Vanderbilt

engineering

Spring 2012

1886 CELEBRATING **125** 2011 YEARS OF

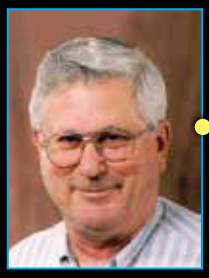
INSIGHT. INNOVATION. IMPACT.

honors and awards

Amrutur V. Anilkumar, professor of the practice of mechanical engineering, and **Sankaran Mahadevan**, John R. Murray Sr. Professor of Engineering, have been elected as associate fellows in the American Institute of Aeronautics and Astronautics. To be eligible, individuals must be AIAA senior members with at least 12 years of professional experience and have been recommended by three or more AIAA members with AIAA associate or fellow grade.

Peter T. Cummings, John R. Hall Professor of Chemical Engineering, has been appointed to two advisory boards for the National Science Foundation. The appointments are to NSF's Advisory Committee for the Engineering Directorate and to the Advisory Committee for Cyberinfrastructure. Cummings has also been named the 2012 Yeram S. Touloukian Award recipient by the American Society of Mechanical Engineers. The achievement award recognizes outstanding technical contributions in the field of thermo-physical properties.

Todd Giorgio, professor of biomedical engineering and department chair, has been elected a fellow of the Biomedical Engineering Society. BMES fellows are nominated by their peers, elected by a fellows committee and recognized for outstanding contributions and achievements in biomedical engineering.



Paul King, professor of biomedical engineering, emeritus, received a lifetime achievement award for outstanding accomplishments in biomedical engineering design instruction. The award was presented to King by the Biomedical Engineering Innovation, Design & Entrepreneurship Alliance during its annual symposium at the Biomedical Engineering Society conference.

Associate Professor of Civil and Environmental Engineering **Eugene J. LeBoeuf** has been elected a fellow of the American Society of Civil Engineers. This is the second highest honor given by ASCE and held by fewer than 5 percent of ASCE members.

The American Institute of Chemical Engineers, the nation's premier chemical engineering group, has inducted **M. Douglas LeVan**, J. Lawrence Wilson Professor of Engineering, as fellow. AIChE fellows must have at least 25 years' experience and show extraordinary accomplishments in the field.

Anita Mahadevan-Jansen, Orrin H. Ingram Professor of Engineering, has been elected a 2012 fellow of the American Institute for Medical and Biological Engineering. Elected AIMBE fellows represent the top 2 percent of biomedical engineers in the country and are chosen for exceptional leadership and achievements in medical and biological engineering.

Yuan Xue, assistant professor of computer science and computer engineering, has received a Faculty Early Career Development award, given by the National Science Foundation to promising junior faculty. The award will support Xue's research into resolving the increasing problem of wireless data network congestion.

Vanderbilt engineering

On the cover: Commemorating 125 years of insight, innovation and impact at the Vanderbilt University School of Engineering. Art by Anderson Design Group, Inc./Spirit of Nashville. Illustration by Andy Gregg.

INSIGHT ◦ INNOVATION ◦ IMPACT®

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Truth in Numbers

DANIEL DUBOIS

Dean Galloway

Rankings. Most of us love to hate them. As academics, we struggle with whether they are an accurate indicator of real quality or just advertising. One can argue that those at the top of the list may tend to appreciate the results of the rankings algorithm more than those at the bottom of the list—whether they agree with the actual algorithm or not.

I would like to share with you some of the numbers that have mattered to me most as dean of the Vanderbilt University School of Engineering for the past 16 years. I believe these numbers are more direct indicators of the success of our students and faculty than rankings.

5,343: The number of students who applied for the 320 available engineering seats in the Class of 2016, illustrating our growing national and international reputation and visibility.

34: The percentage of women studying in our undergraduate programs—roughly twice the national average. Diversity in our classrooms adds to the richness of the education we provide.

81: The current number of tenured/tenure-track faculty in the school. Hopefully, this number will grow to 100 for the Vanderbilt School of Engineering to have the depth and breadth needed for greater impact in engineering education, scholarship and research, as well as to reduce our student–faculty ratio to a level that provides more effective instruction and mentoring for our students.

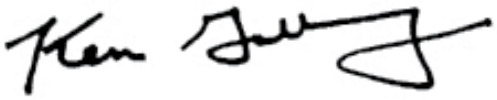
28: The number of National Science Foundation Faculty Early Career Development (CAREER) Program awards received by tenure-track faculty since 2000—indicating the school's ability to attract creative, high-potential faculty members.

12: The number of endowed chairs in engineering. We need the generosity of our alumni to add more chairs if we want to continue to attract and retain the absolute best faculty talent.

$63 million: The total externally funded research expenditures of the School of Engineering in fiscal year 2011. This number is up 400 percent over the past 10 years, illustrating the talent and the drive of our faculty.

This is just a sample of the numbers that matter to me. These numbers are direct indicators of how well we are accomplishing our mission of education and research, and indicate what we should be working to improve.

As I write to you in *Vanderbilt Engineering* for the last time, let me express my gratitude for the opportunity to serve as your dean. It has been an honor and a privilege to serve you, our faculty and Vanderbilt in this position.



Kenneth F. Galloway
Dean

Oh, the Places They Go

Vanderbilt engineering seniors walk off the Commencement platform with some pretty impressive placement statistics. These are for the Class of 2011.

81%
had at least one job offer before graduation (of those eligible to work in the U.S.)

2/3
join the workforce rather than go to professional or graduate school

$60,000
median starting salary
(not adjusted for cost-of-living differences)

Philippe Fauchet Named New Dean of School of Engineering

Philippe H. Fauchet, a recognized leader in research, teaching and innovation currently at the University of Rochester, will become dean of the Vanderbilt University School of Engineering on July 1.

Fauchet, Distinguished Professor of Electrical and Computer Engineering and chair of Rochester's electrical and computer engineering department, succeeds Dean Kenneth Galloway, who is returning to the faculty at the end of the current academic year after serving as dean since 1996.

Fauchet

Fauchet has 30 years of experience in nanotechnology and nanoscience, primarily in the areas of porous silicon and nanoscale silicon and their applications. His research explores the convergence of materials sciences, semiconductor and devices physics, physical chemistry and optics.

During his two decades at Rochester, he graduated 30 Ph.D. students from five departments and received the university's award for excellence in graduate teaching in 2011.

He also brought three large multi-investigator grants to the institution and created the university's multidisciplinary Center for Future Health, where engineers and physicians work to develop affordable technology that can be used in the home. He also established and ran the Femtosecond Laser Facility at Rochester's Center for Optoelectronics and Imaging. Recently, he spearheaded the Energy Research Initiative, a university-wide effort to coordinate and expand the university's research and educational activities in all areas related to energy.

Before moving to the University of Rochester, Fauchet was on the faculty at Princeton and Stanford universities and was one of the originators of Princeton University's Center for Photonics and Optoelectronic Materials.

Fauchet earned his Ph.D. in applied physics from Stanford University in 1984. He graduated from Brown University in 1980 with a master's in engineering.

Fauchet and his wife, Melanie, a nurse practitioner, have 13 adopted and biological children ranging in age from 2 to 22.

Alumnus By Water

The almost 4.4 million passengers who use the Galveston-Port Bolivar ferries in Texas every year now can travel in Commodore style. The 265-foot long *John W. Johnson* honors alumnus **John W. Johnson**, BE'68, (above right), a former member of the Texas Transportation Commission. The ferry, one of six in the fleet, is painted black and gold in honor of Johnson's Vanderbilt ties. The free ferry service is the only way motorists can cross the waterway between Bolivar Peninsula and Galveston Island.

MICHAEL AMADOR/TXDOT

Johnson

And By Air

Next time you travel through the main terminal building at Nashville International Airport, look for the bronze plaque naming the building after **Robert C. H. Mathews Jr.**, BE'51. Mathews, who died in 2008, was an active civic leader in Nashville and chair of The Mathews Company. He served for 22 years as volunteer chair of the Metropolitan Nashville Airport Authority, which owns and operates the Nashville airport.

Celebrating Four New Endowed Chairs

Four Vanderbilt School of Engineering faculty members were recognized with new endowed chairs in November, bringing the number of faculty holding chairs in the school to 12.

Benoit Dawant, professor of electrical engineering and computer science, and **David S. Kosson**, professor and chair of

civil and environmental engineering, each received a Cornelius Vanderbilt Chair. Biomedical engineering professor **Anita Mahadevan-Jansen** was honored with the Orrin H. Ingram Chair in Engineering. **Sankaran Mahadevan**, professor of civil and environmental engineering, now holds the John R. Murray Sr. Chair.

The honors are significant not just for the recipients but also for the School of Engineering. "Endowed faculty chairs are essential to building a world-class faculty, and tremendously important for acknowledging faculty achievement and distinction," Dean Kenneth F. Galloway said. Endowed chairs—sometimes known as named chairs or professorships—recognize a donor, support a professor's research and are valuable in recruiting and retaining faculty.

Kosson

Mahadevan

Mahadevan-Jansen

Dawant

The Cornelius Vanderbilt Chairs are named for Vanderbilt's founder and recognize faculty members doing groundbreaking research. The Orrin H. Ingram Chair in Engineering honors businessman, philanthropist and late Board of Trust member Orrin Henry "Hank" Ingram, founder of Ingram Barge Co., the foundation for Ingram Industries, one of the country's largest privately owned companies. The John R. Murray Sr. Chair honors Murray, a successful oil industry engineer and son-in-law of longtime Vanderbilt benefactor H. Fort Flowers, BE'12, MS'15.

The new endowed chairs are recognized leaders in their fields. Dawant works at the interface of engineering and medicine, and develops techniques that permit the automatic analysis of medical images and their use for surgical guidance.

Kosson is an internationally known expert in safe and environmentally responsible management of large volume wastes and highly hazardous materials. He is the co-principal investigator of the Vanderbilt-led Consortium for Risk Evaluation with Stakeholder Participation (CRESP), a multi-university program working with the Department of Energy, regulators and other stakeholders on cost-effective, risk-informed cleanup of the nation's former nuclear weapons production sites and potential future used nuclear fuel storage and waste disposal sites.

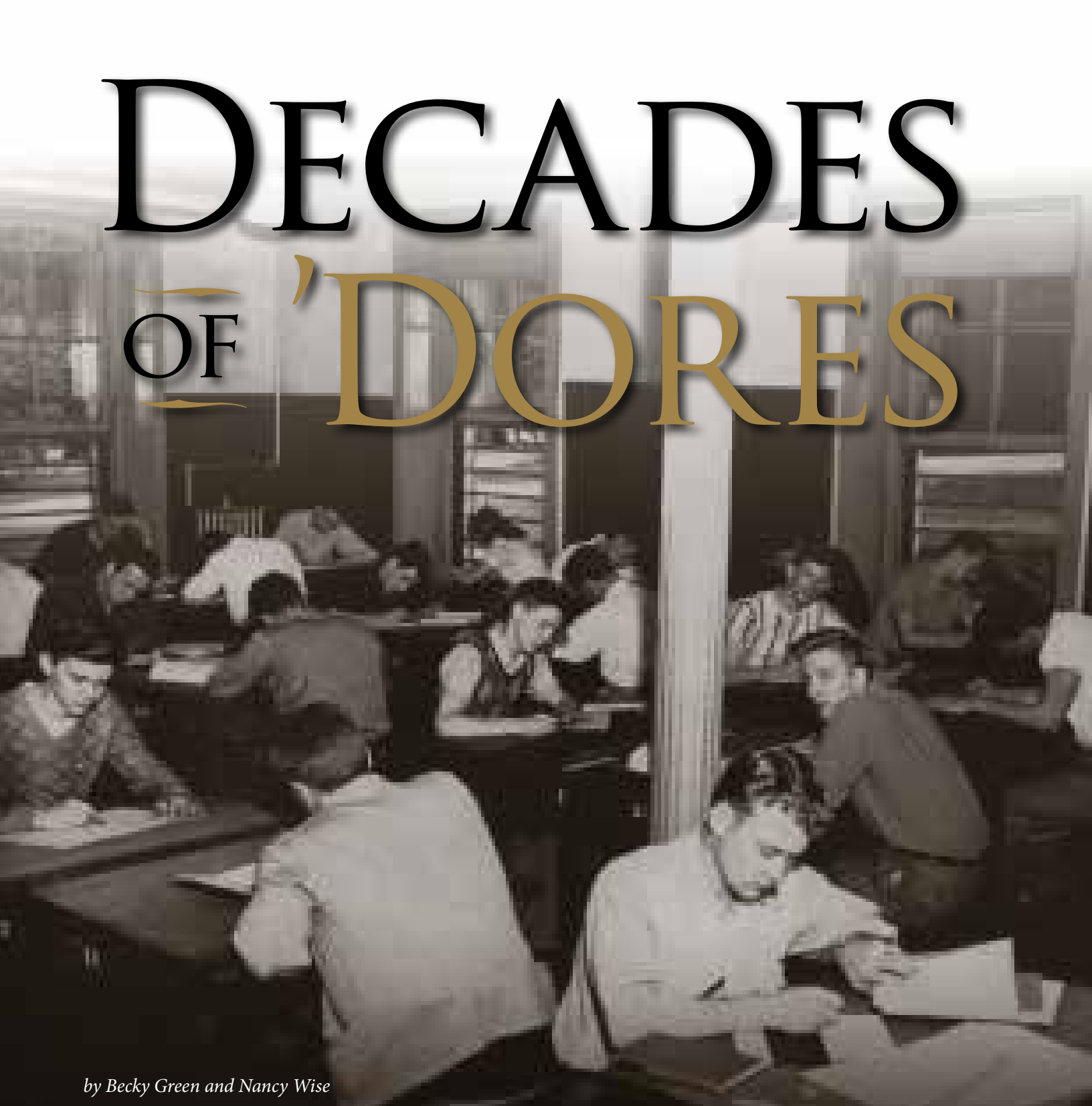
Mahadevan-Jansen develops applications of optical techniques for diagnosis of pathology. Her primary research investigates the applications of optical spectroscopies and imaging for cancer diagnosis and guidance of therapy.

Mahadevan works on ways to increase the reliability and decrease the risks of complex structures and systems. His research on automotive, aircraft and spacecraft systems, civil infrastructure systems and nuclear waste storage has the potential to save human lives and millions of dollars. Mahadevan also directs the Vanderbilt Risk and Reliability Engineering and Management doctoral program, the largest and most prestigious of its kind in the world.

VUSE's graduate program jumped two spots in the *U.S. News & World Report* ranking.

#35

Decades of 'Dores



by Becky Green and Nancy Wise

Imagine opening a time capsule and finding personal accounts about the School of Engineering from its beginning in 1886 to its youth in the 1930s and up until today. What would those early graduates say? What stories would they tell? What memories would they have in common and what experiences have changed?

To celebrate our 125th year, we asked one alumnus from every decade since 1930 to tell us their Vanderbilt story: how they got here, what they studied, what college life was like. We also asked a current student to do the same as a representative of the 2010s.

Their responses tell tales both personal and representative of their eras. It's possible to trace the historic changes in the school and in society through their answers. It's also possible to see a common core: while many things have changed over the years, some things remain consistent—great experiences, quality education, caring professors and a love of Vanderbilt School of Engineering.

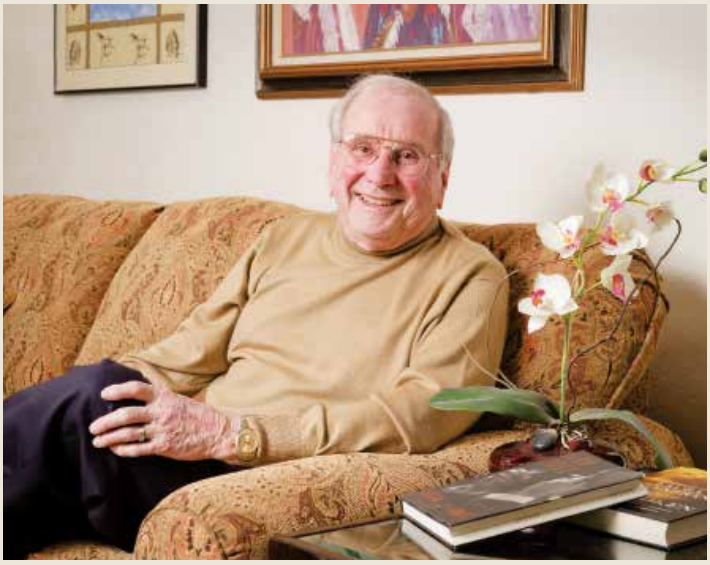
Why VUSE?

After finishing high school at Hume-Fogg, I joined the workforce. I was a hometown boy and after one year I had saved enough money to attend Vanderbilt.

Charles E. Harris, BE'34

When I arrived at Vanderbilt, I was 23 years old and had been out of high school for five years. The Navy awarded me a scholarship where I received full tuition including room and board.

Ralph J. Long, BE'49



Long

My father was an Eastern Airlines pilot based in Miami, and Vanderbilt was the best school in a city that Eastern flew to. Very fortunate for me.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Linn

I had an interest in math and science and I was interested in studying engineering. After visiting Vanderbilt during the spring of my high school senior year, I knew it was the school for me.

Charles Westfield Coker Jr., BS'81

Coker

I chose Vanderbilt to study engineering based on the school's educational reputation and its location. Being from Arkansas, I wanted to go away for school but not too far away.

Ronald A. Lewis II, BE'93

Lewis

I chose Vanderbilt School of Engineering upon recommendation of my guidance counselor who spoke highly of the university. She thought my personality would fit in well with the university.

Roli Kumar-Choudhury, BE'00

Kumar-Choudhury

Choosing Vanderbilt was easy. I have lived my entire life in Tennessee, and I have many alumni in my family. Having the opportunity to attend a top-20 school this close to home was a no-brainer.

Seth Dean, current sophomore

Dean

Classes and Coursework

Senior-level classes were taught in the Mechanical Engineering Hall where there were fewer than 10 students in a class.

Charles E. Harris, BE'34

Harris

I enjoyed my civil engineering classes. Most teachers were eager to have veterans in their classes because they were motivated and hardworking compared to the students fresh out of high school.

Ralph J. Long, BE'49

My favorite classes involved the actual design of a water system and sewerage system for a fictitious community, "Crockett, Tennessee," because it gave me a chance to practice engineering. However, I enjoyed all my classes—especially the seminars.

Walter A. Casson Jr., BE'56

Casson

I enjoyed all of my engineering and math classes and endured the rest. Probably my favorite class was sophomore chemistry. Professor Robert Dilts made it so interesting that I actually enjoyed it, although not everybody did. Once we got past memorizing the periodic table, most of the rest fell in place.

M. Timothy Carey, BE'66

Carey

Drafting class in the post-WWII years.

Engineering Council members pose for the 1991 *Commodore*. Ronald Lewis is third from left, top row.

The computer center, circa 1970s.

It is hard to choose, but I'm going to say Computer Organization. In this course we programmed in assembly language and learned how a computer worked. Suddenly there was no magic—you could see how it all worked. Later in my career I came back to Vanderbilt and taught the Computer Organization course, among others. I always loved seeing the light bulbs turn on in the students' heads as magic turned into understanding.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

My Intellectual Property/Patents class helped me understand the practical applications of what we were learning and why we were studying physics, calculus and thermodynamics.

Charles Westfield Coker Jr., BS'81

I took a linguistics class as an elective and the professor made learning about how sounds make up the languages of different lands and groups of people very interesting. Vanderbilt not only gave me a great engineering education but a great liberal arts education. Vanderbilt engineers are not all about the numbers—they can communicate well and a vast majority of us do have personalities.

Ronald A. Lewis II, BE'93

I enjoyed the Design of Biomedical Devices. I still remember learning about submitting a 510(k) and completing a risk analysis for device design. It was nice to see the real-world applications and when I first started in my quality engineering job, I was able to understand these two topics.

Roli Kumar-Choudhury, BE'00

That Class Was Torture

My two most difficult classes were outside of the normal range of civil engineering: Electric Circuits and Machines and Steam Engineering. I had the attitude, "Why do I need to take these classes?" I am sure that the electrical engineering majors felt the same when they had to attend the four-week Vanderbilt Summer Surveying Camp at Sparta, Tenn.

Walter A. Casson Jr., BE'56

I hated Saturday morning classes for obvious reasons. As time went on and I was in the more advanced computer science classes, we tended to work all night. Back then you had to share the Xerox Sigma 7 (the computer in that round building) with everyone on campus. You could get lots more done at night, so computer science majors became nocturnal. Getting up to attend an 8 a.m. class on Saturday—most likely in a subject to fulfill a distribution requirement—was torture.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Thermodynamics!

Charles Westfield Coker Jr., BS'81

My least favorite class was an introductory mechanical engineering class. There was a reason I chose chemical engineering as my major. I just could not figure out those darn vector forces on a pair of pliers on the midterm exam.

Ronald A. Lewis II, BE'93

Although I enjoyed math and calculus in high school, I have found that certain upper-level math courses here are not for me. They are probably a little more abstract than what I would like, which sort of serves as an antithesis to the EE courses.

Seth Dean, current sophomore

Memorable Professors

We spent good times in the basement of the mechanical engineering building with machine shop instructor "Papa John" Lawrence.

Charles E. Harris, BE'34

I looked up to all of the faculty members. It would be difficult to select any one of them as my favorite since they all had different personalities. … However, the man that gave me the opportunity to continue my studies after the death of my father, and thereby was most influential in my life at Vanderbilt, was Fred J. Lewis, dean of the engineering school. I will never know where he got the money to pay my expenses. He got me a job in Barnard Hall as the laundry agent. He allowed me to be a teaching assistant in mechanical drawing classes, and I worked as a TA during the summer at surveying camp. I graduated with a BE degree in June of 1956.

Fred J. Lewis

Walter A. Casson Jr., BE'56

I came to VU to major in chemical engineering but Professor Robert Dilts actually got me interested in chemistry, so he ranks high on my list of favorites. Professor Tom Harris was always available to help in my senior year. I will always be indebted to him for his help getting me through the last semester of chemical engineering so I could go on to an MBA at Stanford the following year.

M. Timothy Carey, BE'66

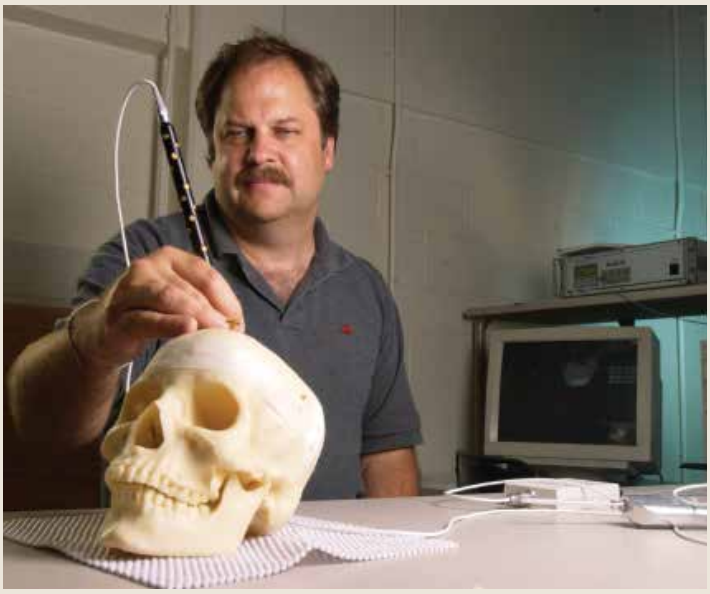
Walt Casson and scores of engineering students attended surveying camp on Bon Air Mountain from 1927-1960.

One of the few photos available of the machine shop in the old mechanical engineering building.

The university housed its computers in the round building that now is the Biomolecular NMR facility.

All historic images **P. 6-15** are from VANDERBILT UNIVERSITY SPECIAL COLLECTIONS AND ARCHIVES unless otherwise noted. **P. 7:** CAREY—TOMMY LAVERGNE; CASSON—COURTESY OF ALUMNUS; COKER—BOB SOFALY; DEAN—JOHN RUSSELL; KUMAR-CHOUDHURY—MARY KNOX MERRILL; LEWIS—COURTESY OF ALUMNUS; LINN—KERRY DAHLEN; LONG—SCOTT BRALEY. **P. 9:** SURVEY CAMP—COURTESY OF CASSON. **P. 10:** MCGILL—NEIL BRAKE; GALLOWAY—DANIEL DUBOIS. **P. 11:** STEVENSON—STEVE GREEN. **P. 12:** NASHVILLE STREETCAR, CIRCA 1930—COURTESY OF TENNESSEE STATE LIBRARY AND ARCHIVES. **P. 13:** KUMAR-CHOUDHURY—MARY KNOX MERRILL. **P. 14:** LINNS—KERRY DAHLEN. **P. 15:** DEANS—JOHN RUSSELL.

McGill Hall


Bob Galloway, professor of biomedical engineering


Mechanical Engineering faculty assemble for the 1981 *Commodore* photo outside Olin Hall.

Professor John Williamson taught the Intellectual Properties course. He was a very senior member of the Vanderbilt engineering school faculty and he was passionate about his area of expertise and encouraging of the students. He would hold court after class with a group of us to talk about our ideas and interests.

Charles Westfield Coker Jr., BS'81

If I had to choose one most influential faculty member, it would have to be Brock Williams (assistant vice chancellor for student recreation and associate director, student athletics). He helped me find my first on-campus job and convinced me that I did not have to be a sociology or psychology major to live in McGill Hall. I lived with a great group of free spirits for three years and worked as a reeve at the front desk of Towers I and II.

Ronald A. Lewis II, BE'93

Professor Bob Galloway was my faculty adviser and was very helpful in guiding me in class choices, answering questions I had from his classes and helping me choose the right master's program in biomedical engineering.

Roli Kumar-Choudhury, BE'00

Major Decision

My father worked for the Army Corps of Engineers and from 1919 to 1923 we lived in Alabama while he worked on the Wilson Dam in Muscle Shoals. Although he wasn't an engineer, his line of work influenced my decision to join the Army Corps and become an engineer.

Charles E. Harris, BE'34

My father and maternal grandfather were longtime employees of DuPont and I grew up in Wilmington, Del. My father's advice was "if you have a chemical engineering degree, you will always be able to get a job."

M. Timothy Carey, BE'66

In high school I was good at math, and my older brother (attending Georgia Tech) suggested I try computer science. At the time, the only thing I knew about computers was the jobs for keypunch operators that I saw advertised on T.V. and I didn't think that was such a good idea. He took the time to explain the difference, and so I checked that box on the application. It was called the systems and information science department and was in the engineering school. Once I took my first course I was hooked.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

It really selected me. I enjoyed my mechanical engineering and math classes, yet I wanted to take business electives. The BS in general engineering allowed me to balance these interests.

Charles Westfield Coker Jr., BS'81

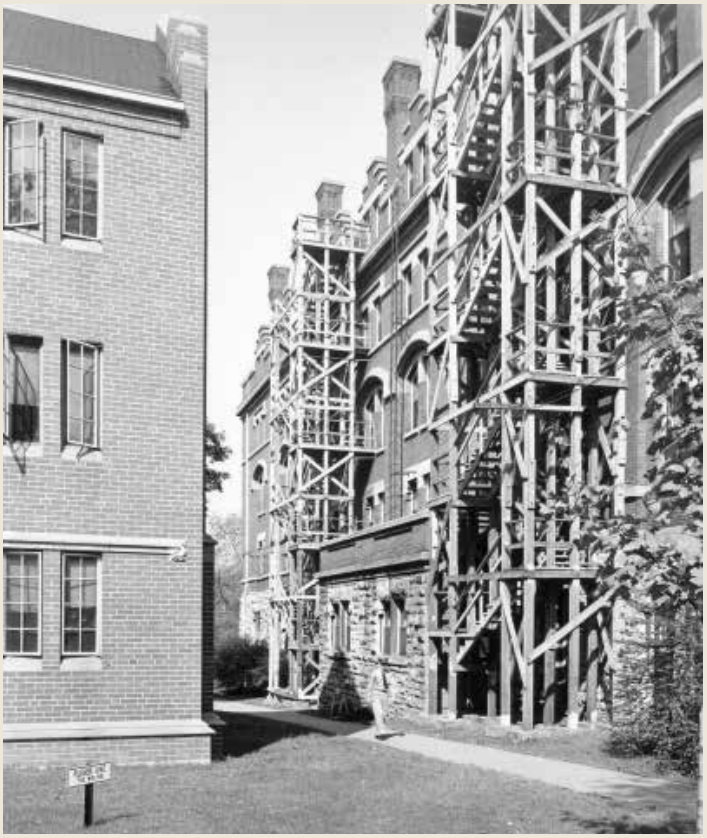
I knew I wanted to become a chemical engineer since eighth grade. I took an aptitude test and engineering came up as a good fit. I researched the different engineering disciplines and chemical engineering sounded most appealing as it was the most versatile. You could be a lawyer, doctor, scientist, professor, researcher, product developer and work in many different aspects of a large corporation.

Ronald A. Lewis II, BE'93

First Impressions

We arrived at my assigned dorm, Old Kissam Hall. It was a four-story brick building with no elevators. It had wooden fire escapes. When my father saw the wooden fire escapes attached to the building, he said (in jest), "If this is an engineering school, I think we should go back home."

Walter A. Casson Jr., BE'56



Old Kissam Hall, covered with wooden fire escapes.

My first memory of VU is driving onto the campus in September 1962 to matriculate. Prior to that I had never been west of the Pennsylvania border. I was struck by the beauty of the Vanderbilt campus and Nashville in general.

M. Timothy Carey, BE'66

My first memory of the engineering school is walking into the ladies' room, only to see a line of urinals. After backtracking and checking the sign, I realized that at one point the engineering school hadn't had a need for ladies' rooms.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Campus in the fall, circa 1960s.

Moving in the dorm the first day, lots of Bee Gees (*Saturday Night Fever*) music radiating from the dorm windows and girls on campus! Seeing girls on campus was really different for me as I had attended an all-male high school.

Charles Westfield Coker Jr., BS'81

During an assembly for the 1989 freshman class, word got out that it was my 18th birthday. A few people started singing "Happy Birthday" and then the entire freshman class of about 1,300 students began singing to me. It was kind of cool but also a little embarrassing.

Ronald A. Lewis II, BE'93

More than four decades of engineering students have attended classes in Stevenson.

Streetcars served as Nashville transportation until approximately the 1940s.

Pajama-clad students paraded through Nashville at Homecomings in the 1950s.

Rotier's and the Exit/In have been part of engineering students' lives for decades.

My first memory was attending the VUSE Summer Research program. It was nice to get my bearings before the start of the school year and explore the opportunities the university had to offer.

Roli Kumar-Choudhury, BE'00

Life on Campus

During my school days, I was living with my family in Sylvan Park where I would walk to the corner of West End Avenue and catch a streetcar to campus.

Charles E. Harris, BE'34

Veterans were considered role models and my younger roommates referred to me as "Pop." The resident conditions on campus in the '40s were somewhat primitive. To shower, I had to go down four flights of stairs to the basement. Although coming from a fleet, the dorms seemed quite spacious!

Ralph J. Long, BE'49

I spent most of my time the first semester with the NROTC. The engineering curriculum was difficult and we all spent a great deal of time studying. Of course, we participated in campus activities such as the Pajama Parade through downtown Nashville during Homecoming.

Walter A. Casson Jr., BE'56

The '70s were a time of great social change for Vanderbilt. When I was a freshman in 1970 we lived in an all-female quad. We had to sign out if we left at night and sign in by curfew (midnight on weekdays, 2 a.m. on weekends). The big news that year was that now men could enter the dorms during certain hours with an escort. Three years later I was living in a coed dorm (The Towers) and the idea of a curfew was nonexistent. The drinking age was 18 and Saturday night activities included imbibing, dancing and just plain fun.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Life on campus was great—friendly people and a beautiful setting. Dorm life was super as we all had our own single rooms in the Kirkland Quad which I believe had recently been built/renovated. We really had a good group of guys (and gals). A typical weekend might involve a football game and visits to the frat houses, the Exit/In, Rotier's and Waxies, and most of Sunday in the science library.

Charles Westfield Coker Jr., BS'81

Campus life was a lot of fun. My freshman year, I was in Kissam Quad on the third floor of Currey. We had many social activities with the adjacent girls' dorms. Most weekends, we would make our own parties on the dorm floor until the RAs would tell us to turn the music down. We would also check out the movies at Sarratt. This went on until we discovered Fraternity Row and the occasional sorority crush parties.

Ronald A. Lewis II, BE'93

University life included the sounds of the Spice Girls as you walked down the halls of my freshman dorm, plus all of us gathering on a Thursday night in our dorm room to watch *Friends*. I remember freshman year living in Branscomb Hall with a very spacious room but with the increase in enrollment the study rooms were converted into rooms with six-plus girls living in one room. The weekends included a movie at Sarratt. We would go out to dinner on West End to Chili's, Calypso Cafe and Las Palmas. Later we would go downtown clubbing.

Roli Kumar-Choudhury, BE'00

We certainly have a few more amenities now than I am sure Vanderbilt students had in the past, but it is cool to think about how many other students lived and worked in the same little room I now live in.

Seth Dean, current sophomore

Life Lessons Learned at VUSE

There are many things I learned at Vanderbilt that have been most valuable in my life; three of them are: 1) Work hard—it's worth it; 2) When circumstances are difficult, don't give up; and 3) What you do for others gives you the most satisfaction in life.

Walter A. Casson Jr., BE'56

The most valuable part of my VU education was the friendships forged during those four years. We all worked and played as hard as we could which resulted in the perfect academic and social growth experience. It set the stage for the next steps which would never have been possible without my Vanderbilt experience.

M. Timothy Carey, BE'66

This is a hard one to answer. Probably that there is no magic. No matter how confusing or complicated something may seem at first glance, you can figure out how it all works if you keep after it.

Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Roli Kumar-Choudhury near her Cambridge home.

Balance. Balance your work, interests, distractions, friends and relationships and you'll likely do OK in the long run.

Charles Westfield Coker Jr., BS'81

Vanderbilt taught me many life lessons. I interacted with people from all walks of life and backgrounds. I learned how to find a common thread with anyone to relate with them if only for five minutes. I pride myself on my ability to assimilate into any situation with any group of people and make everyone feel included.

Ronald A. Lewis II, BE'93

Vanderbilt teaches you how to multitask and balance education, participation in organizations and a social life. This has been really helpful in balancing a career and family.

Roli Kumar-Choudhury, BE'00

To relax. With so many intelligent people vying for a fixed amount of A's, the stress can start to accumulate. I have really just tried to focus on acquiring knowledge and bettering myself instead of being worried about whether or not there will be a curve.

Seth Dean, current sophomore

Alumni through the Decades

1930s: Charles E. Harris, BE'34

As a civil engineer, Charlie Harris had a notable and fruitful career in the hydroelectric branch of the Army Corps of Engineers before retiring with nearly 40 years of service. He specialized in electrical design projects along the Cumberland River and its tributaries, leading projects on the Caney Fork River, Dale Hollow Lake, Obed River and more. Now 100 years old—yes, 100—Harris still lives in Nashville.

1940s: Ralph J. Long, BE'49

Ralph Long entered the School of Engineering on an NROTC scholarship and still on active duty from World War II naval service. A 1949 graduate in civil engineering, Long served as senior vice president of Utah International, one of the largest and most successful multinational mining companies in the world at its time. He joined the company in 1956 and was instrumental in managing operations in Arkansas, Utah and in the Blackwater Mine in Queensland, Australia, among others. He lives in California.

1950s: Walter A. Casson Jr., BE'56

Walt Casson started his civil engineering career at a Florida engineering company and later, started his own land surveying and civil engineering consulting firm. Casson Engineering Co. designed local highways, water and wastewater systems, and thousands of residential lots as well as commercial projects in Florida for more than 35 years. He and his wife, Lauzanne Sims Casson, divide their time between traveling and maintaining residences in Florida and Virginia.

1960s: M. Timothy Carey, BE'66

After receiving his chemical engineering degree, Tim Carey earned an MBA from Stanford before serving in Vietnam. His management experience with Naval Mobile Construction Battalion One set the stage for a career in the pipeline construction industry. In 1978, he became president of CRC Automatic Welding, a small pipeline equipment company, and continued to lead the company as CEO when it became CRC-Evans Pipeline International. Thriving amid leveraged buyouts, the 1980s oil downturn and changes in management teams, Carey eventually sold CRC in 2010. He lives in Houston.

1970s: Cathy Jo Thompson Linn, BS'74, MS'78, PhD'80

Cathy Jo Thompson Linn might not consider herself a trailblazer, but she is. After being one of Vanderbilt's first female computer engineering graduates, she went on to work for IBM, several universities, the Department of Defense and Microsoft. At Microsoft, Linn helped develop object linking and embedding technology before supporting interactions and communications

Cathy Jo Thompson Linn, and her husband, Joe Linn, both hold multiple degrees from VUSE.

for different Microsoft groups. She retired from Microsoft in the late 1990s after being a program manager for the team that shipped Windows CE 1.0. She and her husband, Joe Linn, BS'74, PhD'80, met at VUSE as undergraduates, and today split their time between Seattle and Hawaii.

1980s: Charles Westfield Coker Jr., BS'81

With an interest in business as well as engineering, Charles Coker found that a bachelor's in engineering science provided the right mix for his future. After receiving an MBA from the University of Virginia, Coker joined Sonoco Products Co., a global leader in consumer and industrial packaging. Over the next 25 years, he applied his engineering and business knowledge to manufacturing operations, finance, materials sciences and managing processes in industry. Parlaying his skills into a new profession, Coker moved into commercial and residential property development in the late 2000s. Coker says that he would not trade his engineering education and time at Vanderbilt for any other—especially since he met his wife, Sylvia Sparkman Coker, BA'81, on their first day on campus. The Cokers reside in South Carolina.

1990s: Ronald A. Lewis II, BE'93

Ronald Lewis leveraged his chemical engineering degree and two internships with Procter & Gamble into a job with the top consumer goods company right after graduation. He worked as a development and process engineer on over-the-counter health care products for five years. He then joined Nestlé Purina as principal scientist developing new products and received seven patents for his work. Lewis moved to marketing after earning a

master's in management, and then to Henkel, the multinational corporation behind well-known brands Dial, Right Guard, Soft Scrub and adhesive Loctite. He and his family live in Arizona.

2000s: Roli Kumar-Choudhury, BE'00

Roli Kumar-Choudhury chose to combine her love of science and math by majoring in biomedical engineering at Vanderbilt. She then earned a master's in biomedical engineering–biomaterials/biomechanics before joining medical device manufacturer LeMaitre Vascular. She earned an MBA in 2007 and is now director of quality affairs for LeMaitre Vascular, which develops, manufactures and markets disposable and implantable devices for vascular disease. Kumar-Choudhury and her husband reside in the Boston area.

2010s: Seth Dean, current sophomore

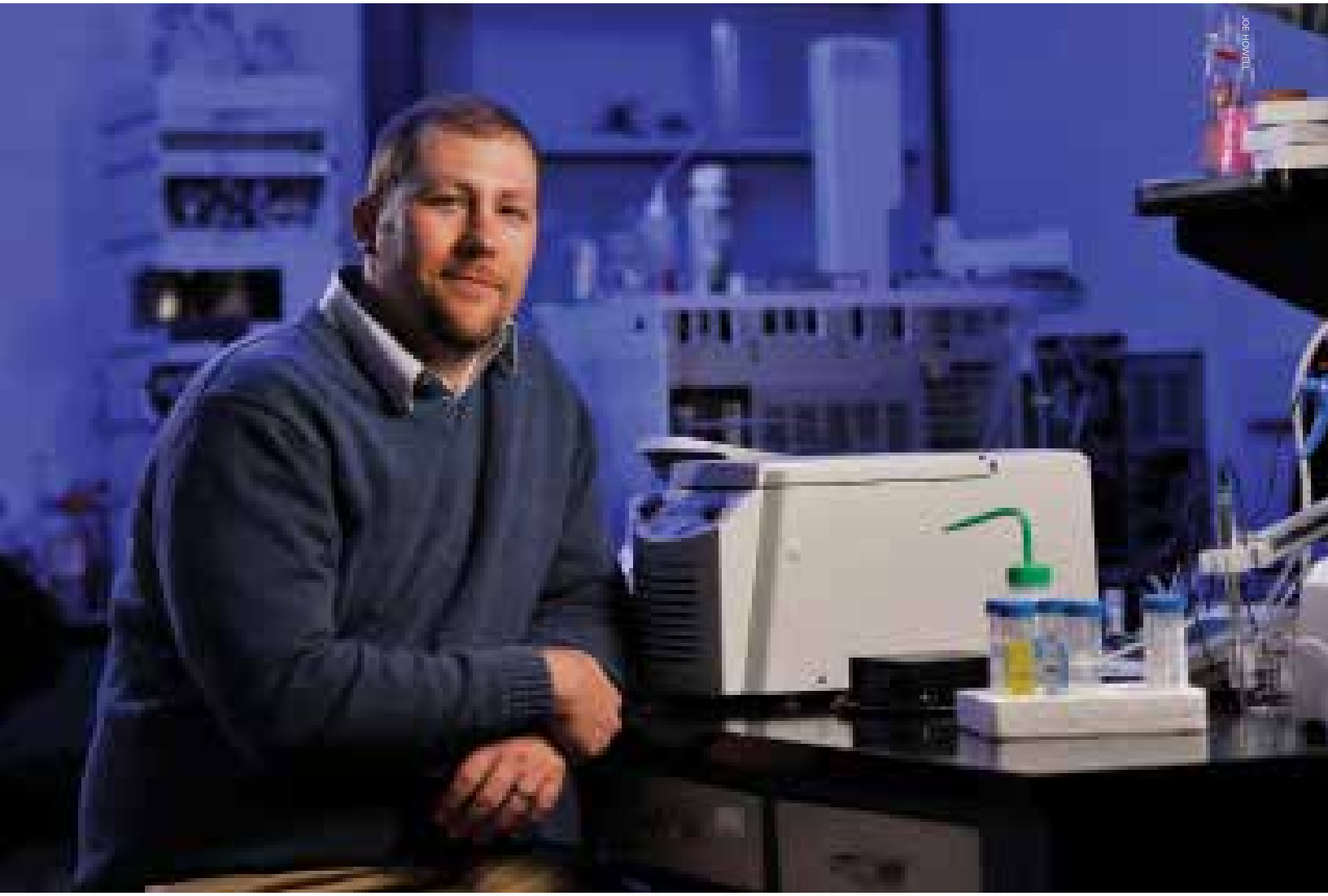
Seth Dean comes from engineering alumni on both sides of his family. His father, J. Bruce Dean, graduated from the school in 1980. His mother's grandfather, Allen Dunkerley Jr., earned his Vanderbilt engineering degree in 1934. A lot has changed in the engineering field since his great-grandfather's time and Dean plans on exploring areas that his ancestor could never have imagined. "There are a lot of undiscovered and exciting frontiers in electrical engineering," Dean says. "Electric cars have become a reality, computers are able to do more a lot faster, and electronics have become such a huge part of daily life."

Current student Seth Dean and his father, J. Bruce Dean, BE'80.

It's His Metabolism

Research into cell processes could lead to breakthroughs for diabetes and cancer

by Sandy Smith



JOE HOWELL

Jamey Young, assistant professor of chemical and biomolecular engineering, likes to build bridges. But rather than physical structures, Young focuses on spanning the divide between biology and engineering, diabetes and cancer, and plants and animals.

Cell metabolism—especially its rate, known as flux—is the thread that connects his various research interests.

"I like to have my hands in different things at the same time," Young says. "That's one of the things that keeps work exciting to me, taking ideas from one field and applying them to another. If it's alive, it depends on metabolism.

"As an engineer, I have certain tools that your typical biologist doesn't have. That gives me the opportunity to contribute something new with the approaches that we've been developing," he says. "By applying a technique called metabolic flux analysis, we are able to map the rates of many different metabolic pathways inside of cells at the same time. It's like generating a traffic report on the cell's metabolism."

PHOTOS BY JOHN RUSSELL

> "Can we inhibit the metabolic pathways that cancer cells depend on for fuel and kill them, or at least slow them down?"
>
> — Jamey Young

His research was given a boost in 2010 when he received a prestigious five-year National Science Foundation Early Career Development (CAREER) award to explore toxicity caused by excess lipids. This particular area of research could bring potential discoveries for patients with diabetes.

With a focus on identifying disease therapies that target metabolic differences between normal and diseased cells, Young's work has expanded in several directions that could play a major role in cancer treatments, pharmaceutical production and food supplies. But that's getting ahead of things a bit.

"We're working to find new drug targets and treatment strategies, not necessarily the drugs themselves. It takes a lot of work to go from identifying basic disease mechanisms to creating a drug that will target those mechanisms and then testing whether it will be safe to use in people," he says. "The things we're studying will contribute fundamental understanding to guide this process."

Potential to Impact Diseases

While a graduate student in the chemical engineering program at Purdue University, Young focused primarily on bacterial cell metabolism. When he began to pursue postdoctoral studies, he made a conscious decision to expand into biomedical applications.

"Really, when you look at diseases that involve metabolism, diabetes and obesity are the key ones. I knew that my expertise in metabolism could be directly applied to those diseases. But there are plenty of other diseases out there that directly or indirectly involve altered cell metabolism," he says.

The ability to work closely with leading medical researchers, particularly in the areas of diabetes and cancer, made Vanderbilt appealing when Young sought a faculty position in 2008.

"Vanderbilt has one of the most well-known and well-resourced diabetes centers in the country. The cancer center is also one of the leading centers in the country. I can do things here that I couldn't do at other places because of the collaborators," Young notes.

Diabetes and cancer may seem worlds apart, but they involve dysregulation in many of the same metabolic pathways. In diabetes, Young is exploring whether proteins can be inhibited or activated to force the cell metabolism back to a normal state.

"We're particularly interested in what happens to liver cells when they're exposed to too much fat. Fatty acids and other lipids circulate in the blood. When a person is obese or diabetic, lipids become elevated and the liver soaks them up like a sponge," he explains. "We're interested in how liver cells respond to excess lipids… and how those metabolic changes cause stress and dysfunction to liver cells."

He says cancer isn't often considered a metabolic disease, but it does have metabolic drivers. Some genes—oncogenes—are known to have the potential to cause cancer. That leads Young down several tantalizing avenues of possible research. "When some of these genes get mutated or overexpressed, how does that reprogram the metabolism of the cells?" Young asks. "Would some of those metabolic processes be good targets for therapeutics to slow down the growth of the cell? Can we inhibit the metabolic pathways that cancer cells depend on for fuel and kill them, or at least slow them down?"

Chemical and Biomolecular Engineering graduate student Lara Jazmin checks the cyanobacteria study.

Plant World Promise in Fuel, Food

Plants also rely on metabolism to grow and Young works with researchers at Vanderbilt and elsewhere to explore ways to better understand that process. Because metabolic flux analysis is typi-

cally applied to organisms that grow by converting sugar to carbon dioxide, mapping metabolic fluxes in plants that carry out the reverse process of photosynthesis hasn't been possible.

Young and others published a paper last year showing how metabolic fluxes in cyanobacteria—bacteria that obtain energy through photosynthesis—could be mapped. The outgrowth is a new research effort that aims to engineer carbon flow in cyanobacteria to produce biofuels.

It may be far-fetched, he says, but could bear fruit. "The issue right now is we have these cells that are producing a valuable product from air and sunlight but at a very small rate and in very small amounts. Can we apply some engineering approaches to figure out how to redirect more carbon into pathways that are producing the biofuels?" Young says. "The end goal for us is in developing strategies and methodologies. We'd like to come up with a tool kit that would enable you to take a photosynthetic organism like this cyanobacterium and figure out how to systematically drive more carbon into desirable pathways. We're mostly interested not in some particular product but developing techniques for understanding the metabolic pathways of these cells and redirecting them."

That already has led to another NSF-funded project in which Young serves as a co-principal investigator. He's helping plant biologists at the Danforth Plant Science Center in St. Louis and Los Alamos National Laboratories discover how to enhance photosynthesis in plants and make them grow faster. The work has applications for both energy and food production.

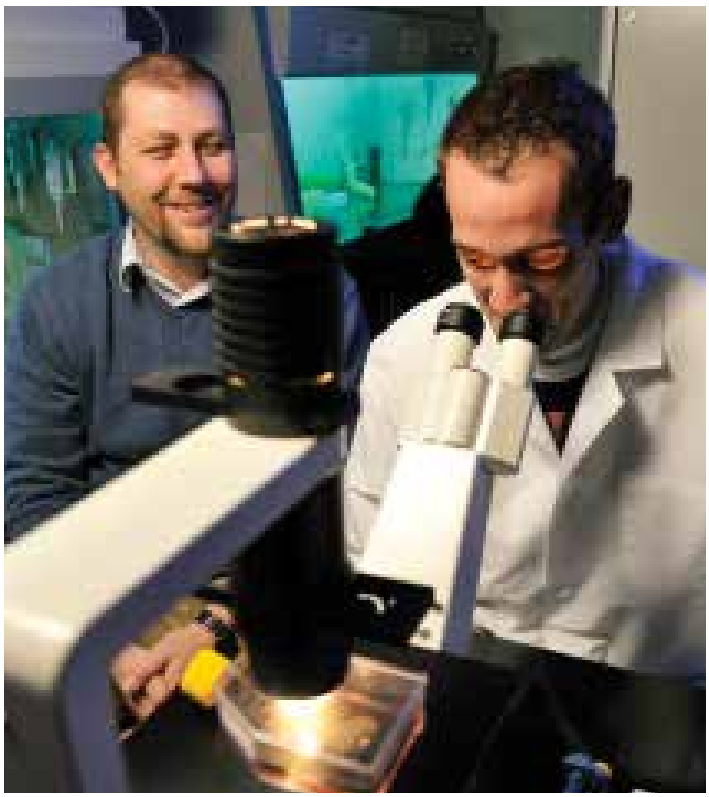
Doug Allen, a biologist with the U.S. Department of Agriculture's Agricultural Research Service and researcher at the Donald Danforth Plant Science Center, has worked closely with Young on the project. "The application that we're working on together recognizes that our existence in this world is based on plants—what we eat . . . what animals eat," Allen says. "The population of the world is going to increase and plants are going to continue to provide for us, so studying their basic biochemistry is an important and timely topic." Young's engineering background brings a diverse view focused on quantification of metabolism. "Being able to quantify metabolism at the cellular level is important to enable rational metabolic engineering," the biologist says.

Teaming with Industry

Young's research also shows potential for industrial uses and an NSF-funded GOALI (Grant Opportunities for Academic Liaison with Industry) grant has paired him with researchers at Centocor, a subsidiary of Johnson & Johnson that specializes in manufacturing therapeutic proteins called monoclonal antibodies.

Currently, Chinese hamster ovary (CHO) cells are widely used in pharmaceutical and biotechnology to produce monoclonal antibodies. When not producing the antibodies, CHO cells produce the byproduct lactate. Young is exploring what controls the production of lactate and whether this can be overcome, bypassed or redirected to enhance the growth and productivity of the CHO cells.

Collaborating with industry builds synergy, Young says. "You're dealing with people who have a lot of experience and really know what problems are important for the industry," he says. That helps academic researchers identify new problems to work on. "Drug manufacturing companies usually aren't interested in basic science, but instead in process development that will get the product out the door. They may not have the inclination to do fundamental research, but because of their experience, they know the right questions to ask."



Graduate student Taylor Murphy conducts research into lactate production of CHO cells in Young's lab.

With so much potential for so many applications, Young must balance opportunities with focus. "Engineers tend to be ambitious," he says. "We think we can tackle everything. I try to achieve a balance between developing new methodologies that exploit my engineering expertise and applying those approaches to important scientific problems where they can have the greatest impact."

At the same time, he sees the value of envisioning multiple applications for his metabolic engineering techniques. "As an academic investigator, I can pick and choose to apply our research methodologies to things I'm interested in," he says. "It's very freeing from my perspective."

Unforgettable

by Daniel Hartman, BE'91, MS'93, PhD'99

With his tall stature, impeccable business attire, clean-shaven face and wizardly bald head, Professor George Cook might intimidate the unfamiliar student.

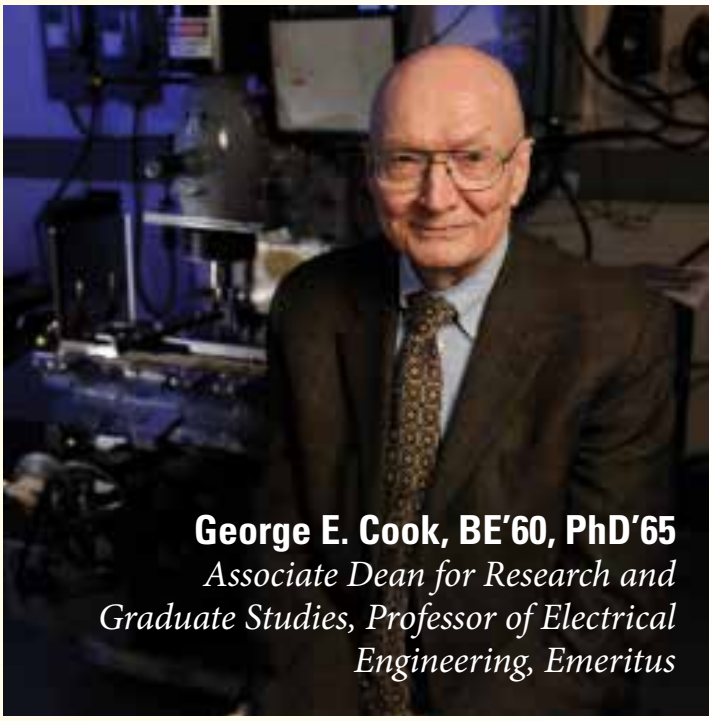
However if you are one of the fortunate students to strike up a conversation with him, you notice his kind eyes, warm smile and sincere and genuinely caring attitude. When one knows Professor Cook well, the feelings he inspires are invariably of respect and admiration.

It was not until my second semester of graduate school that I had the pleasure of taking Professor Cook's robotics manipulators class. Although mathematically and theoretically challenging, his courses were popular because they complemented math and theory with a software-based simulation environment known as ROBOSIM.

ROBOSIM encouraged critical thinking, fostered self-directed learning, and enabled curiosity while generating a deep understanding of the fundamental principles of kinematic theory—the mechanics of motion. Developed by Professor Cook and his graduate students, ROBOSIM allowed students to design their own robots, positioners and workspace environments, and incorporate inverse kinematics into a graphically animated robotic simulation environment. This type of learning environment resonated with me.

In 1993, I finished my master's degree and joined Professor Cook's research team as a doctoral candidate. During one of our very first meetings, I learned that there is nothing subtle about Professor Cook's guidance. The meeting also involved another professor and a fellow graduate student research colleague. While I do not remember the exact nature of the discussion, I do recall we were doubting our ability to follow through with one of Professor Cook's requests. His discontent was clear, and in hindsight, we deserved it. His passion and verbosity were not to disparage, but rather to motivate, us. What remains ingrained in my mind more than anything else was his secretary's comment as we walked out of his office. She whispered that "he is a lot mellower than he used to be."

Professor Cook's research interests have meandered very little during his 40-plus-year career at Vanderbilt, yet he continues to publish new and novel content in welding automation and control. At the time I was a student, the Welding Automation Laboratory was one of a few interdisciplinary research groups in the School of Engineering. Consequently, his leadership encouraged an open and trusting environment where collaboration and teamwork were emphasized. We were able to focus on our strengths and benefit from the collaborations of mechanical and electrical engineering counterparts. Later, as a staff scientist at Los Alamos National Laboratory, I realized the importance of interdisciplinary collaboration, and was properly prepared to contribute, participate and lead in multidisciplinary research endeavors.



JOHN RUSSELL

George E. Cook, BE'60, PhD'65
Associate Dean for Research and Graduate Studies, Professor of Electrical Engineering, Emeritus

Professionally, I continue to develop and promote the same concepts that we worked on in graduate school. When I meet with professionals in the welding and joining industry, it is with great pride that I say I studied under George Cook. Unfailingly, it is met with a smile and a warmness of, "Oh, you worked with George?" Respect and admiration for Professor Cook extends well beyond Vanderbilt.

As a teacher, Professor Cook is committed to the growth of his students and encourages them to reach their potential. As an adviser, his observations can be quite brutal, but he operates from a position of honesty and mutual respect, and his students appreciate his upfront and straightforward nature. As a mentor, he is approachable and conscious of being a role model. He is an excellent listener and never appears overextended or distracted during a conversation. While I have many fond memories of Vanderbilt, my studies under Professor Cook will remain unforgettable.

Daniel Hartman, BE'91, MS'93, PhD'99, is the founder and president of Manufacturing Behavioral Science, a manufacturing process automation and consulting company located in Fairhope, Ala. He holds four patents and has authored numerous peer-reviewed publications, including four book chapters.

Leading Light

Mahadevan-Jansen pioneers ways to use light in medicine and biology

by Joanne Lamphere Beckham, BA'62

More than 100 years ago, the discovery of X-ray revolutionized medical care by opening a window into the human body. Today biomedical photonics—the application of light in medicine and biology—promises to be equally groundbreaking. At the forefront of the revolution is Anita Mahadevan-Jansen, the School of Engineering's Orrin H. Ingram Professor of Engineering.

"Medical photonics is the use of light to diagnose, monitor and treat disease," she says. "I work on diagnosing and treatment."

As director of optical diagnostics research in the Biomedical Photonics Laboratories at Vanderbilt, Mahadevan-Jansen develops technologies that can be used in clinical care. The professor, who joined the School of Engineering in 1997, has received numerous awards and patents on her devices and has pioneered techniques in laser spectroscopy, the interaction of matter with light.

One of her main interests is optical guidance in surgery. Surgeons use her laser spectroscopy techniques during delicate brain surgery—when mistakes can be catastrophic—to better distinguish between healthy and diseased tissue.

Her optical techniques are also used in breast cancer surgery. Following lumpectomies—in which surgeons remove only the cancerous tumor instead of the entire breast—it can take several days for laboratory tests to discover if all the cancerous tissue has been removed. Often, the patient must return for further surgery. Mahadevan-Jansen's techniques are currently being used to discriminate between the lump's healthy and cancerous tissue so that all of the diseased tissue can be removed in a single operation.

JOE HOWELL

Shedding Light on Cancer

An acknowledged leader in biomedical phonics, she always has several research projects under way or in development. "I'm excited about all my projects," she says. However, she's particularly enthusiastic about two new undertakings: developing a simple and effective method of finding the parathyroid glands during thyroid surgery and diagnosing cervical cancer in ethnically diverse women.

"Four years ago I gave a talk at Vanderbilt's School of Medicine about using light to detect brain tumors or breast tumor margins," she remembers. A few days later, surgical resident Lisa White, MD'06, showed up at Mahadevan-Jansen's office to ask about methods to detect the parathyroid glands during thyroid surgery.

Up to 19 percent of the time when surgeons remove diseased thyroid glands, damage also occurs to the parathyroids, four organs the size of rice grains located at the back of the throat. Such damage can have lifelong negative effects on patients' health because the parathyroid glands control calcium concentrations in bones, intestines and kidneys.

Working together to image these tiny glands with near-infrared light, the biomedical engineering professor and the surgical resident discovered that the parathyroid glows with a natural fluorescence 10 times stronger than fluorescence from thyroid tissue. The fluorescence is so strong that a simple detector can reveal it, allowing surgeons to see the location of the parathyroid and avoid it. Vanderbilt has recently received an international patent on a detection device and licensed it to a private company for manufacturing.

"This kind of collaborative discovery could only happen in a place like Vanderbilt," Mahadevan-Jansen says. "There is a close and open relationship between engineering and medicine here."

Saving Women's Lives

Another research area she's pursuing is using light to detect cervical cancer. Cervical cancer is one of the most preventable of all cancers, and yet the disease kills thousands of women in the United States each year. In sub-Saharan Africa, however, hundreds of thousands of women die from cervical cancer annually, in part because of the lack of early detection and access to health care.

"In Zambia alone, 1 in 5 women die from cervical cancer each year," Mahadevan-Jansen says. "I wanted to take the techniques we've developed and use them there."

But before that could happen, certain questions had to be answered. Through her research on mostly Caucasian women at Vanderbilt University Medical Center, Mahadevan-Jansen found that laser spectroscopy could detect pre-cancerous changes in the cervix 94 percent of the time. But she needed to know if those findings would hold up in ethnically diverse women. Partnering with physicians from Nashville's Meharry Medical College, she tested the method with African American women and found that race did not change the results. Since then, she has received funding from the National Institutes of Health (NIH) to continue her research in this area.

Power of Collaboration

Mahadevan-Jansen's work often reaches beyond campus. An interdisciplinary Vanderbilt team that includes Mahadevan-Jansen; her husband, Duco Jansen, professor of biomedical engineering; and neurosurgeon Dr. Peter Konrad is working with researchers from Southern Methodist University and other institutions to develop prosthetic arms and legs that work naturally through a two-way optical link with the peripheral nervous system. Supported by a grant from the Department of Defense, the researchers are attempting to use beams of light to stimulate and control bundles of nerve cells, allowing amputees to control and feel the movement of prosthetic limbs.

JOE HOWELL

Mahadevan-Jansen worked with Lisa White, MD'06, to develop a simple method to detect the parathyroid glands during thyroid surgery.

Mahadevan-Jansen also collaborates with physicians from the medical center on projects as diverse as using optical methods to detect deadly melanoma, identify the quality of bone health, and determine when mothers are having pre-term labor. Such collaboration often results in products to improve patient care.

"The physicians at Vanderbilt Medical Center are always happy to work with us," she says. "And the next thing you know, our research has the potential to become a (commercial) product. If it weren't for the relationship between engineering and medicine at Vanderbilt, that wouldn't happen."

Anita Mahadevan-Jansen

- Orrin H. Ingram Professor of Engineering
- Professor of Biomedical Engineering
- Professor of Neurological Surgery
- Ph.D., biomedical engineering, University of Texas, Austin, Texas
- M.S., biomedical engineering, University of Texas
- M.S. and B.S., physics, University of Bombay, Mumbai, India

On the Front Lines of the Cold War

by Cindy Thomsen

NATIONAL AIR AND SPACE MUSEUM (NASM 9A08839), SMITHSONIAN INSTITUTION.

A Pershing 2 missile on its launcher/erector in the field, circa 1983.

When Terrell Jones graduated from the School of Engineering in 1951, Vanderbilt engineers had their pick of top jobs. Because he was already married at the time, Jones opted for the offer with the highest pay. As it turned out, that job wasn't at all what he expected, but it did set him on a history-making career path that offered a front row seat to the Cold War.

After working as a "glorified draftsman" in Dallas for a year, Jones made the move to Huntsville, Ala.—Rocket City, U.S.A., to work for Rohm and Haas, the multinational chemical manufacturing giant, doing propulsion work for the U.S. Army. Jones recalls that Huntsville was a true boomtown in the 1950s.

"Things were developing so fast that one day they just completely bulldozed a cane field and poured a blacktop street down the middle of it," Jones says. "Then they'd put up these little prefab houses that were like shoeboxes. They were just two or three pieces stuck together."

His first job at Redstone Arsenal didn't have much room for advancement, so he made the move to civil service and began working for the Army Ballistic Missile Agency. The agency was headed by Wernher von Braun, the German-born American rocket scientist and trailblazer for the U.S. space program.

Top-secret

Jones, who eventually achieved top-secret clearance, started in the structures and mechanics lab and then moved to the propulsion project office. Shortly thereafter, the Department of Defense requested that the agency begin work on a new missile fueled by a solid propellant. Jones was assigned to the project, which eventually became the Pershing missile, and worked as the project manager for the missile's propulsion system.

The scope of the project was broad and unknown to many. People worked on different parts of the missile in different locations.

"People who were limited in their clearance might be working on a crankshaft, but they wouldn't know what it would go to," he says. "Later on, when I had to meet with the people doing the warheads, they were very selective in what they would let me see. They really didn't want to give me the weight and size of the nuclear device. I had to design around their restrictions."

The Pershing was a two-stage rocket and Jones was responsible for two rocket motors inside those stages. His parts of the puzzle had to mesh with everyone else's.

"If I made the thrust too high, then the guidance people griped because the acceleration would be too great, for example," Jones says. "One group wanted a smaller diameter, but I was able to have my way on that one."

Nuclear Mobility

As the work continued, it became clear that the Pershing was a one-of-a-kind weapon—the first ballistic missile that was mobile. To understand just how important of an achievement that was, one has to understand the political atmosphere at the time.

The threat of nuclear war with the Soviet Union and the fear of communism permeated America. Schoolchildren practiced bomb drills and families built shelters. With the nuclear arms race running full steam ahead, the Pershing missile was the key to U.S. defense.

The missiles had a fairly short range—only about 1,000 miles. They were positioned in Northern Europe, pointed at Russia.

"Each missile was on a big trailer that was pulled by a tractor-like vehicle," Jones says. "Whenever it stopped, these stabilizing feet would expand. This missile would be raised hydraulically from a horizontal position into a firing position. The next morning they'd lower the missile, pull up the feet and move it somewhere else."

All this time, Soviet satellites were tracking the missiles. According to Jones, the missiles' movements "drove the Russians crazy" because they couldn't keep up with locations. That mobility, combined with the threat of nuclear missiles able to breach Soviet borders, was a key U.S. military advantage.

In 1960, Jones departed the Pershing project and moved to North Carolina to work for Northrup Corp. After 10 more years developing missiles and propulsion systems, he left and started a second career building homes. After retiring from that construction business in the 1990s, he continued building as an active volunteer and site supervisor with Habitat for Humanity. Today, 51 years after graduating from VUSE, he resides in Palm City, Fla.

DAMON HIGGINS

Terrell Jones

Work for Naught—or Not?

Throughout his career—whether working on space-age technology or building homes, Jones has relied on his Vanderbilt School of Engineering education.

"After I started working, I was thankful that I had had to take some courses that I didn't appreciate at the time," Jones says. "It turned out that many things I learned through class work and lab work helped me in my field. I couldn't foresee that when I was in school."

The Army awarded Jones' work on the Pershing system, but Pershing missiles were never fired outside of a test situation. They—along with many Russian missiles—were banned by the Intermediate-range Nuclear Forces (INF) Treaty, signed by the United States and the Soviet Union in 1987. The Pershing missiles were all destroyed.

"I had mixed emotions about that treaty," Jones says. "I was glad to see anything with the potential to cause death and destruction gone. But from the standpoint of all that work—not just from me but from all the other people who worked on the project—it hurt.

"In the end though, I wish we could've gotten rid of all the nuclear missiles out there. This was just a small drop in the bucket." ●

Status Report

Dean Galloway on the State of the School

by Jennifer Johnston

JOHN RUSSELL

First-rate faculty. Talented students. Innovative research. Professionalism. All are hallmarks of the Vanderbilt School of Engineering under the leadership of Dean Kenneth F. Galloway. As he prepares to return to teaching and research—and continues his role as a national leader in engineering education—Galloway sat down with *Vanderbilt Engineering* magazine to reflect on the School of Engineering's past and look to the future.

VE: The engineering school is celebrating its 125th anniversary this year. When you arrived in 1996, you were only its seventh dean. How did it feel to become part of that long history?
KFG: It's been a wonderful experience. Vanderbilt is truly a great university. I've seen it improve in the time I've been here—in the quality of students, quality of faculty, in national recognition. So it's been a wonderful time to be here. I'm happy to have been part of a very large team, certainly in the engineering school, that helped make this happen. No one person can say, "I made this happen."

VE: Under your leadership, research expenditures from external sources grew from less than $10 million to $60 million annually at a time when federal resources were dwindling. What has spurred such tremendous growth, and what are the prospects for the future?
KFG: Overall, I've been amazed at what our faculty has been able to do with the resources they have. We have a tremendous, tremendous faculty—who have brought major research dollars to Vanderbilt—and that is improving every year. The young people

> "We have a tremendous, tremendous faculty . . . many of whom are among the best in the world at what they do."
>
> — Dean Galloway

we hire are among the very best in their fields. The emphasis here is still on teaching, but our faculty is very involved at the forefront of their research fields. They've been challenged and they've risen to the challenge. There's a lot of really good stuff going on. Not in any one department and not one small group of people. In every department, there are many contributors, many of whom are among the best in the world at what they do. I'm very proud of our young faculty who won National Science Foundation CAREER Awards. We've had 28 since the year 2000.

VE: What is the biggest challenge facing the school?
KFG: We're going to face a lot of challenges in the future in terms of federal funding. It's impossible to know what the federal government is going to do in terms of providing funding to academic engineering. Absolutely impossible.

VE: What other major challenges do you foresee?
KFG: It's always about people, space and money. The engineering school needs additional space due to the growth of our research programs. We have had some very generous alumni and donors, particularly during the *Shape the Future* campaign—donors gave $85.4 million to the engineering school alone and added 55 new endowed student scholarships during the campaign. But as the reputation of the university and the reputation of the engineering school have grown, we do have the opportunity to hire very, very talented faculty members, and we have done so, but we have missed hiring some because we had inadequate laboratory space for research programs. Bottom line: The faculty needs to grow and research programs need more space.

VE: What have been some of your most satisfying moments as dean?
KFG: One of the most enjoyable things I get to do is see how well our alumni are doing. I'm always impressed by what nice people they are and how they're still very interested in the university. Just this morning I had breakfast with Sandy Cochran (BE'80), CEO of Cracker Barrel Old Country Store. She's a great example of someone who used the problem-solving skills and analytical skills of an engineer to become a very successful businessperson.

C.J. Warner (BE'80), one of her classmates, is the president of Sapphire Energy, a company that's trying to extract oil from algae. We have a former student who founded Google Earth, Chikai Ohazama (BE'94), and is now a project manager for Google, and another who is the chief technology guy at Facebook, Jeffrey Rothschild (BA'77, MS'79). One of our graduates, David Dyer (BE'71), was president of Lands' End. He engineered the sale of that company to Sears and is now the president of Chico's. Joe Dorris (BE'65) is the former president of Futaba Corporation of America. You see Vanderbilt engineers very often moving to leadership positions. I think they get a broader education at Vanderbilt.

VE: How would you describe the current students in Vanderbilt engineering?
KFG: Our students are the best at Vanderbilt. We have benefited from the university's growth in the national perception of its quality. In 1986, the average SAT score of incoming freshmen in engineering was 1280. Today, it is 1485. This year, we had 5,343 applicants for 320 spaces.

Vanderbilt engineering is also very fortunate in the sense that it's always been thought of as a good place for women to study. About one-third of our students are women—that's about twice the national average.

VE: What do you think is unique about the educational experience at Vanderbilt?
KFG: Vanderbilt is not a typical engineering school. We're not a tech school, so our students have opportunities to take courses in the College of Arts and Science, to be part of the university. It's a little different place to study engineering.

VE: What's next for you? We understand it involves a national role in advocating for engineering education.
KFG: I have just been elected president-elect of the American Society for Engineering Education, starting in June and assuming the presidency in June 2013. This will occupy a good deal of my time for the next two years. It's a pivotal time in the leadership of the society as we increase our focus on public advocacy for engineering and engineering technology education with decision makers in academia, industry and government.

My goals will be to continue ASEE's efforts in communicating the excitement of engineering to students in K-12; in promoting diversity in the engineering workforce; in preparing students for a globalized economy, and in encouraging collaboration between academia and industry.

Also, I plan to return teaching and research within the Radiation Effects Research Group at Vanderbilt. The RER has a strong research portfolio that supports the federal government in radiation effects and microelectronics research for space applications.

100+ Years and Continuing

VANDERBILT UNIVERSITY SPECIAL COLLECTIONS AND ARCHIVES

A young H. Fort Flowers, BE'12, MS'15, (left) with his three-wheeled Motorette and friend Sam Hunt (leaning on seat) in downtown Nashville.

by Cindy Thomsen

Some philanthropic families put their names on buildings. Others endow chairs. Still others choose to create scholarships. Rarely does one family do all three—but the Flowers are no ordinary family when it comes to supporting Vanderbilt.

For more than a century, members of the Flowers family have attended and supported the Vanderbilt School of Engineering. It started with H. Fort Flowers, a young man from a farm in Adairville, Ky.

Flowers was born in 1887 as the last of seven children and attended a one-room schoolhouse. In the early years of the 20th century, he graduated at 15 and moved to Nashville to live with an aunt. He apprenticed with Nashville's Tennessee Central Railroad locomotive shop for nearly four years. H. Fort's son, Daniel Flowers, G'49, picks up the story from there.

"At the end of the apprenticeship, my father entered Vanderbilt to be trained as an engineer," Dan says. "I don't know if there were scholarships back then, but Vanderbilt found him a job teaching machine shop [then part of the engineering school]. He was invited to join a fraternity—Phi Kappa Psi—and that gave

him lots of contacts he would use in the future."

After graduating in 1912, H. Fort headed to New York City and a job with Otis Elevator as a draftsman.

"It was while working in New York and living at the Phi Kappa Psi fraternity house at Columbia University that he met—at a fraternity convention—the chief engineer of Cleveland Electric Power," Dan says. "That gentleman told my father that he needed a special kind of railroad car. My father sketched one out on the spot. The man from Cleveland Electric told my father that if he could build it, Cleveland Electric would buy it."

Railway Car Magnate

The design H. Fort roughed out that day was for a street railway dump car that unloaded bulk material from the side. H. Fort turned to the Nashville Bridge Company to build it and within five months, he delivered the first car. While it was being constructed, he completed requirements for a Vanderbilt graduate degree in mechanical engineering. It was 1915 and the Differential Steel Car Company was born.

Many railway cars, as well as mine cars and trucks and more than 80 patents later, H. Fort decided that it was time to give back to the school that had given him so much.

"My father had a good reason for supporting Vanderbilt—because Vanderbilt supported him," Dan says.

In 1969, the highly successful engineer, inventor and manufacturer funded the H. Fort Flowers Graduate Wing of the Heard Libraries. Of no less significance was that he encouraged his children and grandchildren to follow in his philanthropic footsteps.

"The family has gone in and continued to support Vanderbilt," Dan says. "We owe a great deal to Vanderbilt and we have a duty to keep that up."

In 1980, H. Fort's children, Daniel, Barbara, Joan, Sara and Fred, G'72, created the H. Fort Flowers Endowment Fund at the School of Engineering. It funds the H. Fort Flowers Chair in Mechanical Engineering, first awarded in 1990 to Thomas A. Cruse. Today the chair is held by Michael Goldfarb, H. Fort Flowers Professor of Mechanical Engineering, who is doing breakthrough development of robotic artificial legs and arms for amputees.

By 2011, the fund had grown in value and a second endowed chair was created. The second chair is named for H. Fort's late son-in-law, John R. Murray Sr., also an engineer. The John R. Murray Sr. Chair in Engineering is held by Sankaran Mahadevan. H. Fort's grandson, Joseph Flowers, BE'88, explains why these chairs would've meant so much to his grandfather.

"After my grandfather passed away in 1975, there was an interest in putting together a way to honor him at the school," Joseph says. "The idea was to focus on teaching, particularly on the teaching of design. He always felt it was important to push design and to encourage new thinking and creativity—especially as the world became more compartmentalized."

Buildings to Chairs to Scholarships

Joseph and his wife, Lori Manix Flowers, BA'88, took the family's giving in a new direction in 2003 when they endowed the Joseph and Lori Flowers Scholarship in the School of Engineering.

"When I was at Vanderbilt, I was lucky enough to receive a General Motors scholarship during my junior and senior years," Joseph says. "The sense of freedom that came with it was really nice. It's great to share that freedom with other students and help them concentrate on their work and not worry about the financial stuff."

Lori says she hopes the scholarship helps students make the decision to come to the School of Engineering. "I like to think that we're helping students go where they truly want to go and not just where they can afford," she says.

It's remarkable to consider that the Flowers family has been part of Vanderbilt for more than 100 years—especially as the School of Engineering celebrates its 125th anniversary. The family has supported virtually every area of the school and Vanderbilt as a whole—from buildings to teaching to scholarships. Members of the Flowers family have been involved at a variety of levels, providing time, gifts, expertise, guidance and support, as well as graduating several generations of alumni.

"With a quality institution, you have to support the infrastructure and promote the quality of the students," Joseph says. "Otherwise, the legacy can't continue. My parents and my grandparents have a history of supporting Vanderbilt. Without people like them, it would be a different place." ●

H. Fort Flowers' Family Tree at Vanderbilt

Children:

Daniel F. Flowers, G'49, is married to Jean Davis Flowers, BA'56.
Fred Fort Flowers, G'72

Grandchildren:

Lynne Flowers Carlton, BS'82, is married to Dr. Jeffrey C. Carlton, BE'81, MD'85.
Jane Murray Davis, A'78
Joseph Flowers, BE'88, is married to Lori Manix Flowers, BA'88.
Julia M. Flowers, A'73
Richard W. Flowers, MBA'82
Katherine M. Henderson, BA'73, is married to Carl Henderson, MS'74, MS'77.
John R. Murray Jr., BE'74

Great-grandchildren:

Ann Davis Weber, BA'02, EdD'11, is married to Eric Weber, BS'01.

Plenty to Celebrate

PHOTOS BY ZACH GOODYEAR PHOTOGRAPHY

by Mary Elizabeth Copeland

Dean Kenneth F. Galloway and the Engineering Alumni Council hosted alumni, parents and friends at the fall Celebration Dinner commemorating the 125th anniversary of the Vanderbilt University School of Engineering. Festivities included a slideshow highlighting the school's past, the presentation of the Distinguished Alumni Award to three esteemed graduates, and remarks from Chancellor Nicholas S. Zeppos and Provost Richard M. McCarty.

Members of the Fred J. Lewis Society and alumni returning to campus for Reunion Weekend watched as three outstanding alumni joined the ranks of the School of Engineering's Academy of Distinguished Alumni. Robert G. Anderson, BE'65, John D. Gass, BE'74, and Thomas R. Walters, BE'76, were nominated and selected for induction based on their career achievements, service and character.

Associate Professor of the Practice of Engineering Management and Director of the Division of General Engineering Christopher J. Rowe, BE'96, ME'98, surprised Galloway with a signed print of a Spirit of Nashville piece commissioned in honor of the school's 125th anniversary. Guests received prints to commemorate the event and anniversary (A modified version of the art graces the cover of this issue of *Vanderbilt Engineering*).

The Celebration Dinner provides an opportunity for donors to enjoy the company of former classmates, professors and university leadership. Guests also meet current students, many of them scholarship recipients.

For more information regarding the dinner and awards, Distinguished Alumni nominations or to become a member of the Fred J. Lewis Society, contact Development and Alumni Relations at (615) 322-4934.

Above, from top: Claire Earll, BA'08, Matt Walters, BE'08, and Dean Galloway. **Second:** Engineering Alumni Council President Pam Hathcock deZevallos, E'67, Bob Anderson, BE'65, and Cherry Anderson. **Third:** The Academy of Distinguished Alumni welcomes its new members. **Fourth:** Sophomore Peter Ingram, Crenshaw W. and Howell E. Adams Sr. Memorial Scholarship recipient; junior Katie Lopez, Frederick M. and Jean B. Riggs Scholarship recipient; and sophomore Ian Shaw, Hardaway Family Scholarship recipient.

The Academy Welcomes

Robert G. Anderson, BE'65

After graduating from Vanderbilt with a civil engineering degree, Anderson progressed through the ranks at Rodgers Construction Co., eventually becoming its president. He now serves as chair of the R.G. Anderson Co., a construction company he founded in 1989 and which consistently ranks among the top construction companies in the region. He has served on the Engineering Alumni Council and is a member of the School of Engineering Committee of Visitors and the Fred J. Lewis Society.

Above: Bob Anderson (second from right) celebrates his induction with family.

John D. Gass, BE'74

Gass started designing offshore platforms at Chevron shortly after earning his civil engineering degree at Vanderbilt. Today he is a vice president of Chevron Corp. and president of Chevron Gas and Midstream, responsible for the company's global natural gas business. He also oversees Chevron's shipping, pipeline and power operations. Gass is actively involved with Vanderbilt as a member of the School of Engineering Committee of Visitors and as a member of the Fred J. Lewis Society.

Above from left: John Gass is congratulated by his wife, Jane Ann Driver Gass, BS'74, and his mother, sister and brother-in-law.

Thomas R. Walters, BE'76

Mechanical engineering graduate Walters began his career with Exxon in 1978 and has worked both nationally and internationally for the company. He is now president of ExxonMobil Gas and Power Marketing Co. and serves as a vice president of Exxon Mobil Corp., the world's largest publicly traded international oil and gas company. Walters is a member of the School of Engineering Committee of Visitors and the Fred J. Lewis Society.

Above: Matt Walters, BE'08 (far left), and Jake Walters, BE'11 (third from right), join family members in congratulating their father, Tom Walters (third from left), on his Distinguished Alumnus Award.

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A Look Back

Don't panic if you walk up to the side door of Jacobs Hall and find something missing. The Tau Beta Pi Bent hasn't been kidnapped or removed. After 45 years in one spot, the sculpture of a watch key in the shape of a trestle bent has been given a more prominent place in the heart of the engineering complex. As part of recent renovations, The Bent was relocated to the courtyard in front of Featheringill Hall where students, faculty and staff pass by daily. The Bent was installed in 1965 by engineering honor society Tau Beta Pi.

Vanderbilt Engineering **extends a very grateful thank you to Vanderbilt University Special Collections and Archives, and Philip Nagy in particular, for assistance over and above in the course of our 125th anniversary year.**

JOHN RUSSELL