MEET THE BUSIEST GUY ON GROUNDS
WeLcOme FROm the DeaN

The conclusion of the spring semester means summer vacation is starting for many of our students at the School of Engineering and Applied Science. It’s the perfect time, then, in this next issue of Unbound, to take a closer look at our esteemed faculty, many of whom spend countless hours outside the classroom advancing various fields of engineering.

I’m very proud of the team we’ve put together across the nine departments of the Engineering School. The dynamic and diverse members of our faculty are not only shaping the minds of future engineers, but they are also conducting groundbreaking research, collaborating with leaders in industry and business, and improving society at large with new innovations.

As a highly ranked engineering school, we pride ourselves on offering students a broad educational experience. Learning here involves not just being taught what is already known. As you’ll read in our feature on the brand-new Lacy Hall (page 4), experiential learning is increasingly becoming a bigger part of our curriculum. With hands-on interaction that accompanies classroom education, our students are immediately working towards great innovations that have yet to be realized.

We thank you for your continued support. Please stay in touch with us.

JAMES H. AYLOR
Louis T. Rader Professor of Electrical Engineering
Dean of the School of Engineering and Applied Science
Busiest Guy on Grounds

Associate Professor of Mechanical and Aerospace Engineering Edward Berger rarely has a free moment. As SEAS associate dean for undergraduate programs, he juggles teaching with constant meetings, counseling students, conference calls with colleagues across the country and several research projects. Follow a typical week with the busiest guy on Grounds.

Hands On

With the opening of the brand-new Lacy Hall, engineering students will have increased access to experiential learning.

Spell Relief

With Auvi-Q, SEAS grad Evan Edwards has developed a lifesaving epinephrine auto-injector for those who suffer from serious allergies.

Fab 5

Meet five faculty members shaping the educational experience of the Engineering School.

Generations of Mentoring

The tradition of mentoring has long been a staple of life at the Engineering School. The relationship between Dean James Aylor and Senior Associate Dean Barry Johnson is a perfect example.
With the Upcoming Opening of Lacy Hall, Engineering Students Will Have Increased Access to Experiential Learning
No matter how many words you use or how much you try to express technology, you can't understand it until you experience it.

How do you explain the concept of “hot” to a child? How can a medical student understand suturing a wound without actually doing it? How can a mechanic determine the exact amount of torque needed to mount a wheel on a car with an air gun? Too much and the wheel is impossible to remove, too little and the wheel might fly off when it hits a pothole.

“No matter how many words you use or how much you try to express technology, you can’t understand it until you experience it,” says George Cahen, professor of materials science and engineering and director of experiential learning. He sees these examples as illustrations of the importance of experiential learning to students in the School of Engineering and Applied Science.

According to Cahen, many students have only theoretical knowledge of the design process when they first arrive at school. “Until you go through it, it’s just words in a book,” he says. “Many students have no idea of the failures that may occur. It surprises them.”

By actually experiencing the design process, students grasp the steps and nuances involved, but also gain a sense of the variables that affect design. “Real design and prototyping is necessary for engineers to understand the design process,” Cahen says. “You can’t predict your way through it.” These real-world exercises expose students to variables such as time and temperature that often arise.

Once students have developed a prototype, they are often in for another surprise. “People use things in different ways than we imagine. Design should accommodate this,” Cahen says.

Experiential learning takes place all across the Engineering School. But thanks to a gift from Linwood A. “Chip” Lacy Jr. (ChE ’67, Darden ’69), a new building specifically designed to facilitate and centralize experiential learning will soon welcome its first students.

Lacy Hall, a 20,000-square-foot, four-story building, will feature the Ann Warrick Lacy Experiential Learning Center, a space named after Lacy’s mother that occupies the top two floors of the building.

“Right now a number of experiential learning projects exist in spread-out locations; there’s no synergy,” Cahen says. He points to teams that are working on three car projects—solar, electric and Mini Baja. “They can now help each other, which will in turn help them be more efficient,” he says.

In addition to learning from each other, teams will have access to modern machinery, including expanded rapid prototyping capability. These machines allow students to download their designs from a CAD program, rather than having to construct a prototype themselves. Technicians are available to assist student teams.

Faculty benefit from Lacy Hall’s location too. “It provides faculty with more opportunities to work with students,” Cahen says. They no longer have to go out to Milton Airport, for example, to supervise projects.

Lacy Hall will enhance the quality of education for engineering students. But how will it affect their future and their careers?

For one, the facility will help student teams prepare for international student competitions, which in turn will help them prepare for global careers. “The beauty of these competitions is meeting the other students and faculty and seeing how they do things,” Cahen says. “When they see someone else do something better, they want to do it better.”

Experiential learning also provides students with a valuable skill. “They leave with the experience of making something. They go from making poor-quality initial prototypes to more professional designs,” Cahen says.

This progress is a result of yet another benefit of experiential learning — teamwork. “Progress comes from first-years working with fourth-years and teams working together. They make remarkable advancements.”
The life-threatening allergies that twin brothers Evan (MAE ’02, SIE ’04) and Eric Edwards grew up with inspired creation of a device that promises to transform allergic reaction treatment.

The product they envisioned and designed as undergraduate students led the brothers to form Intellijeect, a specialty pharmaceutical company headquartered in Richmond, Va. Sanofi, one of the largest pharmaceutical companies in the world, recently launched Intellijeect’s epinephrine auto-injector called Auvi-Q (Allerject in Canada).

Auvi-Q is the first and only such device with audio voice prompts and visual cues that guide users through the injection process. The product was designed to be compact and easy to use.

The original idea arose from a pre-college trip to Europe for Evan and Eric. Due to food allergies, they were supposed to have epinephrine handy at all times. “Eating our way through Europe was going to be a challenge and we thought we had forgotten our auto-injector device,” Evan says.

So, aiming to develop a different type of epinephrine delivery device, Evan headed to the Engineering School, while brother Eric headed to Virginia Commonwealth University with plans for medical school.

For Evan, a critical course was Invention and Design, taught by Michael Gorman and Larry Richards. The NSF-funded course featured multidisciplinary teams of students from across SEAS and the College of Arts & Sciences. “In that class I found the mechanism and catalyst to turn our idea into a product and a company,” Evan says.

When he approached his professors with what was then a prototype called Epicard, they saw its value and potential. “We told him he was so far along in his thinking, it would be a mistake to share his idea with the class,” Richards says.

Outside of class, the Edwards brothers pursued their auto-injector device. Evan formed an E-team through the National Collegiate Inventors and Innovators Alliance, which promotes entrepreneurship among engineering students. The team received a $14,000 grant to develop a prototype, which was displayed at the 2000 NCIIA March Madness of the Mind.

After earning his bachelor’s degree in mechanical engineering in 2002, Evan began work at U.Va. on his master’s in systems engineering with Gorman as his adviser. His thesis addressed requirements for a biomedical startup company utilizing human factors engineering.

Evan credits Gorman, Richards and others in the Engineering School for their help and guidance in the early years. “What I respect about Professors Gorman and Richards is that they encourage students to come up with their own ideas and let creativity thrive,” Evan says.

Evan regularly returns to the Engineering School to speak and teach. “I’m passionate about sharing my story and knowledge with students,” he says. “That was me not too long ago. I tell them there’s no better time to be an entrepreneur than coming out of college. If you fail, you will have had a great experience and learned a ton during the process.” Richards says that for his students, Evan’s visits are among the highlights of the course.

In recognition of his professional success and University support, Evan received the Engineering School’s Outstanding Young Engineering Graduate Award in 2009.

Looking ahead, Intellijeect is developing a pipeline of drug/device combination products, as always from the viewpoint of patients and their needs. “Exciting things will happen in the next few years for our company,” Evan says.

Larry Richards will be tracking the progress of both Intellijeect and Evan. “It’s wonderful to watch one of your students come so far,” Richards says.
BUSIEST GUY ON GROUNDS

Is an engineering professor’s job done when class ends? Not even close.

Glimpse a Week in the Life of a Faculty Member: Ed Berger

Associate Professor of Mechanical and Aerospace Engineering Edward Berger serves as the associate dean for undergraduate programs in the Engineering School. For Berger, a week can be unpredictable, fulfilling, collaborative, supportive, hectic and enlightening. A typical week may find him meeting with SEAS and University colleagues, speaking one-on-one with students, teaching in the classroom, participating in conference calls with colleagues across the country, crunching data or fine-tuning a proposal or research paper.

Berger hardly has a free minute. In the course of a week, he will meet with 15-20 students, attend nine committee meetings, and participate in three conference calls. Each of these seemingly disparate activities support Berger’s ultimate goal: serving engineering students at U.Va. and across the country.

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A week in the life of Ed Berger

8:15-10 a.m.: Dean’s Office Team Meeting
“The other associate deans and I meet with Dean Aylor to discuss what’s going on in the School. It’s an information exchange where each of us talks about what’s happening in our area.”

11:40 a.m.-12 noon: Student Meeting
A student with a medical issue meets with Berger to discuss withdrawing from school. “We get a lot of walk-in business. I met with six students this week who didn’t have an appointment, but each of them did have a problem.” In a typical week, Berger will have eight to 10 scheduled appointments with students too.

12-1:30 p.m.: Undergraduate Office Staff Meeting
“We deal with student personal issues. Often mental health issues, such as anxiety and depression can manifest themselves as academic problems. We reach out to other instructors for students we are concerned about and determine how we can help them. This staff meeting is all about sharing information so that the entire staff is up to date on each student’s situation.”
“That’s one of our core functions, helping students through problems — we have 10-15 students at any given time who we are actively helping. We often tap the University support system, including Student Health and the Dean of Students Office, to help our students.”

5-6 p.m.: Teach Fundamentals of Engineering Review Course
Students preparing to take the Fundamentals of Engineering exam in April have organized review sessions on specific topics. Berger teaches the statics review tonight, and will teach dynamics Thursday.

MONDAY

TUESDAY

12:30-2 p.m.: Conference Call
Berger and 10 colleagues from across the country are working on a project sponsored by the National Science Foundation and the American Society for Engineering Education to develop a mechanical engineering “community of practice” for faculty. “I’m one of the leaders of the effort, and I’m currently organizing a community of practice for mechanical engineering faculty who want to be better teachers. Right now we have about 25 faculty from across the country signed up. The broader effort includes leaders in other disciplines and over 100 faculty in all. We’re disseminating best teaching practices through this (virtual) community of practice.”
Berger also is collaborating with researchers at University of Illinois, University of Akron and University of Wisconsin on a large research proposal to a consortium of aircraft engine manufacturers. The research involves both experiments and modeling to predict the role of friction damping in the performance and durability of aircraft engine airfoils. The proposal seeks about $1.5 million to be split across the collaborating institutions. The proposal is due Friday.
12-1 p.m.: Graduation Planning Meeting

“All departments across SEAS meet every other week during the spring semester to make sure our graduation ceremony is well planned and well executed.”

With few scheduled meetings on this day, Berger can focus on a research paper. “I’m writing it with Reid Bailey, assistant professor of systems and information engineering, who does a study abroad class in Argentina. The paper will compare Reid’s class with the study abroad course I teach in Panama. We’ve found we achieve similar outcomes using some similar and some quite different approaches. We’ll present the paper at a conference in Atlanta in June.”

Reflecting on the Panama Canal class, Berger says the best part is the class discussion. “We talk about history and engage in serious debate about the labor migration to Panama for the Canal construction, as well as the outright racist policies implemented by both the French and the Americans during its construction,” he says.

Understanding the social norms of the period is key. “In a class of a dozen people, there are many perspectives, and students draw on their own experiences and understanding of what it means to be moral and ethical.”

1-2 p.m.: Conference Call

As the technical program co-chair for the 2013 American Society of Mechanical Engineers annual International Design Engineering Technical Conference in Portland in August, he works with several colleagues from across the country and around the world in planning the program, which consists of over 1,000 technical papers.

8:30-10 a.m.: University Undergraduate Electronic Forms Committee

“I want to transform how our office runs. I’m trying to help make us a fully electronic and data-driven office.” To that end, Berger meets with either colleagues from across Grounds to help move the school and University toward electronic processes, or with the Student Information System advisory board examining ways to improve the student records system.

5-6 p.m.: Teaching

Fundamentals of Engineering Review Course

11-12:30 p.m.: Background Research for a Proposal

After this meeting, Berger turns his attention to a research proposal. “This one will be submitted to the National Science Foundation in May. The project examines student success and failure. If students come to us with good grades, strong SATs, and high class rank in high school, why do some fail here? We’ll look at grades and study habits, and try to discern a student’s fundamental mindset about their studies. I suspect that success in university engineering programs isn’t about intellectual ability; my hypothesis is that success in our environment is largely about ‘grit,’ or perseverance. Those who have it can bounce back from failure and other setbacks. There is an emerging body of research that no one has yet applied to the engineering school population.”

8:30-10 a.m.: SEAS Deans and Chairs Meeting

Every other week, the deans and department chairs in the Engineering School meet to discuss ongoing issues, including matters of policy and decisions related to the mission of the School.

2:30-3 p.m.: University Undergraduate Policy Committee Meeting

“If an issue in the undergrad world needs SEAS representation, I do it.” This committee meets once each month to review and suggest changes to the University’s undergraduate policies. The overarching goal is twofold: (1) make sure that policies are up to date (for instance, in the Undergraduate Record), and (2) to the extent possible, unify policies across schools. For example, right now the group is considering ways to unify the language and criteria for academic probation and suspension.

11 p.m.: Submit Proposal to Aircraft Engine Consortium

The proposal is due at midnight, all of the information from Berger’s collaborators has finally arrived earlier in the day, and the University’s Sponsored Programs Office has signed off on it. Berger finally presses “send” at 10:59 p.m.

11-12:30 p.m.: Submit Proposal to Aircraft Engine Consortium
If you are Patrick Hopkins, you don’t land your dream job at the tender academic age of 30, back at the place where you spent eight years of your life as an undergrad and graduate student, by wasting energy. You do it by studying what could happen if we all wasted less of it.

“When you look at the amount of energy wasted in the U.S., it is just astounding,” he said. “Actually, for every unit of energy that we use, over 50 percent is wasted.” Hopkins is particularly focused on the main reason why that energy dissipates — heat. Green lighting and LEDs succeed because they don’t waste energy as heat, he explains. But Hopkins’ current research, which recently earned him awards from the U.S. Air Force and Navy, seeks to take this a step further by exploring how to recover that heat and turn it into usable energy through nanoscale and interface material engineering.

Hopkins, an assistant professor in the Department of Mechanical and Aerospace Engineering, attributes much of his success to the environment in which he first studied, and now works. “It is very easy to be inspired here, and that was a big part of my motivation in coming back.” Early inspiration came from his graduate adviser, Pam Norris, the current SEAS Associate Dean for Research and Graduate Programs, who first guided him towards a career in engineering energy in nanosystems.

Today this U.Va. alum and former Rodman Scholar (who also earned a Harrison Undergraduate Research Award, Double Hoo Research Award, and National Science Foundation Graduate Fellowship during his outstanding academic career as a student), is delighted to be able to play the role of mentor.

“To be able to guide a young mind that wants something is a wonderful thing. There are so many opportunities here. I am so glad to be able to be here and not only teach, but also help students achieve their dreams.”
Assistant Professor Lisa Colosi is on a series of tight deadlines. She’s doing everything she can to make sure she meets all of them — compiling spreadsheets, scheduling meetings, coordinating with other professionals.

It takes a lot to run a research group, teach a new laboratory class in the Department of Civil and Environmental Engineering, go up for tenure, and plan a wedding all in the same semester.

“I think it’s pretty helpful to be an engineer if you’re trying to plan a wedding,” Colosi quipped.

Colosi’s PhD research at the University of Michigan focused on removing “emerging” contaminants from the water supply. (Emerging should be in quotes, she said, because they have been emerging for 20 years.) When she came to U.Va., she continued her work in this vein. More recently, she’s worked on tackling the bioenergy problem with her CEE colleague Andres Clarens, who is also an assistant professor in the department.

It’s at the intersection of contaminant removal and bioenergy that Colosi believes she may have found something truly special.

“There is a lot of latent energy in wastewater and a variety of approaches to capturing it,” she said. “I’m trying to make a case for integrating wastewater treatment and algae cultivation. If you combine the two systems, you can get not only energy but better water quality,” Colosi and her students have several different sets of experiments ongoing in their laboratory in Thornton Hall. They expect to deliver several exciting research publications this summer.

In her orderly office, Colosi gives the impression of a person with a lot less on her schedule than she has. She laughs a lot. She smiles a lot. It’s no wonder her students have selected her for multiple teaching awards. She has also been recognized for excellence in instruction by the American Society of Civil Engineers and won UVa’s Fund for Excellence in Science and Technology (FEST) Award, sponsored by the Office of the Vice President for Research. That’s what reassures her she is on the right track with her research.

“Having the FEST designation is empowering because it feels like the University community values the work you do,” she said.

Colosi’s research will also likely be the deciding factor in her tenure review. But whatever the outcome of the review, she is confident in her ability to help make the world a better place through environmental engineering.

“There is a lot of really cool sustainability stuff going in both industry and academics,” Colosi said. “It’s very powerful to see people that care about the environment and want to make it compatible with doing business.”
What does creating a trophy have to do with engineering? Everything, according to Dana Elzey. When Elzey, an associate professor in the Department of Materials Science and Engineering, was tasked with developing an award for a Universitywide competition several years ago, he put the problem to students in his Introduction to Engineering course. They didn’t immediately take to it, or even think it was worthy of the class. But Elzey assured them they were doing engineering.

“The engineer’s job is to find the best solution to a problem given a set of constraints,” Elzey said, “whether it’s building a bridge or coming up with the right way to reward a contest winner.”

In his cramped office just paces from a café swarming with students, Elzey has spent a career turning his own problem-solving efforts on U.Va.’s undergraduate engineering curriculum. The epiphany came in the early 1990s when he taught his first Introduction to Engineering class at U.Va. What does it mean to be an engineer, he asked. How should students be introduced to the vocation? Is it attractive to students?

“What I have focused on is achieving a better balance between research and engineering design, a better balance between theory and practice, a better balance between knowledge and skill,” Elzey said.

Ten years ago, Elzey’s crusade was rewarded when the department began giving students the option of pursuing an engineering design project instead of a research project as their program Capstone.

These days, Elzey divides his nonteaching time between directing U.Va.’s international programs and the Engineering School’s Rodman Scholars program. He was recently recognized as the inaugural recipient of the Henry Lee Kinnier Award, which provides funding to a School of Engineering and Applied Science faculty member via the Ernest “Boots” Mead Endowment. Elzey is using the money to hold a dinner seminar series for a diverse group of undergraduates who intend to pursue graduate studies in engineering.

Elzey still teaches an Introduction to Engineering course as well, and the trophy his intro students created two years ago — a bronze helical structure cast around a sphere that appears to be magnetically levitated — is still in circulation and given each year to the winner of the UVa. Cup.

“For the students who said, ‘This isn’t engineering,’ it was about getting them to think more broadly about how useful the engineering method is,” Elzey said. “It is a merger of scientific knowledge and creativity.”
Reid Bailey’s teaching philosophy can be summed up in three simple words: Keep it real.

“I really believe that students should be working on real-world work, or authentic work,” said Bailey, an associate professor in the Department of Systems and Information Engineering. “So if it’s a design class, they are designing things for real people. If it’s a systems class, they are working on cases with real situations or real data.”

For Bailey, this is as true in the traditional classroom setting as it is in Mendoza, the wine region of Argentina, where Bailey’s students have joined forces with students from the McIntire School of Commerce and others from around the University to put their real-world focus to the ultimate test. This May will mark the sixth time he has led a team of students to the country for a two-week, real-world, business immersion experience.

Made up primarily of systems engineering and commerce students, the groups have an opportunity to learn how to work with people bringing different skill sets to the table to identify and solve the kinds of problems you can’t replicate in a classroom exercise.

They also have the opportunity to make a real difference. “I always go back to the story of our first program down there. The group was working on laying out a warehouse that had been built without much thought toward functionality. A lot of excess time was being wasted getting to the wine they needed.”

Fast forward one year and Bailey returned to see the results. “You could see the student design. They implemented the recommendations almost exactly. It was amazing that this group of students could come in with no knowledge of the wine industry, in our first year there, and provide that kind of value to them.”

The program’s educational rewards go both ways, Bailey said. “It is my favorite thing I do. It is about mentoring the students, putting them in situations where they don’t know what to do. They know they need your help, and they want it. That’s when they are really ready to learn.”
Generations of Mentoring

ENGINEERING SCHOOL FACULTY FOSTER SUCCESS THROUGH SHARED EXPERIENCE

James Aylor, Dean of the School of Engineering and Applied Science (left), and Senior Associate Dean Barry Johnson (right)
So much in this business is about relationships. We all create our communities and find people we can collaborate with.

— James Aylor, Dean of the School of Engineering and Applied Science

Look at almost any personal success story and you’ll find a common denominator. Somewhere along the line, someone believed in that person enough to share what they’ve learned, what they know, and what they have experienced, in a way that not only jump-starts careers, but that also changes lives.

This tradition of mentoring has long been a staple of life at the Engineering School, and Professor and Senior Associate Dean Barry Johnson’s life and career provide a perfect example. Barry was the first Ph.D. candidate of Professor James Aylor, then a member of the faculty of the Electrical and Computer Engineering Department and now dean of the Engineering School. It launched the pair on an extraordinary journey of collaboration and friendship that has now spanned more than three decades and provided Johnson with countless lessons that he has paid forward to his own students.

“It goes back to the very first class I ever had with him,” Johnson said. “There was never a student/supervisor feel to the relationship. I always felt that we were colleagues, and it is something I have tried to model and emulate in my own teaching.”

Looking back on it, Aylor recalls the pair was in a unique position to learn together. “You might argue that he and I were kind of learning the graduate student thing together, and figuring out what a Ph.D. looks like.”

They have been teaching and learning together ever since. “So much in this business is about relationships,” Aylor said. “We all create our communities and find people we can collaborate with.”

This particular relationship has been at the heart of nearly every career decision for Johnson, from the decision to leave the private sector and join the faculty here in 1984 to the decision to return to the private sector in 2002 to found and lead his own security-based company, Privaris, to the decision to return to the faculty in 2006. “I had a lot of energy and effort invested in that company. I chose to come back to U.Va. predominantly because Jim became dean and invited me to be part his team.”

Part of the success, Johnson maintains, came from Aylor’s selflessness. “There have been many, many times, going back to when I was a student, when Jim put my best interests significantly above his own best interests. I always felt I was No. 1 in his mind and that is something that I try to emulate.”

Mark Gogolewski (Engr Phy, Applied Math ’92) is one of the many students who can attest to the fact that Johnson learned his mentoring lessons well. After first meeting Johnson as a student in his digital logic course, Gogolewski sought him out for an independent study project that played a critical role in what has become a remarkable success story.

“My interests were changing, in midstream, but I wanted to finish my degrees. It made it more real that I had an opportunity to kick the topic around with Barry. I went from working on the physics side of electrical engineering to looking at digital design, and specifically hardware design.”

Gogolewski used these lessons to help guide him as he co-founded Denali Software in 1995. He would help lead the company, as its chief technology officer, all the way to its 2010 acquisition by Cadence Design Systems.

“At U.Va. you are far more likely to have professors that are accessible and approachable and who work well with you. I got really lucky in getting Barry, because that is really who he is. He is a very caring person, and it felt almost parental in the amount of care he put into it. It was definitely a huge element in how my life progressed.”

“It is just incredible to see where Mark is and I certainly admire all that he has accomplished,” Johnson said. “I hope and believe that the things he learned and the experiences he had at the University of Virginia had something to do with that.”