree granting colleges and universities in the US, but only 12% of engineering faculty. Christine Wanner and Agnes Wold revealed in their 1997 Science article “Nepotism and sexism in peer-review” that female postdoctoral applicants have to be significantly more productive than male applicants to receive the same peer-review scores. They must publish at least three more papers in prestigious science journals, or 20 more in lesser-known journals, to be judged as productive as men.

A 2003 study by Frances Tix and Carolyn Pinka in Discourse & Society found that recommendation letters often cited women’s compassion, teaching and effort, as opposed to hardcore achievements and research accomplishments. These comments both reflect and promote the portrayal of women as teachers and students, and men as researchers and professionals. Unspoken, maybe even unconscious, biases such as these may help explain why women earned 80% of their male counterparts’ salaries in 2007.

All these factors contribute to women’s feelings of isolation in STEM disciplines. They often abandon their fields because of an unsupportive work environment, extreme work schedules and unclear rules for advancement and success. This appears less true in academia than in other fields, but dissatisfaction with departmental culture, advancement opportunities, research support and faculty leadership drive many women faculty to change careers.

JACQUELYNNE ECCLES, A LEADING researcher in the field of occupational choice, has spent three decades collecting data about career choices. Her work documents a difference in the value that men and women place on contributing to society.

Women tend to prefer work that fulfills a clear societal goal. Perhaps this is where STEM fields have failed to convey their higher purpose, feeding widespread misunderstanding of how they benefit society. This disconnect would help explain why biomedical and environmental engineering generally draw more women than areas such as mechanical or electrical engineering.

Karen Jehanion, President of KMI Consulting, Inc., suggests that educators can help rectify this situation.

“Universities and professional societies need to present the broad range of careers that can result from an engineering degree. There are many young women who excel in math and science but may find the traditional role of an engineer contrary to their liking. If they were able to see the alternatives, they might be more likely to enter the field.”

Cruz’s experience at Clemente is living proof that Jehanion’s suggestion is likely to work. When students say they don’t want to be engineers, she asks them why not. They respond, “Because I want to be a rapper.” Cruz counters with an account of her experience in Drexel’s music lab.

“I’ll describe how the students there were creating a keyboard that you play just by touching a screen. I show them pictures of myself in the lab, playing the touchscreen keyboard. I tell the kids, “See these people? They’re all engineers!” I bring them some of my real-world experience of what engineers actually do.”

“And then you know what I hear? They want to visit. They want to see the lab, play with the instruments, get involved. They understand that engineering can be fun.”

US DEPARTMENT OF LABOR WORKFORCE projections for 2018 show that nine of the ten fastest-growing careers requiring at least a bachelor’s degree demand significant scientific or mathematical training. This projection challenges women to “re-up” or get out—pun intended.
Because of the paucity of women leaders, it’s important that men and women participate in mentoring.

Fields like engineering yield outputs that are essential to our everyday lives. Women inform progress from a perspective that represents the wisdom and aspirations of half the human race. This alone justifies encouraging girls to pursue science and engineering, and taking measures to retain women in the fields as role models.

Conversations with Drexel women suggest that Luziani’s chemistry teacher’s snub belies the norm - most of them cite numerous positive influences. “I’ve had wonderful mentors and role models throughout my career,” observes Monica Akston, Corporate Director, Environment, Health and Safety at Eaton Corporation. “This group has been most inspiring. They provided me with different perspectives, different opinions, different sets of advice—but they were alike in their desire to help me fulfill my potential.”

Ivy Chin insists that mentors don’t need a technical background. After guiding retail innovator QVC’s hugely successful fuzzy into online sales, she now heads the e-commerce division at department store giant Belk, Inc. “My parents were a big influence on me. Not on the technical or business aspects, but they taught me to have a strong work ethic, honesty and integrity.”

NOR DO MENTORS HAVE TO BE women. Dr. Gallagher contends, “I think it’s important for women to learn how to navigate the system to pursue executive leadership opportunities. Because of the paucity of women leaders, it’s important that men and women participate in mentoring.”

Dr. Spiller encourages aspiring female engineering students to join support organizations. “It really helps to be friends with women in engineering. I recommend becoming involved with the Society for Women Engineers—that organization is full of powerful women who share your interests.”

For those wary of dipping their toes in the STEM pool, Chin recommends a flying leap off the diving board. “Dare to push your limits. Push the edge of your comfort zone. See what you might be able to do.” Jehanian echoes her sentiments: “Women need to recognize, embrace and leverage our many strengths. In doing so, some of the challenges will be diminished.”

Jehanian suggests getting creative. “For me, one way of meeting my own expectations and addressing my needs was to blaze a different trail. I chose to go out on my own rather than stay in the corporate environment. It allows me the opportunity, freedom, choice and privilege to work with other inspirational people who have a common goal and focus.”

Akston counsels, “Of course, it’s one thing to have the opportunity. You also have to live up to it. When you know what you’re doing, and when you’re a well-placed person, it’s easier to believe in yourself.”

“Remember, you’re not waiting for someone to tap you on the shoulder. You have to be proactive.”

To view the full interviews with these amazing Drexel women, please visit our website at www.drexel.edu/coe/wie.

Drexel University and the College of Engineering are taking significant steps to foster an environment that embraces female students, encourages women faculty to thrive, and creates a network of support. Joan McDonald, Senior Vice President for Enrollment Management at Drexel University, has been integral in this movement.

While Drexel mirrors the national statistic for women in science and engineering disciplines at 20%, females constituted the majority of Drexel’s overall enrollment beginning in the fall of 2008.

However, this is not surprising according to McDonald. “We see strong female leadership at the Dean’s level at Drexel in Biomedical Engineering, Nursing, Public Health and the College of Arts and Sciences. Add to this mix, a growing cadre of young female faculty in those disciplines and female leadership at the most senior level, and you’ve got an environment where young women know that barriers to advancement need not exist.”

Above: Evelyn Cruz’s robotics class introduces the fascination of science and engineering to bright fifth graders like Donovan Perez and Melissa Mejia.

Right: Potential engineers enjoy hands-on science in Dr. Alissa Marcus-Clyne’s Girl Scout Saturday sessions at CoE.

To encourage this environment, Drexel makes it more conducive for the work/life balance needed to have children. Dr. Spiller explains: “Research shows that women perform better when they work for women. So we need more women faculty, but the life of a junior faculty member and the whole tenure process is really not conducive to having a family. I think Drexel is among a few bold universities that are making progress in changing the way we grant tenure, so that you can raise a family at the same time. Hopefully this approach will result in more women entering academia.”

And the Drexel female faculty are actively recruiting the next generation to study and practice STEM fields. “Children often model their behavior based on adults they see around them. Since there aren’t a lot of women engineers in highly visible positions, there aren’t many women engineers to serve as role models for young girls. Drexel has a large number of women engineering faculty who do outreach in the community to help address this issue,” Dr. Gallagher observes. One such faculty member is Dr. Alissa Clyne, who holds monthly Girl Scout Saturdays in her lab. Dr. Clyne is profiled on page 20.

In addition, Drexel’s College of Engineering has many support groups specifically for women, including the Society of Women Engineers and Women in Computer Science. However, there are an equal number of groups for students that encourage mentoring regardless of gender. For example, the Peer Mentorship Program, started fall of 2008, has more than 20 upperclassmen mentors who provide academic and social guidance to freshmen entering Drexel.

Drexel’s College of Engineering summer programs are also a great source of outreach. Each summer CoE hosts over 200 high school students, college students and teachers, who engage in hands-on learning activities and research, which they bring back to their peers and classrooms. The programs have been a great source of outreach and have helped to build the network that Drexel is known for.
UNSAFE

The Philadelphia Inquirer reported last year that the Eagles had fired a stadium worker who used his Facebook page to vent about safety Brian Dawkins’ departure from the team. This April, British Prime Minister Gordon Brown sacked Stuart MacLennan, who was running for a Parliamentary seat, for profane tweets about voters. And a series of salacious emails helped force the early retirement of US congressman Mark Foley in 2006.

As stories like these zipped through the Web, pundits and bloggers alerted readers that they’d better play it safe from now on and upload those flames anonymously. Not so fast, warns CU’s Rachel Greenstadt. The Computer Science Assistant Professor has been taking a long look at a little-known technique that can reveal a writer’s identity on the basis of style alone.

Dr. Greenstadt heads the College’s Privacy, Security and Automation Laboratory, which studies the intersection of artificial intelligence, privacy and security and human-computer interaction. “Stylometry analyzes writing style,” she explains. “Word choice, syntax, punctuation and other attributes vary from one person to another. Shakespeare was still alive when Londoners began whispering that he’d stolen The Tempest of Love’s Labours Lost from Francis Bacon. Stylometry might shed light on that ancient quarrel, though it’s unlikely to end it. But other applications of stylometry pose serious implications for society, contends Dr. Greenstadt. “The police find a suicide note pinned to a corpse: did the victim write it, or is it a ruse to cover up a murder? The FBI intercepts an anonymous email threatening the President: is it just another crank, or does its style match up with previous warnings from a known terrorist cell?”

The technique is gaining respect in law enforcement. Tech journalist Colin Barras reports in the New Scientist that “Stylometry even helped to convict ‘Unabomber’ Theodore Kaczynski!” Stylometry’s increasing use as a forensic tool implies that it has earned acceptance, but the jury is still out. How reliable is it? Can we trust it beyond a reasonable doubt? Can an author dupe the system by affecting a different voice—or incriminate innocent people by mimicking their style?

These and other questions intrigued Dr. Greenstadt some years ago when she and a colleague wondered how author-recognition systems based on linguistic style would function if people tried to intentionally fool them. They never had a chance to follow through with the research.

BY JULIE FISHER AND MIKE NORRIS

STYLOMETRY’S USE AS A FORENSIC TOOL IMPLIES ACCEPTANCE, BUT THE JURY IS OUT.
Last year Michael Brennan, a student in Dr. Greenstadt’s graduate-level “Intro to Artificial Intelligence” course and currently a PhD candidate, expressed his own interest in linguistic analysis. Dr. Greenstadt welcomed the opportunity and the pair launched an unusually thorough study. Their 2009 paper “Practical Attacks Against Authorship Recognition Techniques” documents stylometry’s value and vulnerability.

The researchers found “clear validation of three prominent stylometric methods.” But strategies to outwit the software achieved significant success.

“We discovered that you can fool stylometric programs in several ways. One is to rework your style,” recounts Dr. Greenstadt. “We refer to it as the obliteration method. Another is to write in someone else’s style—an imitation attack. We found that either approach can reduce the software’s effectiveness to the level of guesswork. It’s not very difficult, and you don’t have to be a professional for an artist to pull it off.”

“People probably don’t think about the clues their writing exhibits,” adds Michael. “But there’s a wealth of information available just looking at plain text.”

For centuries, scholars have parsed stylistic details to determine the authenticity of paintings and musical works as well as text, but the technique found its first systematic description in the late 19th Century. Nevertheless, Michael recalls that “Our initial survey of the literature turned up very little precedential research.”

His work with Dr. Greenstadt helps to narrow that gap. Dr. Patrick Juola, a computer scientist and text analyst at Duquesne University, hailed it as “a great paper. When you read a paper and say ‘well now I know what I’m studying for the next five years,’ they did something right.”

With stylometric analyses admitted as evidence in a growing number of criminal trials, the paucity of careful study is cause for concern.

“Stylometry has been employed in non-adversarial contexts, but in forensic and security applications it’s an adversarial tool,” notes Dr. Greenstadt.

“Where no one has looked at how the system will behave in that setting, you see a big red flag. There’s got to be a way to attack it.”

No one will complain if stylometry can snare criminals or foil a terrorist plot. But spam and privacy theft show that communications technologies present opportunities for abuse.

“The effectiveness of stylometric systems has a big impact on the privacy of the Internet. Now you have to start asking yourself, ‘Is this piece of writing going to identify me? Should I post this or not?’

“I think it’s important to answer the question one way or another. From a forensics perspective, we need to know how well these systems work. For each of us as individuals, it’s a question of security: can you ever really write anonymously? How can you be sure your private writings stay private?”

Revealing cracks in stylometry’s credibility, the study raises a number of provocative questions. In his book Foundations and Trends in Information Retrieval, Duquesne’s Dr. Juola called stylometry a field with “great potential for further work.”

The Drexel researchers are now pursuing goals on both sides of the equation. “We want to discover how well current methods of authorship recognition perform when human adversaries try to circumvent them,” says Dr. Greenstadt, “and develop better recognition schemes.”

At the same time, they’re working to safeguard privacy: “We hope to build a tool that authors can use to avoid compromising their anonymity.”

“You have to start asking yourself, ‘Is this piece of writing going to identify me?’

How about you? How do you prevent others from determining your identity?”

Finger Tips

Studies underway in Dr. Greenstadt’s lab reflect concurrent trends in authorship recognition. As stylometry tools gain sophistication, methods to outwit them develop apace. The researchers offer a few suggestions for writers hoping to maintain privacy.

“Through observing the successes and failures of the attacks in this study,” reports Michael Brennan, “we’ve learned that the best things an author can do to protect his or her identity is to write short passages and pick a specific author to imitate. Outwitting an author gives you clear direction on how to adjust your writing style, and that makes it easier to disguise your output.”

“Research has also consistently shown that it’s far more difficult to attribute authorship to short documents as opposed to lengthy ones. The longer the document, the more writing style features are displayed and those can be extracted for analysis.

“But you have to recognize that there’s no guaranteed method for hiding your writing style. Where one stylometry technique fails, another may easily discover who wrote what.”
Civil, Architectural and Environmental Engineering

Dr. Ahmet Aktaş, with co-PI’s Drs. Patrick Gurian, Thomas Hewitt (CoAS), Franklin Moon and Franco Montalto, recently received NSF grant for "The Learning Bridge." Drexel leads a consortium including Purdue, Texas A&M and Northeastern Universities in the project to transform two major bridges into a living laboratory. Drexel’s share of the two-year project is $275,000.

Dr. Trish Gallagher appeared on and contributed to the "Living the Off Grid" episode of Mary Talks Money on the LiveWellRID network, which premiered January 14, 2010 at 11:30 am.

Dr. Charles Haas was selected to chair a National Research Council committee to conduct an "Evaluation of the Health and Safety Risk Analyses for the Planned Expansion of USAMRIID’s Biosafety Level 3 and 4 Laboratories at Fort Detrick, Maryland.

Drs. Franco Montalto (PI) and co-PI’s Drs. Michael Piascecki, Patrick Gurian and Mimi Sheller (CoAS) received a NSF RAPO Grant for “Supporting Haftan Infrastructure Reconstruction Decisions with Local Knowledge: A Case Study Focusing on Water and Sanitation in Lebanon.” The budget for the one-year project is $199,854.

Drs. Frank Moon (PI) and Emin Aktaş (co-PI) received a NIST grant to develop an ANDERS for bridges, which will use a combination of human-operated and robotic vehicles to automate bridge deck maintenance. Drexel’s share of the five-year project is $210,884.

Dr. Mira Olson and co-PI’s Drs. Alisa Morris Clyne (ME), Patrick Gurian, Peter Lelkes (BioMed), Dr. Wan Shih (BioMed) and Senior Investigators Wei-Heng Shih (MSE) and David Urias (Goodwin) received a NSF-NUE grant for “Integrative Approach to Environmentally Responsible Nanotechnology Education.” The budget for the two-year project is $200,000. With co-PI Dr. Caroline Schauer (MSE) and collaborators at Johns Hopkins University, Dr. Olson (PI) received a grant from NSF for “Investigation of Chemotaxis in Porous Media: Visualiztion Experiments and Modeling.” Drexel’s share of the two-year project is $255,000.

Dr. Michael Piascecki and Dr. Rick Hooper (Consortium of Universities for the Advancement of Hydrologic Science, Inc.) and Ilya Zastavskiy (San Diego Supercomputer Center) have received a NSF grant for “GeoInformatics: Development of Community-based Ontology and Standards for Hydrologic Data Discovery and Exchange.” Drexel’s share of the three-year project is $258,314.

Dr. Sabrina Spartari and the Eastern Regional Research Center led a life cycle study of winter barley ethanol which resulted in a reversal of the EPA’s proposed rule that would have banned winter barley ethanol’s certification as an “Advanced Biofuel.” (Dr. Spartari is profiled on page 35).

Dr. Joe Wartman received a NSF grant for "Topographic Effects in Strong Ground Motion—from Physical and Numerical Modeling to Design." The project is a collaborative effort with Virginia Tech, the University of Arkansas, Georgia Tech and the University of Puerto Rico. Drexel’s share of the three-year project is $265,000. If NSF also awarded $915,000 for Dr. Wartman’s three-year project “Seismically Induced Rock Slope Failures: Mechanisms and Prediction.”

Drs. Jin Wen (PI) and Patrick Gurian (co-PI) received a Philadelphia Housing Authority grant for “Framework of Assessing Building Energy Efficiency Strategies for Philadelphia Housing Authority.” The budget for the project is $411,925.

Dr. Aspasia Zerva received a NSF grant for “Spatial Variability Effects on the Seismic Response of RC Highway Bridges.” The budget for the three-year project is $250,260.

Chemical and Biological Engineering

Dr. Cameron Abrams received a NIH grant for "Chimeric Virucides Based on a Novel Theory of Viral Metastability." The budget for the four-year project is $13,452. Dr. Abrams published "Large-scale conformational sampling of proteins using temperature-accelerated molecular dynamics" in Proceedings of the National Academy of Sciences.

His article "Docking of insulin to a structurally equilibrated insulin receptor ectodomain" was the cover story in the May 1, 2010 issue of Proteins.

Dr. Jason Baxter was awarded a grant for "Acquisition of an Ultratrace Laser System for Terahertz Spectroscopy and Sub-Picosecond Measurements." The budget for the two-year project is $332,291.

Dr. Richard Cairncross received a Fulbright Lectureship Award to work at the University of El Salvador in March 2010, on the topic of "Sustainable Engineering—A Multidisciplinary Curriculum for Training the Engineers of the Future."

Dr. Kenneth Lau, with co-PI’s Drs. Alexander Friedman (MEM), Vadym Mochalin (MSE) and Giuseppe Palmeise (CBE), received a NSF MRI grant to acquire a state-of-the-art XPS surface analysis instrumentation system. The budget for the project is $1,125M.

Dr. Lau received a Sigma Gamma Corpor-ation grant for "Solventless Particle Encapsulation via Initiated Chemical Vapor Deposition.” The budget for the 18-month project is $70,000.

Dr. Giuseppe Palmeise and collaborators at Army Research Labs entered Drexel University into a license agreement with Daiex Chemical Company to commercialize a fatty acid monomer, repair resins/putty and fatty acid vinyl ester technologies.

Dr. Masoud Soroush received a NSF GOALI grant for "Design of Chemically Self-Regulated Acrylic Coatings Processes through Iterative Use of Chemical Quantum Calculations and Spectroscopic Methods.” The budget for the project is $1.1M.

Computer Science

Dr. David Breen was awarded US patent #7,542,036 for "Level Set Surface Editing Operators.” Dr. Breen presented and co-authored the paper "EnVision: Visualizing Water Quality from Geographically Distributed Wells" at the 11th IASTED International Conference on Computer Graphics and Imaging held in Innsbruck, Austria February 17-19.

Dr. Jeremy Johnson was elected president of ACM SIGSAM. Dr. Johnson organized a session on Software Synthesis as part of the MACIS 2009 conference, which was held jointly with the Asian Symposium on Computer Mathematics in Fukoku, Japan, December 14-17, 2009.

Dr. Frank Lee along with Dr. Paul Diefenbach (CoMAD) hosted a creative industries press tour April 24, 2010 to showcase Drexel’s innovative gaming program.

Drs. William Regli (PI) and Rachel Greenstadt (co-PI) received a NSF grant for, “US-Czech Network Centric Intelligent Systems: Drexel and Czech Technical University.” The budget for the three-year project is $149,814.

(Ad Greenstadt is profiled on page 24)

Dr. Dario Salvucci received an ONR grant for his project, “Metacognition as Multitasking.” The budget for the three-year project is $414,651.

Electrical and Computer Engineering

Drs. Kapil Dandekar (PI) and co-PIs Adam Fontechio, Youngmoo Kim, Timothy Kurzweg, Jeremy Johnson (CS) and an interdisciplinary team of senior investigators have received a NSF-MRI grant for “Development of Software Defined Communications Testbed for Radio and Optical Wireless Networking.” The budget is $898,500.

Dr. Bruce Eisenstein was awarded US Patent #7,564,402 for his project “Information Gathering Using Reflected Satellite Signals.”

The Drexel Engineer
Dr. Adam Fontecchio received a DoE STTR Phase 2 grant for “H-PDLC Turnable Filter for Hyperspectral Imaging.” Drexel’s share of the two-year project is $375,000. Dr. Andra B. O’Conor and Dr. Mary Jo Hinman, both of the Department of Chemistry, received a DoE grant for “Optically Tunable Dielectric Metamaterials Using Monolayer Nanoparticle Films.” The total award is $395,000.

Dr. Richard Knight will receive the ASM International Thermal Spray Society’s (TSS) President’s Award.

Dr. Yury Gogotsi received a US DoE grant for “The Influence of Electrolyte Structure and Electrode Morphology on the Performance of Ionic-Liquid-Based Super capacitors.” The project is estimated to cost $2.5 million.

Dr. Mary T. Kuzirian received a DoE grant for “Enhancing the Performance of Perovskites for Solar Cells.” The project is estimated to cost $2.5 million.

Dr. Charles T. Kittrell received a DoE grant for “Development of a New Technique for Measuring the Electrical Properties of Materials.” The project is estimated to cost $2.5 million.

Dr. Craig A. Layton received a DoE grant for “Materials for Energy Storage.” The project is estimated to cost $2.5 million.

Dr. Joseph M. Liberase received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. Christopher Li received a DoE grant for “Development of Novel Nanomaterials for Energy Storage.” The project is estimated to cost $2.5 million.

Dr. Steven A. Lippincott received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. Wayne D. Matus received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. William M. McMahon received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. John J. McNeill received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. Charles W. Mee received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. John M. McNeil received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. Jonathan Spanier received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. Alisa M. Clyne received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. David E. McDonald received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

Dr. John E. McMichael received a DoE grant for “Development of a New Class of Materials for Environmental Protection.” The project is estimated to cost $2.5 million.

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The active agent in alcoholic beverages, ethanol found favor with humans millennia ago. Its newfound potential as a fuel has inspired many a toast, but complaints abound that its current sourcing skews agricultural priorities and degrades the environment. “Biofuels blended with gasoline are one of the few alternatives that don’t force radical changes on consumers or auto manufacturers,” observes CoE assistant professor Sabrina Spatar. “But right now most of the ethanol produced in the United States comes from corn. Over the long term, it isn’t economically or environmentally feasible to rely on corn as a feedstock.”

Dr. Spatar’s comment would raise storms of protest from the hefty sector of agribusiness devoted to corn-based ethanol, but she’s used to controversy. She provided similarly candid advice to congressional staffers writing the American Clean Energy and Security Act of 2009, which remains contentious a year later.

Better known as the Waxman-Markey Act, the legislation and its attendant debate coincided with the release of an influential report co-authored by Dr. Spatar. The Gigaton Throttledown challenges industry, government and academia to cooperate in developing new energy technologies, each with the potential to cut annual greenhouse gas emissions by at least a billion metric tons by 2020.

“To make good policy decisions,” she contends, “it’s essential to observe and analyze the life cycle of fuels. You have to take a comprehensive view from planting the seed to fueling the car.”

Cellulosic solutions
Growing down Market Street outside her office, mid-afternoon traffic flanks the ubiquity of internal-combustion engines as Dr. Spatar reaches toward a bookshelf. She retrieves a nondescript stalk that could be any common weed. “That’s one of the beauties of switchgrass,” she smiles. “It occurs naturally throughout various parts of the United States. Farmers have been using it for years as an inexpensive crop for soil cover, game forage and other uses.”

A number of plants such as sorghum, Miscanthus (elephant grass) and winter barley have also shown promise as ethanol feedstock. “And farms in the Midwest produce millions of tons of corn stover [stalks and roots left after harvesting] and other crop residues.”

Such cellulosic sources make excellent ethanol feedstocks, superior in many ways to corn (see sidebar, page 29).

Currently though, corn dominates the US ethanol industry, yielding most of the nine billion gallons produced here in 2008. Only sugarcane, the main source of Brazil’s 6.5 billion gallons, comes close.

As the world’s largest producer of biofuels, the US stands to reap massive commercial rewards from their global adoption. The US Office of Policy Analysis predicts that within ten years, world consumption of biofuels will top 54 billion gallons. [1]
“But to make all that ethanol from corn would be a staggering undertaking,” warns Dr. Spatari. “It would require production of more than 627 billion gallons on a million acres of land, a challenge even on a global scale.”

Undocumented by Bay Area venture capitalist Sunil Paul, the Gigaton Throwdown cites studies by management consultant McKinsey & Company, Timothy Searchinger of Princeton University and others questioning the nation’s equity in corn-based ethanol production. McKinsey’s 2009 report Pathways to a Low Carbon Economy estimates that corn ethanol-related impacts contributed 7.4 gigatons of carbon dioxide to the environment in 2007 alone. Searchinger offers even less enthusiasm, declaring bluntly that “switching from gasoline to corn ethanol doubles greenhouse gas emissions for every mile driven.”

Dr. Spatari seeks a pragmatic compromise. “We need to find solutions that don’t require an overnight revolution in our household of land resources. “Some feedstocks, like switchgrass, could be harvested sustainably. We call them second-generation feedstocks. They offer much higher cost-benefit ratios than corn. And off-season crops like winter barley don’t interfere with food production if they’re grown on land that would be fallow in the winter. Crops like these can be part of the solution fairly quickly.”

Stadel plans to continue his work in sustainable engineering as he finishes his degree. “Our research has helped me realize the dramatic environmental impacts of some engineering activities.” Corn ethanol’s introduction as a partial alternative to petroleum-based gasoline won widespread applause, but concerns about its life-cycle cost may open the door to alternatives such as switchgrass.

“Winter crops could help us find energy independence.”

Stalks in trade

Occupying 86,462,000 acres in the United States and yielding nearly $50 billion in revenues, King Corn enjoys the favor of traditionally conservative farmers. But many have expressed cautious interest in switchgrass, whose profit potential and other benefits reward adoption.

We need solutions that don’t require an overnight revolution.

- Mature technology and familiar cultivation cycle, high comfort level
- Production infrastructure and markets are established and highly capitalized
- Wide variety of end products ensures highly consistent demand
- Grows with minimal demands on time, capital and pesticides
- Reductions water runoff, regenerates and conditions soil
- Long cultivation cycle—one planting can yield 10 years of harvests

Winter crops would have low land use demands, low carbon intensity and significant waste-remediation benefits.”

“Winter crops could help the United States find energy independence, greater security and cleaner air,” says Dr. Spatari, “and help support rural economies in states from North Carolina to New York.”

Recently—with Colt’s Mrs. Mitra Olson, Grace Husman and Richard Caimcroce, and Susan Kilham from Drexel’s department of Biology—Dr. Spatari has been investigating one of the most intriguing biofuel discoveries. “Algae-based fuels might one day be able to provide transportation fuels that have low land use demands, low carbon intensity and significant waste-remediation benefits.”

Geologists, activists and petro-execs disagree on what, but few dispute the what: petroleum reserves won’t last forever, and evidence is mounting that we’ve passed the peak of extraction. “The faster we learn what feedstocks merit investment, the sooner we ramp up production,” concludes Dr. Spatari, “the better our chances of minimizing the effects of climate change. I’m doing my best to move us in that direction by informing policy.”

Algae alternative

Algae produce oil as a byproduct of photosynthesis—up to 15 times as much as most crops in an equivalent land area. And some varieties appear to grow even better when fed carbon dioxide and organic material such as sewage. The dream feedstock? A form of Drexel professors is investigating its potential.

Seeking the sustainable

A few miles from Drexel’s campus—a drive that pumps five to eight pounds of greenhouse gases into the sky depending on the car and the traffic—student Alexander Stadel is generating feedstock for Dr. Spatari’s analysis. Pursuing a Drexel BS/MS in Architectural and Civil Engineering, Alexander works at the USDA’s Crop Conversion Science and Engineering Research Team’s facility in Wyndmoor.

“I do the data modeling,” he explains. “Her expertise in biofuel technology meshes perfectly with my interests, which include life cycle assessment.”

On a recent visit to Stadel’s research center, US Undersecretary of Agriculture Dr. Rajiv Shah singled out its efforts for praise and expressed the current administration’s optimism about advanced biofuels. Alexander shares Dr. Shah’s excitement. “Our life-cycle model of ethanol derived from winter barley is a primary analysis tool that will be used to guide a potential policy decision. “The carbon impact reduction potential of our work is really exciting—it may lead to a cleaner environment and greater fuel security for our country.”

Dr. Spatari seeks to guide decision-makers in energy and fuel-standards policy by giving them reliable systems-analysis tools. She and Stadel hope their efforts will usher in more sustainable technology and engineering practices.
Paul Baran '49 (HD) was featured in a story in the San Jose Mercury News. Mr. Baran launched Plaster Networks, a firm making adapters and software to carry digital signals on a building's electrical wiring. He also started GoBackTV, a company developing video streaming for television.

William E. Barton, Jr. '84 was named Operations Manager of Turner Construction Company’s Philadelphia operations. Mr. Barton has managed projects including the US Airways Group international terminal at Philadelphia International Airport.

Gerald W. Bricker '70 and his firm, Advising Consulting, LLC., became certified by Resource Associates Corporation of Wyominging, PA, in their international network of K-12 and Executive Development Affiliates.

Paul G. Casner '63 was named Chairman of the Board for Mikros Systems Corporation. Mr. Casner is Chief Executive Officer and President of Integral Systems and former Chief Operating Officer of DRi Technologies.

Hung Phu Chau '80 was profiled in an article, “CHEs & EmEs make their mark in industries from energy to agricons,” in Diversity/Careers in Engineering & Information magazine. Mr. Chau is a chemical services manager at Philadelphia Gas Works and oversees the company’s safety and emergency response functions.

Suzanne G. Chiavar, PE '85 ’93, Vice President of Engineering at New Jersey American Water, joined the Board of Directors of the New Jersey Alliance for Action. The consortium of business, labor, government and non-profit leaders is dedicated to creating jobs, improving the economy and protecting the environment of the region.

Ron Connolly '91 was named Senior Vice President of Business Development at Frontage, a pharmaceutical research and development services company with offices in the U.S. and China. Mr. Connolly will be responsible for sales, marketing and strategic business initiatives.

Kerinia Cusick '85 was named Director of Government Affairs, Mid-Atlantic at SunEdison. Ms. Cusick leads the effort to create solar-friendly policies throughout SunEdison’s Mid-Atlantic region.

Mark S. Dichter, Esq. ’66 joined the Board of Philadelphia Live Arts & Philly Fringe. Mr. Dichter is Chairman of the Labor and Employment Law Practice at the law firm of Morgan Lewis.

Capt. Christopher Ferguson '94 (HD) was honored by the Philadelphia City Council for his career accomplishments. Assigned to the Johnson Space Center in Houston, he piloted NASA’s space shuttle Atlantis and was Commander of the shuttle Endeavour.

Edward R. Garry, Jr., PhD '83 ’85 ’89 established the ACR Scientific Learning Center for Science and Math in Lancaster, PA. The Learning Center caters to educational needs, including tutoring, identification and correction of weaknesses, complete courses and weekend or summer science camps to develop interests in science. Dr. Garry is founder and President of ACR Scientific Corporation, also based in Lancaster.

Michael P. Giessmann, MBA '87 ’92 was appointed to the Board of MANNA, a Philadelphia nonprofit group devoted to bringing nutrition and other services to individuals and families living with life-threatening illnesses. Mr. Giessmann is Director of Financial Planning and Business Analysis at PECO Energy in Philadelphia.

Michelle Goddard '08, a mechanical engineer at the US Army Edgewood Chemical Biological Center, was named by the Career Communications Group and Women of Color magazine as a “Technology Rising Star.” The award honors young minority women who have demonstrated extraordinary achievement in the technology arena and in their communities.

Simon A. Hauger '93 ’04 was featured in the Philadelphia Daily News for leading a group of West Philadelphia High School students to twice win the national tour de Sol contest in which they develop alternative-School vehicles. Mr. Hauger’s team also competes in the $10 million Progressive Insurance Automotive X PRIZE competition. Follow them at www.evteam.org.

W. Nicholas Howeley III ’75 has joined Case Western Reserve University’s board as a newly appointed Trustee. Mr. Howeley is Chairman and Chief Executive Officer of TransDigm Group Inc and TransDigm Holdings of Cleveland, OH.

Vincent Kelley ’82 ’86 assumed the role of Senior Vice President of Engineering and Technology at Sunoco in Philadelphia. Mr. Kelley will also head the company’s efforts to idle the Eagle Point refinery.

Stephen Koppler ’82 was named the Interim Executive Director of the Commercial Vehicle Safety Alliance (CVSA). He was previously the CVSA’s Director of Policy and Programs.

Sgt. 1st Class Jason Kurtz ’96 returned to the US after a deployment to Iraq or Afghanistan in support of Operations Iraqi Freedom or Enduring Freedom. Sgt. 1st Class Kurtz, who serves in the Army National Guard, is a signal support systems specialist with the 628th Aviation Support Battalion, based in Annville, PA. He has served in the military for 20 years. Sgt. 1st Class Kurtz is also an engineer with Tyco Electronics in Lancaster, PA.

Michael L. Marucci ’01 ’06 was appointed Director of Research and Development for the Hoeganaes Corporation, a world leader in the production of ferrous powders based in Cinnaminson, New Jersey. Mr. Marucci previously was Global Manager of Quality Assurances or Hoeganaes.

Michael Nicolaides ’03 was appointed as the Electrical Inspector of the Borough of Trainer, PA. Mr. Nicolaides is a certified UCC inspector and owner of Nicolaides Electrical, LLC in Newport Square, PA.

Ronald J. Patterson, Esq. ’83 was appointed to the Board of Trustees of West Catholic High School in Philadelphia. Mr. Patterson is a Partner in the Real Estate Department at Klehr, Harrison, Harvey, Brantz & Ellers.

Jianhong-Jennifer Ren, PhD ’98 received a Distinguished Research Award from the Javelina Alumni Association of Texas A&M University at Kingsville. This award recognizes faculty for outstanding achievement in research. Dr. Ren, an Associate Professor of Environmental Engineering, has been with Texas A&M-Kingsville since September 2003.

Edward C. Ross, PhD ’64 was elected Chairman of the Board of Directors at California Micro Devices. Dr. Ross has served on the CMD Board since 2002, where he was a member of the compensation and nominating committees. Dr. Ross is retired President of Taiwan Semiconductor Manufacturing Company North America.

Theodore Scabrozo, PhD ’99 joined Y-Cellon, Inc. as a Corporate Post-doctoral Researcher under the Corporate Research Postdoctoral Fellowship Program of the NSF and ASIE.

John M. Seiner, PhD ’87 became the new Director of the James L. Whitten National Center for Physical Acoustics at the University of Mississippi.

William H. Singer, PhD ’82 was recognized by Cambridge Who’s Who for demonstrating dedication, leadership and excellence in studying the biophysics, chemistry, and optical properties of the Senior Research Scientist and Chief Executive Officer of Singer Consulting, Inc. Dr. Singer is responsible for developing artificial intelligence applications and inspection systems.

James Tusar ’89 wrote an article, “Next Generation Core Designs,” that was published in the Nuclear Plant Journal. Mr. Tusar is a Manager at Boiling Water Reactor Design for Exelon Nuclear with responsibility for nuclear fuel design, reactor core design, core management, core monitoring systems and reload coordination.

Jeffrey Wilcox ’88, Vice President of Engineering for Lockheed Martin Engineering Enterprises, presented the keynote address, “Achieving Strategic Balance: Integrating Global Security Solutions in the New Operational Landscape,” at April’s PCP APEX EXPO in Las Vegas. Mr. Wilcox is responsible for developing and executing the strategy for the Lockheed Martin Engineering Enterprise and its 71,000 engineers and scientists. He was commencement speaker at Stevens Institute of Technology on May 27, 2010.

Michael Witkowski, PE, LEED, AP ’99 ’08, Project Manager and Associate at McHugh Engineering, was named Young Engineer of the Year by the Engineers’ Club of Philadelphia. He has served on Drexel University’s College of Engineering Alumni Association since 2001 and two years ago was elected as a voting member of Drexel University’s Alumni Board of Governors.

William Allan Wood ’28 has been declared Drexel Engineering’s oldest living alumnus at 105 years old.

Paul Yeomans ’68 was hired by McCarthy Building Companies, Inc., as Director of Hospitality and Gambling. Mr. Yeomans will work with the hospitality/gaming/entertainment industry to expand and create new business opportunities for McCarthy’s Nevada Division. Mr. Zawacki is CEO of Xcelerex Inc, a biotechnology company based in Massachusetts.

Adam Ziedonis ‘04 was selected as the new Resident Inspector at the Peach Bottom Atomic Power Station in Delta, PA. Most recently, he was a Reactor Inspector in the Region 1 Division of Reactor Safety, performing engineering inspections.
2010 Engineer of the Year Charles M. Vest has urged the profession to take on what he calls the most daunting challenges facing humanity. He cited housing and feeding our species while husbanding our limited resources, rebuilding the infrastructure that supports our complex societies, preserving individual security in the face of threats from disease and natural disasters, applying the fruits of technology wisely and fairly, and not least, finding ways to prevent our own self-destruction. The College of Engineering invited Drexel students, faculty and staff to create images that represent some of these challenges. The photographs displayed here were submitted by first, second and third place winners respectively: 2 and 5. Dan Colaraj ’12 (ECE), 3 and 4. Keyur Jain ’13 (MEM), 1 and 6. Koan Nazak ’14 (MEM).
Fulbright caps a busy CoE career for Karen Miller

By Elizabeth Brachelli

Karen Miller (CASEE ’11) traveled to Jamaica last year with Drexel’s chapter of Engineers Without Borders to plan repairs to damaged infrastructure. This year, she served as a Fulbright Scholar and designed a model for sustainable tourism in the country. As a graduate student in Drexel College of Engineering’s Technology and Policy program, she has also addressed projects for groups that don’t know where to begin the search.

Engineers Without Borders gave Karen a wider arena for her societal aspirations. Last summer she traveled to Middleton, Jamaica to assess high-traffic footbridges that were destroyed by Hurricane Gustav in 2008. “The bridges were part of the one path between two towns. It’s the main highway for children to reach school. We met with the community to get their insight on the project,” gaining local knowledge to inform her senior design team’s plans to repair and improve the bridges.

This year brought word that Karen has been accepted as a Fulbright scholar. Starting in Fall 2010, she’ll help homeowners restore damaged houses while she conducts research in Istanbul’s historic Suleymaniye district. At the same time she’ll study at Mimar Sinan University of Fine Arts toward her goal of a career in historical preservation.

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Named after the highest honor our College bestows on alumni, Circling Back is a new section to our magazine and we need your help to populate it! Each issue, we’ll relay a theme and ask that you send in a response. To start us off, our 2010 Circle of Distinction awardees share their favorite memories of their days at Drexel. Do you have memories you’d like to share with the CoE community? Visit www.drexel.edu/coe/circlingback or email ebrachelli@coe.drexel.edu to contribute to Circling Back!

William Wood ’28
A graduate of the Class of 1928 and 105 years young, Bill Wood is Drexel’s oldest living alumnus and a venerable part of our collective history. When Woody attended Drexel, college graduates accounted for less than 1% of the nation’s population, compared to 20% today. Woody watched the first student dormitories and an athletic field grace the campus, a dean’s office open to oversee student life, and the first Dragons join an alumni relations program.

Spanning more than eight decades, Bill Wood’s engineering career demonstrates the rewards of this exciting profession.

Lou Bucelli ’83
Lou fondly recalls professors such as Dr. Thomas Hindelang, but he insists that his fondest Drexel memories are still being created.

Lou takes great satisfaction in sharing his career and life experiences as a mentor to students, young faculty and alumni. And he’s proud to declare that he has learned much from them as well. Asked for the most prized lesson, he cites the Engineering Behind a Respectable Golf Game, one he’s still working to master with help from many volunteers.

Lou’s countless friends gratefully rely on him for the purchase of Mulligans at any Drexel golf outing.

Ken Dabundo ’81 85
Ken’s fondest Drexel memories center on people. Sharing the same co-op cycle, his Materials Engineering class of slightly more than 20 students enjoyed five years as a family.

Dr. Alan Lawley’s sense of humor and Judy Trachtman’s warm smile particularly stand out for Ken. Ken remembers returning to school from his first co-op at Caterpillar Tractor. He sensed that a bright light had been turned on, building the bridge between what he learned in the classroom and its day-to-day application in industry. It was an invaluable part of his education.

Chuck Gershman ’86
Drexel and Philadelphia are tightly intertwined in Chuck’s memory. He remembers freshman dorm life; watching Fourth of July fireworks from the floating docks of the Drexel boathouse; Live Aid; the MOVIE fire; fried rice from the lunch trucks; shoes sticking to the floor at the Jail House; Geno’s or Pat’s at three in the morning; lighting a fiber optic link in his first co-op at IBM; Drexel versus Louisville during March Madness; going one on one with Michael Anderson; the first Apple Macintosh… and graduation.

Doug Sharp ’82
Doug’s standout Drexel memory is playing pinocchio with fellow students Joe Peiro and Bob Konowitz (and a fourth when they could find one)… often just before tests and exams. Strange as that may seem, the challenges of acquiring a degree in Chemical Engineering at Drexel made pinocchio an appropriate way to reduce stress and clear the mind. Figuring that if they didn’t know the material by then, Doug and his classmates reasoned that last minute studying wasn’t going to help. This philosophy served him well throughout his career.

Ed Sullivan ’90
As sophomores, Ed and his wife were supposed to be studying for mid-terms. With forecasters predicting a massive snowstorm, the couple thought why study—classes will surely be cancelled. Much to their chagrin, they awoke the next day with not a flake to be found.

A lecture by Dr. Bruce Eisenstein introduced entrepreneurship as an alternate path in applying a Drexel education. Ed took the advice to heart, following that path after graduation. Success tempted him to invest in a pro football team. But Ed felt that would be unfair to Drexel, as our team has remained undefeated since 1972. :)

Help ensure a bright future for engineering students

Grants, scholarships and other financial aid enable our students to manage the cost of a great education. In 2010, nearly 360 students were able to enjoy a Drexel education thanks to the generosity of alumni who believe in staying involved and giving back.

And scholarships are not the only way to support the College of Engineering. Opportunities to fund student programs such as senior design, graduate fellowships, laboratory and classroom renovation are just a few areas critical in maintaining a dynamic campus environment.

There are many ways in which to make a charitable contribution; outright gift of cash, donation of stock or property; even including the College of Engineering in your estate plans.

Your gifts can give you the satisfaction of playing an active role in Drexel’s future, while providing a number of financial benefits. Find out more by contacting Lynda Koloskij at 215-895-6267 or visit http://www.drexel.edu/coa/aboutgifts/