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eGFI Dream Up the Future

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American Society for Engineering Education

How many examples of engineering did you find?

1. Underwater turbine*
2. Flying ambulance
3. Medical body scanner
4. Robotic surgery*
5. Medicine*
6. Medical 3-D projection display
7. Rail transportation*
8. Fountain*
9. Cosmetics*
10. Shoes*
11. Water desalination plant*
12. Robotic dolphin
13. Lasers*
14. Green roof*
15. Robotic gecko*
16. Futuristic shopping
17. Video games*
18. Building changing color
19. Virtual computer interface
20. Vertical farm*
21. Hover scooter
22. Hover board
23. Energy-efficient street lamps
24. Personal flying vehicles*
25. Stadium*
26. Sound system
27. Robot cleaning
28. Robot cooking*
29. Projection television
30. Submarine*

31. Green wall
32. Lighting system
33. Wind turbines*
34. Diamond from mining*
35. Glass sky road
36. Roller coaster connecting buildings
37. Skywalk connecting buildings
38. Communications tower
39. Traffic circle
40. Hover cars
41. Soccer ball*
42. Thermal energy heating pipes*
43. Mining*
44. Robot painting building
45. Toy factory
46. Robots working in factory*
47. Bridge over river*
48. Recycling*
49. Solar panels*
50. Rocket to space*

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ENGINEERING IS...

Have you ever wondered who created the world's tallest, fastest roller coaster? Or who designed the smartphone that lets you play Angry Birds while you're waiting in line to ride it? Engineers are the minds behind almost all of today's technologies. They solve problems using science and math, drawing on their creative powers to come up with better ways to get things done. And they find new ways to turn imagination into reality. Engineering is many things, some of which are shown here. **What else can you dream up?**

Designing Cool Gadgets

First the iPod, then the iPhone, and now the iPad: For the past decade, Apple has clearly been getting things right when it comes to producing revolutionary portable computing devices. Its latest offering, the iPad 2, has been a runaway success, boasting features like an interactive touchscreen, an HD display, two cameras, Wi-Fi, and countless downloadable apps that range from the useful and educational to the purely fun and silly. The sleek new design is also 33 percent thinner and 15 percent lighter than the original iPad. Rival companies like Motorola and Samsung have raced to bring tablet computers to the market as well, but so far Apple commands the majority of the market share. Could a tablet with a 3-D display be coming next? Or maybe one that easily folds into your pocket? Only time — and tomorrow's engineers — can tell.

Making Movies

Cartoons have come a long way since the hand-drawn moving pictures of decades past. Now, the animated films at your local cineplex are made possible by sophisticated computer software created by engineers. Modeling the realistic textures and movement of such things as fur, hair and fabric, for example, takes serious computing power. Without it, the swashbuckling hero of *Puss in Boots* would look decidedly less so. And when a cartoon character looks solid enough to touch, it's thanks to a 3-D animation software package called Maya, now the industry standard. Clearly, it takes a lot of ingenuity to create characters that virtually pop off the screen.

Defying Gravity

Today's roller coasters are engineering marvels, taller and faster than ever. Kingda Ka in New Jersey has a 418-foot drop and races to speeds of up to 128 mph. Its hydraulic launch system catapults riders to maximum speed in just 3.5 seconds. In 2002, the top speed of the world's fastest ride was "only" 106.9 mph. And engineers are still pushing the speed envelope. The Ring Racer in Germany will use an air launch system to zoom to 135 mph in 2.5 seconds. Hold tight!

Creating Makeup

Makeup, lotions and shampoos all contain chemicals, even if they're marketed as "all natural." That's why chemical engineers have always been crucial to the manufacturing of cosmetics. For example, many products now use nanosize chemical particles (measuring three-billionths of an inch or less) in order to make them more effective. When the active ingredients in sunscreens, like titanium dioxide, are reduced to nanoparticles, the sunscreen doesn't leave a white, greasy film on the skin. Some cosmetics have supersmall beads that contain key chemicals that get activated only when they're needed. Chemical engineers have also developed smart makeup that reacts to your pH (acid) levels and body temperature to create a color just for you.

ENGINEERING IS...

Finding Solutions

Fit and athletic amputees have proved over and over that the loss of a limb is no reason to give up sports (story, page 12). But prostheses for swimmers have remained clunky, at best. That's why Richard Stark, a student at Sweden's Umeå Institute of Design, was inspired to create Neptune, a specially engineered prosthesis for competitive swimmers. The colorful, flexible superflipper can be adjusted to provide different amounts of resistance and can also rotate 90 degrees to accommodate breaststroke kicks. Judging from Stark's tests, Neptune works just swimmingly.

Cleaning Up Pollution

Can you imagine big cities without smog? Soon, the buildings around you might be cleaning up the air. TX Active, a new innovative cement product, kills pollution by neutralizing the toxins that come into contact with it. The secret ingredient is titanium dioxide, a chemical often used to turn paints bright white.

TX Active begins consuming smog as soon as it is exposed to sunlight or ultraviolet light. Its maker, Italian company Italcementi, claims that if 15 percent of a city's surface area were covered with the material, air pollution could be cut in half. With cement production alone contributing to 5 percent of global carbon emissions each year, smog-eating buildings sound like the perfect way to green up the streets.

Fashioning New Materials

They say practice makes perfect, but at the elite level, athletes need more than just training to improve. Materials engineers play a key role in creating athletic wear that can record the body's movements in fine detail, helping athletes and coaches better understand what makes a great performance.

The Under Armour E39 shirt is designed to do just that. Equipped with electronic sensors and a three-axis accelerometer, this biometric top can monitor breathing and heart rate, as well as measure the swiftness of a runner's left and right strides independently. NFL tested and player approved, these smart shirts could soon be helping you make varsity.

NEPTUNE FLIPPER COURTESY RICHARD STARK

Building a Greener World

These days, living inside a bubble is beginning to look more and more attractive. South Korea is planning to construct a series of giant domes that mimic the world's ecosystems while providing a place for scientists and regular citizens to study the environment. Designed by SAMOO Architects and Engineers, the Ecorium Project spans 33,000 square meters and will feature an education center, a wild plant area, a wetland reserve, an environmentally focused think tank, and a large system of interconnected greenhouses.

Ecorium scientists will study nature's many different ecosystems and how to best protect them and also offer public exhibitions and programs on environmental preservation. And you thought your local science center was cool!

Making Video Games

Nintendo revolutionized video gaming in 2006 with the Wii and its motion-activated controller. Sony eventually introduced a similar controller, the PlayStation Move. But in 2010, Microsoft responded with Kinect, a plug-in device for its Xbox 360 console that gets rid of hand-held controllers altogether. Using a webcam and 3-D light sensors, the technology is ideal for dance games. In the best-selling Kinect game Dance Central, players move their feet, hips and arms to any one of 32 different dance anthems while their on-screen avatars mimic their moves.

Exploring the Oceans

Aerospace engineers may call space the final frontier, yet Earth's oceans are still 95 percent uncharted territory. Now, Virgin wants to shine some light into the deep and is about to launch the ultimate undersea expedition to do so. The Virgin Oceanic submarine will complete five pioneering dives – one in each of the world's oceans – over the next two years. The single-person sub will be the first manned vehicle to visit four of the five chosen sites, as well as the first underwater vessel capable of reaching full ocean depth. No one knows what new treasures or creatures we'll find down there, but they're bound to be extraordinary.

An engineer finds his passion working in the movies.

Dreaming in 3-D

GROWING UP, Patrick Campbell liked working on cars and figured that studying mechanical engineering was a good way to get into the field. He never imagined that one day he would help create a 3-D camera system that would wow moviegoers around the world in the highest-grossing movie of all time.

Campbell's interest in cars turned to cameras after a chance meeting with cinematographer and inventor Vince Pace. At the time, Pace was designing underwater camera housings and lighting for James Cameron's blockbuster film *Titanic*. Campbell joined the team at Pace's company in California and started working on a 3-D digital camera for *Ghosts of the Abyss*, a Cameron documentary that explored the wreck of the Titanic on the ocean floor.

Before the film premiered in 2003, Cameron approached Pace with the idea of making a lightweight digital 3-D camera for a film he wrote before *Titanic* but didn't make because the technology wasn't advanced enough at the time. "All we knew then was that it would be non-water related, but that was about it," Campbell recalls. The project was *Avatar*.

The demands for the camera were stringent. It had to shoot in high-definition 3-D, but it also had to be lightweight and comfortable enough to be carried around for hours. The result was the Fusion 3D camera system, which consists of two camera sensors and two lenses mounted 2.75 inches apart – roughly the same distance as between a pair of eyes. The angle of the lenses changes as a subject gets closer or farther away, mimicking the way eyes move when looking at something. The engineers incorporated lots of electronics and software to make sure all the systems worked properly and in sync.

Campbell says that work on the Fusion 3D camera system is the best thing that has ever happened to him professionally. Adds Pace: "The smartest move I made in business was partnering with a brilliant engineer."

James Cameron plans to film two sequels to *Avatar* to be released in December 2014 and December 2015. "When working with Cameron, you can never know the full extent of what he wants to accomplish until just before you start shooting," Campbell says. "He's always pushing the boundaries when making his movies, and he'll expect us to adapt the Fusion system for whatever situation he comes up with for the *Avatar* sequels."

PHOTO OF JAMES CAMERON BY MARK FELLMAN

Imagining the solar-powered highway of the future

Driving on SUNSHINE

Electrical engineer Scott Brusaw dreamed of "electric roads" as a child. A few years ago, his wife, Julie, reminded him of his boyhood fascination and asked why roads couldn't be paved with solar cells to collect and convert sunlight into electricity. No way, Brusaw said at first: Solar cells are too fragile to drive on.

But then Brusaw consulted materials engineers at Pennsylvania State University and the University of Dayton and learned about bombproof glass being created for U.S. Army Humvees. "After I talked to the glass experts, I walked away convinced it could work," he says. So he started Solar Roadways, a company dedicated to bringing his dream of electric roads alive.

Brusaw estimates that the United States has 25,000 square miles of asphalt-covered surfaces that get at least four hours of sunlight each day. If all that solar-heated pavement were used to create electricity, it could provide enough juice to meet the nation's power needs three times over.

With $100,000 from the U.S. Department of Transportation, Solar Roadways developed a prototype solar road panel. In 2011, the company got an additional $750,000 grant to improve upon it. The panel is the core component of Brusaw's vision of an intelligent highway system – powered not by fossil fuels but by the sun.

CHARGING UP
Paved with solar road panels, rest stops provide convenient charging stations for electric vehicles.

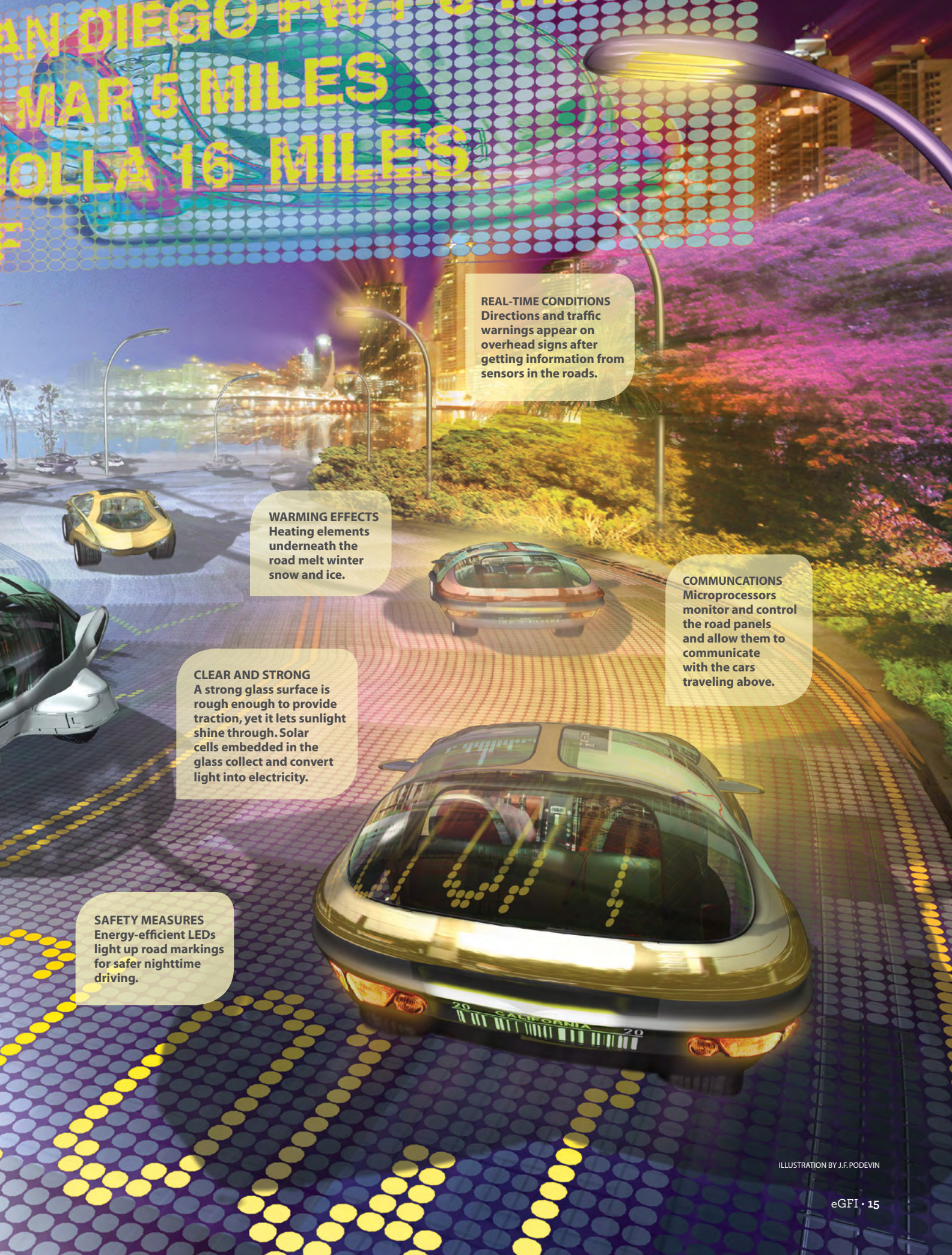

ILLUSTRATION BY J.F. PODEVIN

STUDENT VOICES

Ebonè Pierce

Dillard University, New Orleans, La.

Mechanical Engineering & Physics

"I chose to become a mechanical engineer because I love to build and create things that will benefit others. I love to help people, and to see a smile on their faces is when I feel most accomplished."

"As a young kid, I would spend hours playing with Legos. I loved having thousands of them at my disposal to design whatever I could dream up. In fifth grade, I was assigned a project to write about where I saw myself in 20 years. I explained to my teacher that I enjoyed playing with Legos, and she said that I should consider engineering."

Brian Wybrecht

Michigan State University, East Lansing • Civil Engineering

You have been reading a free preview of the latest edition of eGFI magazine, which is only available in print. To read more about amazing engineering innovations and careers — including the articles above — please purchase a copy from our online store: https://shop.egfi-k12.org/

Or continue reading the previous edition of eGFI magazine on the following pages...

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ENGINEERING: GO FOR IT

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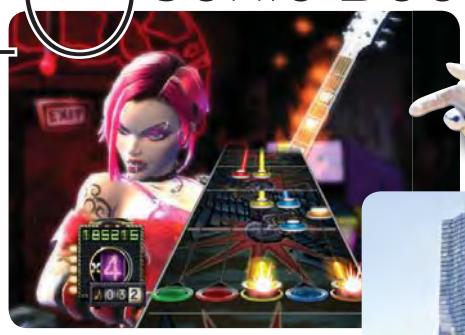
LOOK INSIDE

2 Engineering Is...

8 Pick a Major

16 Action Replay

20 Sonic Boom



18 High Ambitions

44 Student Voices

COVER ILLUSTRATION: **HUAN TRAN**

ENGINEERING IS..

Have you ever wondered who created the world's tallest, fastest roller coaster? Or, for that matter, who designed the airplane or car that brought you and your family to the theme park? Have you ever thought about who came up with text messaging? From smart phones to solar power plants, engineers are the minds behind almost all of today's technologies.

Engineers solve problems using science and math, harnessing the forces and materials in nature. They draw on their creative powers to come up with quicker, better, and less expensive ways to do the things that need to be done. And they find ways to make dreams a reality. Engineering is many things, some of which are shown here. What else can you dream up?

Creating New Materials

Nanotechnology is the re-engineering of matter at the atomic and molecular levels. That kind of manipulation means researchers can create brand-new materials that have applications in many areas, including health care, auto manufacturing, aeronautics, fashion, and cosmetics. For example, engineers at the University of Illinois at Urbana-Champaign are working on materials that repair themselves if damaged. They could be used as skins for rockets and aircraft. Engineers at Lehigh University have created a material with iron nanoparticles that removes cancer-causing arsenic from groundwater. And Georgia Tech researchers have created fibers that harness electricity from body movement. Woven into clothing, the fibers generate electricity from nanowires attached to their surface. The electricity could then be used to power portable electronic devices — truly juicy couture.

Saving the Earth

Coal-fired power plants are a major source of carbon dioxide, a greenhouse gas. But they continue to be built because coal remains an abundant and cheap fuel source. Still, a report from the Massachusetts Institute of Technology says that carbon dioxide emissions could be drastically cut, even with increased coal burning. The trick: Future power plants would have to capture the carbon and then sequester, or bury, it underground. The MIT report calls for the construction of large-scale demonstration plants to help engineers develop the best carbon capture-and-storage technologies. Meanwhile, MIT civil engineer Ruben Juanes determined that carbon dioxide could be injected into saline aquifers. Safely trapped as tiny bubbles within briny, porous rock, the carbon dioxide won't leak back into the atmosphere, even centuries later.

MAKEUP: ISTOCK; EARTH: COURTESY NASA

Entertaining the Public

The 3-D movies from decades past were often gimmicky stinkers. But at least the effects were fun, and you got to wear colored glasses in the theater. Now, 3-D is making a comeback, and this time, the content may equal the technology. The creepy *Coraline* delighted kids and adults alike. DreamWorks' *Monsters Vs. Aliens* (left) benefited from new, computer-assisted filming technologies. And *Avatar*, a 3-D sci-fi flick directed by James Cameron (*Titanic*) is slated for release in 2009. One expert predicts that 3-D will be mainstream within five years. Then, the technology will quickly filter into home video devices, dragging gaming and Internet surfing into the third dimension. It'll also open up a new market: reprocessing old 2-D movies into 3-D ones for home enjoyment.

Building Virtual Worlds

Virtual reality allows us to experience other worlds, both real and make-believe. Engineers use complex algorithms to build 3-D virtual spaces that fool our senses and make us feel as if we're really there. At Disney World, strap on a VR helmet and find yourself riding Aladdin's magic carpet. Soon, you could step into an Immersive Cocoon (right) and be surrounded by the sights and sounds of another world. But VR technology isn't all fun and games. An electrical engineer has designed a computer-generated, 3-D approximation of war-torn Iraq to test bomb-detecting sensors under many different conditions. The tests revealed ways to use the sensors more effectively. That's a lifesaving payoff that's real, not virtual.

Making Cool Gadgets

When Apple's engineers created the iPhone (right) a few years ago, it was an immediate hit, despite a fat price tag. Not only was it a cell phone but an iPod-like music and video player, too. It could surf the Web, handle e-mails, and receive GPS signals. Plus, it looked great and had touch-screen control.

The latest iPhone not only costs less than the original but is 3G, so its cellular and Wi-Fi connections are faster and more robust. It's also a computer platform, so software makers can design countless applications for it, which owners can download from Apple's latest e-tailing venture, the App Store. The iPhone's popularity sparked a race among mobile phone manufacturers to mimic its sleek interface. Next, Palm hopes its Pre smartphone can capture a share of that excitement.

Defying Gravity

Today's roller coasters are engineering marvels, taller and faster than ever. Kingda Ka in New Jersey (left) has a 418-foot drop and races to speeds of 128 mph. Its hydraulic launch system catapults riders to maximum velocity in just 3.5 seconds. In 2002, the top speed of the world's fastest ride was "only" 106.9 mph.

Though it makes you feel weightless, a coaster's hair-raising downhill plunge actually makes you appreciate gravity's pull. Some hit G-forces of nearly six times gravity — well beyond what space shuttle astronauts experience upon launch. Albert Einstein called roller coasters perfect examples of energy conservation in a mechanical system, because they convert potential energy into kinetic energy and rely entirely on gravity and momentum. And engineers are still pushing the speed envelope. The Ring Racer in Germany will use an air launch system to zoom to 135 mph in 2.5 seconds. Hold on tight!

ROLLER COASTER: GETTY IMAGES

Brewing New Fuels

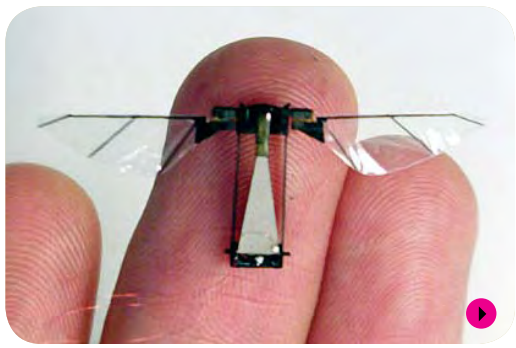
Corn and soy aren't just foods. They're also the feedstocks for alternative fuels such as biodiesel and ethanol. Some say that increased demand for those crops has led to spiraling food costs and shortages. But the new hope for biofuels is a plant that won't compete for farmland: algae. Yep, pond scum. An acre of algae should produce 10,000 gallons of oil — perhaps as much as 100,000. Soy produces only 50 gallons per acre. Moreover, fast-growing algae can be grown on land unsuitable for other crops and doesn't require scarce fresh water. However, the process of growing and processing algae is still quite expensive. That's why engineers at schools like Arizona State University continue to research affordable methods to turn algae into a truly green fuel.

Developing Alternative Energy

A growing gust of support is giving clean, inexhaustible wind energy a real lift. The U.S. Department of Energy says it's possible for wind to produce 20 percent of the nation's electricity by 2030, up from 1 percent now. Legendary Texas oilman T. Boone Pickens says it can be done within a decade. He's building the country's biggest wind farm in Texas, already the leader in wind power. But engineers have several hurdles to clear to make wind mainstream, including figuring out how to store excess capacity during calm periods and how to move electricity hundreds of miles from windy vistas to power-hungry cities. Universities in Wyoming, Colorado, and Iowa are among the many schools working to make wind energy a force to be reckoned with.

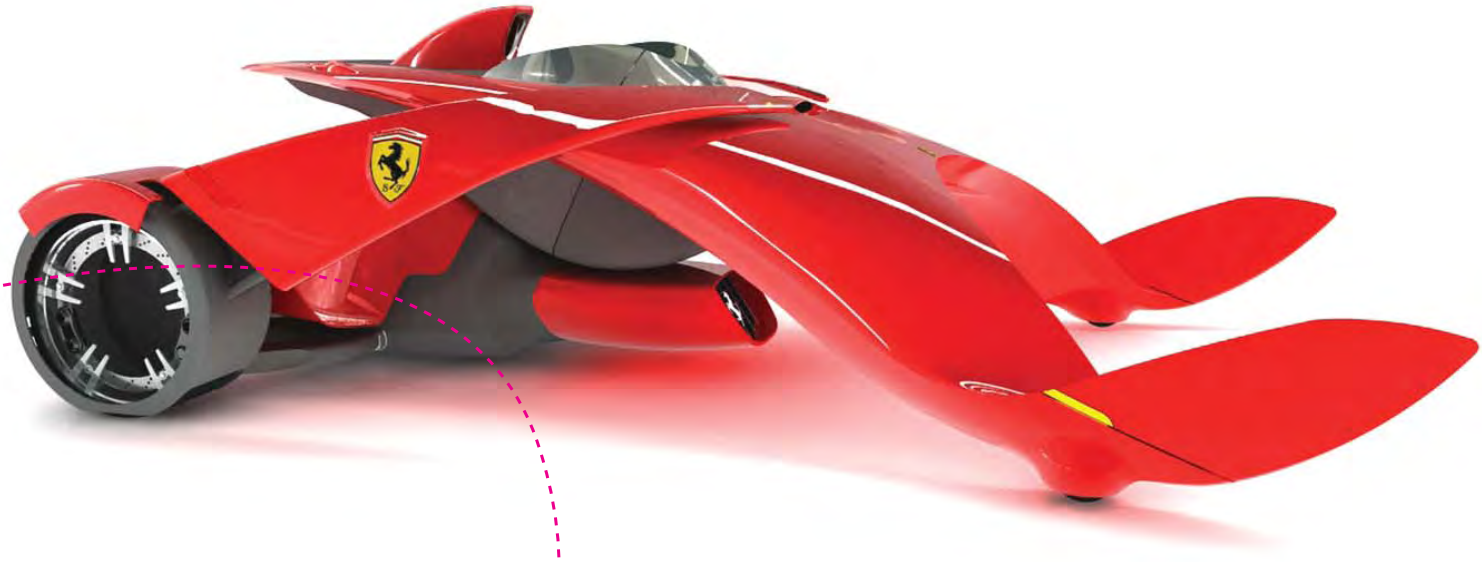
Fighting Terrorism

Harvard University engineer Robert Wood is developing a robotic fly. Propelled by tiny, flapping wings, the microrobot (right) weighs no more than a few grains of rice and flits about just like a real fly. It's pretty cute, but it's also a deadly serious device. With light and odor sensors attached, Wood's robofly could be a tiny spy in the sky, keeping track of terrorists or detecting bombs.



Like Wood, many engineers are working to fight terrorism by devising technologies to help keep the country safe. Some are developing wireless networks of dust-sized sensors to sniff out chemical or biological weapons. Other engineers are developing machines to scan trucks for explosives. And still others are toiling to improve cybersecurity in order to protect the Internet from attack.

GAS PUMP: ISTOCK; ROBOTIC FLY: COURTESY HARVARD; WIND TURBINES: SCIENCE PHOTO STOCK



Designing New Vehicles

Cars of tomorrow will certainly look different from today's. Gasoline-powered, internal-combustion engines are bulky. Getting rid of them would free up a lot of space, allowing engineers to rethink automotive design. Car interiors may look more like comfortable lounges with customized seating arrangements. And forget steering wheels: Carnegie Mellon University researchers predict that self-driving robotic cars are only a decade away. Car exteriors will look different, too. Audi engineers suggest that cars could use holograms to change looks. Toyota predicts that nanotechnology will enable cars to morph into different shapes and styles based on a driver's whims. Ferrari's Monza concept vehicle (above) is "part car, part motorcycle, part flying wing." It takes the idea of a "hybrid" to a whole new level.

Reducing Poverty

Nearly half the world's population lives on less than $2 per day. But abject poverty shouldn't be tolerated as a natural part of the human condition. Noted physicist and futurist Freeman Dyson believes that technology can help raise people out of destitution. He's chairman of the Solar Electric Light Fund, which brings affordable solar power to rural areas in the developing world. In poor communities, lack of electricity can have a devastating effect on health, education, enterprise, agriculture, and the environment. One recent SELF project installed solar power at four health clinics in a mountainous region of Lesotho, Africa, where HIV infection is rampant. SELF's motto reads: "Energy is a human right." And who better to help grant that right than engineers? After all, they're energy experts.

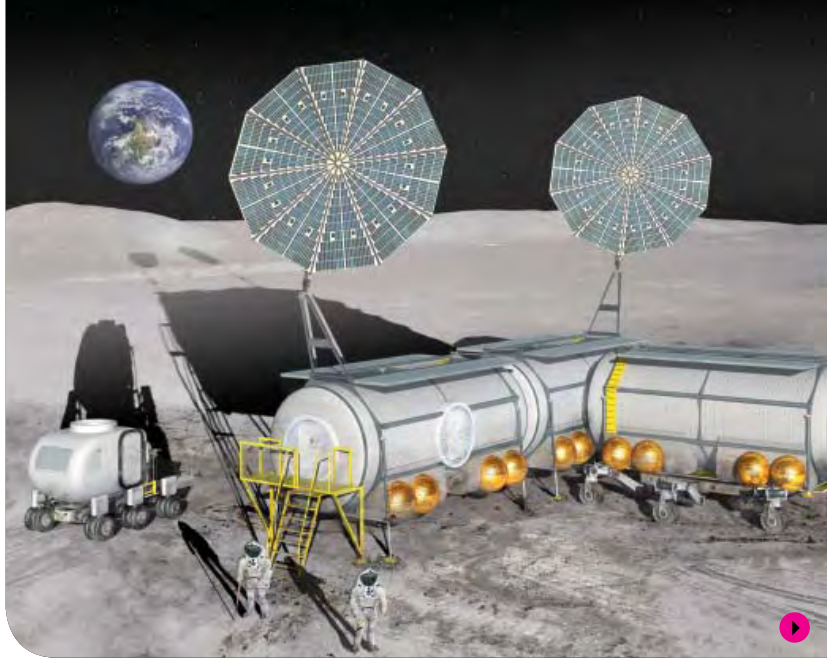
Curing Illness

The chemotherapy drugs that Mark Davis' wife needed to battle breast cancer made her horribly ill. Davis, a chemical engineer at the California Institute of Technology, resolved to find a better way. Most chemo drugs attack healthy as well as cancerous cells, thus causing awful side effects. Davis devised a solution that's now in clinical trials. He bonded the molecules of a strong drug with those of a polymer. The resulting molecules are too big to pass through blood vessels in healthy tissues but can slip through the leakier blood vessels that feed tumors. In one test, the new drug delivery method effectively treated a case of pancreatic cancer considered to be fatal. No wonder biomedical engineering is such a popular, fast-growing discipline.

SOLAR IMAGE: COURTESY SOLAR ELECTRIC LIGHT FUND; NANO IMAGE: CONEYL JAY/PHOTO RESEARCHERS, INC.; CAR: COURTESY IMAN MAGHSOUDI

Protecting Soldiers

Soldiers in battle wear many pounds of protective gear. But that protection isn't perfect. Those who survive bomb blasts often suffer brain trauma, resulting in symptoms ranging from memory loss to blurred vision. MRI scans often can't detect brain injuries from shock-wave jolts, because the damage consists of microscopic tears to brain cells. But Shu Yang, a University of Pennsylvania materials engineer, has developed a crystal patch that changes color when hit by a shock wave. The resulting color can indicate the severity of the blast. A patch worn on a uniform could allow medics to more quickly determine if a blast victim is at risk of injury. The U.S. Army is also using special sensor-equipped helmets in Afghanistan that measure how badly a head is shaken by blasts. The collected data will help researchers develop helmets that offer better shock-wave protection.



Exploring Outer Space

We're going back to the moon — this time, for good. NASA expects to establish a permanent base on the lunar surface by 2024. So engineers must design modular living and working quarters that can house four astronauts for four weeks at a time. The shelters will have to store adequate supplies of air, food, water, and equipment and protect occupants from heat, dust, and radiation. NASA engineers are also developing pressurized, two-person rovers so astronauts can explore hundreds of miles of moon terrain. And since it's easy to get lost in a lunar environment, NASA has given Ohio State University engineers $1.2 million to develop a navigation system that will work like GPS but without satellites. That way, no one will get lost in space.

Ending World Hunger

World hunger could worsen as cropland becomes scarcer and the Earth's population increases. A Columbia University environmental health scientist thinks the solution lies in building high-rise, indoor farms right in the heart of the world's cities. Dickson Despommier says that such farms could grow a variety of foods using hydroponics. That means no need for pesticides, fertilizers, or good soil, which is an issue in poor regions. It would take 4 to 6 acres of land outdoors to match the crop yield of just 1 acre indoors. The farms could raise chickens, pigs, and fish, too, all in a controlled, closed system. It will take a lot of work for engineers to make "vertical farming" a reality, but Despommier notes that the necessary technologies already exist.

MILITARY PHOTO: COURTESY ARMY.MIL; MOON IMAGE: COURTESY NASA; VERTICAL FARM: ©MITHUN

PICK A MAJOR

ILLUSTRATIONS: HUAN TRAN

WOW! AVERAGE STARTING SALARY AROUND **$55,000**

AEROSPACE

Fascinated by flight? Aerospace engineering will let you soar. You'll design and develop the manned and unmanned craft that fly through or above the Earth's atmosphere, from fighter jets to spaceships. Earthbound industries will need your skills, too — to help them, for instance, make race cars and even golf balls more aerodynamic.

AGRICULTURE

Modern agriculture is a high-tech industry. As an agricultural engineer, you'll integrate engineering techniques and hard science with the art of farming to help keep people fed. You might find ways to ensure that crops get the proper nutrients, design cutting-edge harvesting machinery, or work on the safe disposal of agricultural wastes. Then again, you might help develop the next generation of biofuels or further refine hydroponics — the science of growing crops in water.

ARCHITECTURAL

Great architecture is a beautiful thing to behold. But without architectural engineers, the world's coolest structures would remain on the drawing board. Major in architectural engineering, and you'll work on systems to keep buildings lit, plumbed, and ventilated, as well as develop the safest, most cost-efficient construction methods. With skyscrapers reaching new levels of height and complexity — the Burj Dubai will soar about 2,654 feet into the air — you'll have your work cut out for you.

FASTEST-GROWING FIELD

BACHELOR'S DEGREES HAVE DOUBLED OVER THE PAST FIVE YEARS.

BIO/BIOMEDICAL

With this major, you'll apply quantitative engineering solutions to medical problems — a truly life-enhancing proposition. You'll work with physicians and biologists, and your research possibilities include developing artificial organs, prosthetics, therapies, and diagnostic tools. You might even cross over into agricultural or environmental engineering.

CHEMICAL/ BIOLOGICAL

The word "chemical" often has a bad connotation, which is illogical, considering that everything in nature is composed of chemicals. As a chemical engineer, you'll work with raw materials to produce valuable products, including pharmaceuticals and "green" fuels. Or you might find ways to better clean up toxic spills or make food production safer. Who knows? You might even invent a better hypoallergenic makeup.

#1

HIGHEST AVERAGE STARTING SALARY

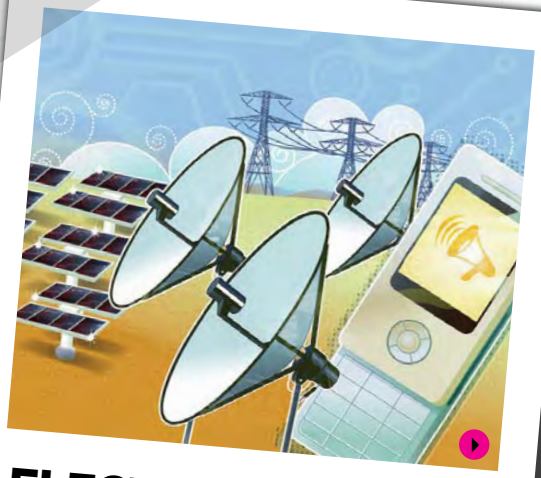
$65,466

CIVIL

If you like to think big, then civil engineering is for you. As a civil engineer, you'll work on roads, bridges, dams, and other key structures. You might plan, design, and supervise major construction projects, including airports and water-treatment plants. Ultimately, you might help build the rail beds for tomorrow's magnetic levitation trains or create the modular structures needed to make the moon and Mars habitable for humans.

COMPUTER

Want to be a leader in the information-technology revolution? Computer engineers deal with all aspects of computing systems. You could specialize in operating systems, networks, software, or hardware. Computing is ubiquitous: Microchips are embedded into products ranging from toasters to telephones, so you'll always be in demand. You might get involved in designing future quantum computers, which will manipulate atoms and molecules and be millions of times faster than today's supercomputers.

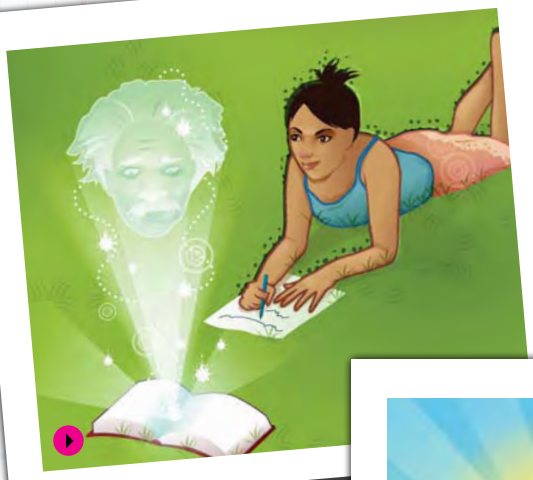


ELECTRICAL

Power to the people — that's what electrical engineers love to give. As an electrical engineer, you'll take energy from turbines, fuel cells, hydroelectric plants, or solar panels and efficiently channel it to homes, factories, and businesses. You might also design the components that move digital information from place to place, making you an expert in the technologies used in computers, cell phones, satellites, and televisions.

ENGINEERING MANAGEMENT

All engineering and technical projects — and their budgets — require someone to be in charge. That'll be you if you major in engineering management. You'll plan and organize projects. You'll allocate resources, from people to components. Like other managers, you'll learn and use key organizational skills, but you'll also have a deep understanding of engineering. And that's a big plus.



ENGINEERING SCIENCE/PHYSICS

Engineering science/physics is the big tent of engineering. You'll combine the practical (basic engineering) with the theoretical (physics, mathematics). While you'll work comfortably across many disciplines, the electives you take will let you focus on a specific area of interest — anything from digital electronics design to nuclear radiation instrumentation.

ENVIRONMENTAL

The Earth faces major environmental problems, from global warming to water shortages. Want to help solve them or work on ways of preventing new disasters? Then check out environmental engineering. Water distribution systems, recycling methods, sewage treatment plants, and other pollution-prevention and -control systems are the kinds of eco-friendly projects you might work on. Or you might find new ways to improve air quality or reduce the use of pesticides.

44%

of bachelor's degrees awarded to women

GENERAL

Inventing a new technology requires one skill set; bringing it to market demands another. You can learn both in general engineering — a comprehensive interdisciplinary program that integrates basic and engineering sciences with design. You'll graduate knowing how to combine engineering with solid business principles: a recipe for career success inside or outside the field.

13.4%

PROJECTED INCREASE IN TOTAL ENGINEERING JOB OPENINGS BY 2014

INDUSTRIAL

As an industrial engineer, you'll create and run systems essential to society — from manufacturing to services such as healthcare, finance, and retailing. You'll juggle designs, materials, machines, information, and people to keep industrial processes functioning as smoothly as a Rolex watch. Your technical problem-solving skills will make you an ideal project manager. Your credo: Efficiency rules!

MANUFACTURING

Quality control will be your forte as a manufacturing engineer, whether you're producing sports gear, foodstuffs, or automobiles. Your skills will let customers enjoy top-notch products in quantities needed, whenever and wherever they want. To ensure high-quality production, you'll be involved from start to finish, working with all aspects of manufacturing, including automation, production control, and materials handling.

MATERIALS

Ancient alchemists tried to turn base metals into gold. As a materials engineer, you'll be their modern equivalent — except with sound science on your side. You'll render raw substances — plastics, metals, and ceramics — into useful products like Gore-Tex or fiber-optic cables, possibly using nanotechnology. Perhaps you'll develop new composite airplane skins that can detect small cracks and repair themselves.

MECHANICAL

You're a tinkerer who loves machines? Then head for mechanical engineering, and specialize in designing, building, and maintaining machines of all types and sizes, from jumbo jets to mini monitors. You might also help design other products: shoes, light bulbs — even doors. Your degree is an entree to many areas — including robotics, automotives, and air conditioning. Mechanical engineering is highly multidisciplinary: You might even find yourself working with doctors to develop artificial organs.

3

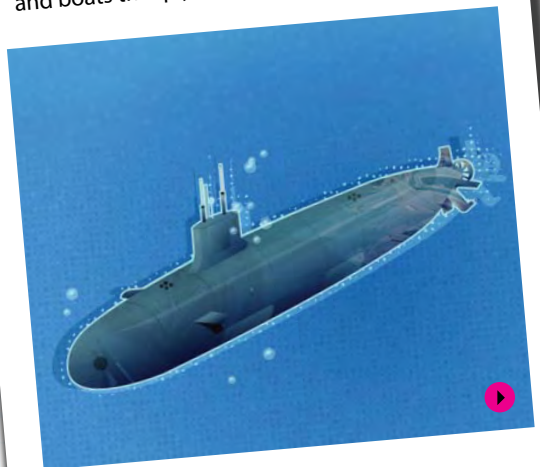
#1 MOST IN-DEMAND ENGINEERING MAJOR

MINING

From diamonds to gold to bauxite, Earth is chock-full of valuable resources. If you're a mining or minerals engineer, you'll work with geologists to find and appraise these minerals. You'll also design mine layouts, supervise their construction, and develop ways to transport mined materials. More importantly, you'll work to safely mine the natural underground wealth without destroying the land above.

NAVAL ARCHITECTURAL

In the 21st century, the seas remain an unforgiving environment. As a naval architect, you'll produce self-sufficient vessels capable of transporting people and cargo great distances across the watery depths. You'll rely upon imagination, scientific principles, and engineering acumen to design the many ships and boats that ply the oceans.



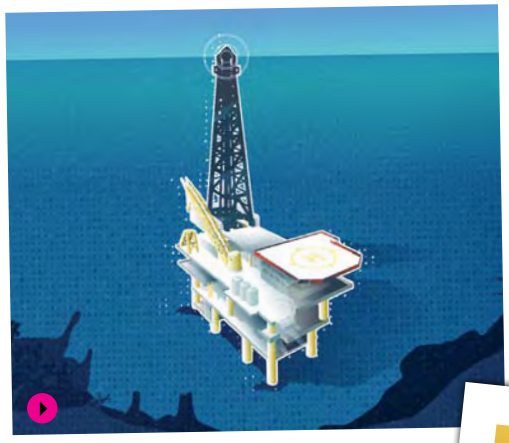
NUCLEAR

Nuclear energy is one of the most powerful energy sources known. As a nuclear engineer, you'll work to safely harness that power — perhaps using it to propel spacecraft across the solar system. You might create industrial or medical uses for radioactive material or manage the safe disposal of nuclear wastes. You might even help develop future nuclear power plants that promise safer, cleaner energy from the fusion of atomic nuclei.

DATA SOURCES: AMERICAN SOCIETY FOR ENGINEERING EDUCATION; *JOB OUTLOOK 2009*, NATIONAL ASSOCIATION OF COLLEGES AND

8%

PROJECTED JOB GROWTH BY 2016

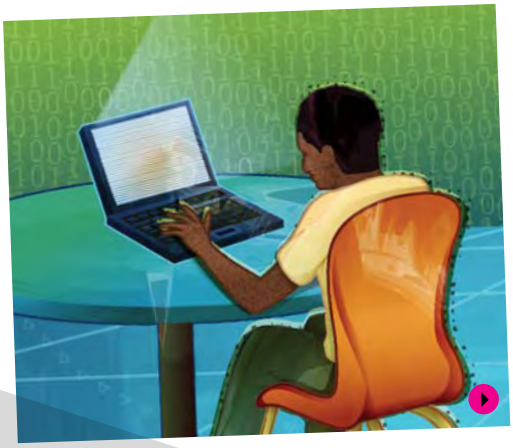


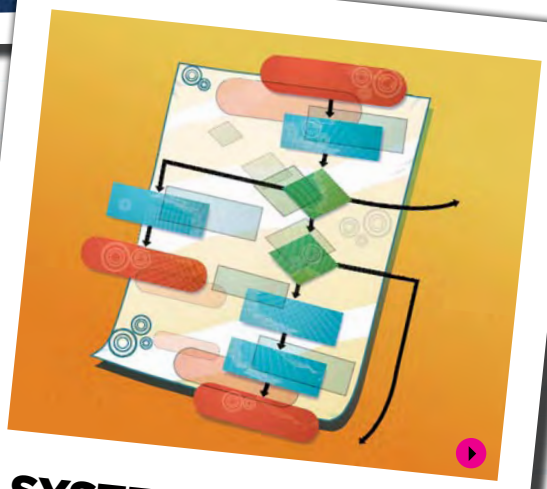
PETROLEUM

Even though the United States hopes to wean itself from oil addiction, petroleum engineers will certainly be busy for years to come. As a petroleum engineer, you'll work to discover and safely retrieve oil regardless of where it's found — from dry deserts to the open ocean. You'll work to ensure drilling processes are safe, economical, and environmentally friendly. And you might also develop the alternative energy sources that will eventually help us kick the oil habit.

SOFTWARE

Computers are constantly becoming more powerful. But it takes software to harness all that computational prowess and turn computers into the useful machines we use every day. That's where you, as a software engineer, come in. You'll analyze, design, construct, and test complex programs using the systematic, quantifiable methods of engineering. High-quality software will result from your working quickly and cost-effectively using special models and tools.



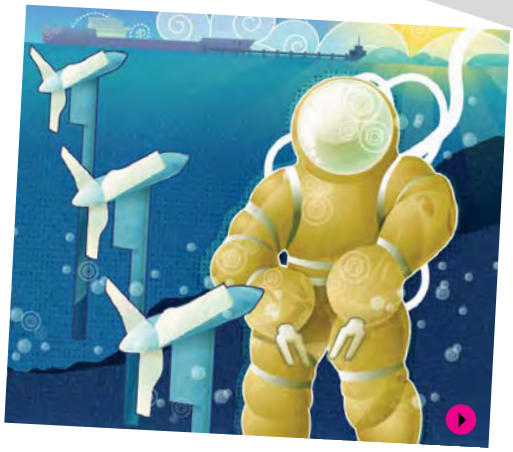


SYSTEMS

It's a multidisciplinary world, and major engineering projects require the skills of many types of engineers. You'll be the team captain if you're a systems engineer. It'll be your job to ensure that the various disciplines work together harmoniously and on schedule, meeting cost and performance goals. A jack-of-all-trades, you won't specialize in one field but instead possess a deep working knowledge of all technical areas.

OCEAN

Oceans cover 70 percent of the Earth, yet they remain largely unexplored, their resources barely tapped. As an ocean engineer, you'll blend oceanography, mathematics, physics, and materials science with civil, mechanical, and electrical engineering. You'll use your knowledge to solve problems ranging from beach erosion to energy recovery and pollution control. You might design piers, oil rigs, or underwater tunnels. In short, you'll dive into the deep end of Earth's last great frontier.



NUMBER OF UNDERGRADUATE ENGINEERING DEGREES AWARDED TO WOMEN

13,356

EMPLOYERS; AND *OCCUPATIONAL OUTLOOK HANDBOOK, 2008-09 EDITION*, U.S. BUREAU OF LABOR STATISTICS,

A BRIGHT FUTURE

Finally, solar power technologies are having their day in the sun.

Is solar power the heavenly answer to our energy needs? Perhaps. Not only is sunlight clean, abundant, and everlasting — it's free. Until recently, however, the cost of converting it into electricity was prohibitive — especially when compared with natural gas, which was cheap. But as they say, things change. New technologies are making solar power more cost-effective. Oil and gas prices are rising. And what's more, many states have enacted laws to push power companies to use cleaner technologies.

California, for instance, declared that 20 percent of its energy must come from renewable sources by 2010, rising to 33 percent by 2012. So last year, the state got its first solar-powered electric plant in 20 years. Built by the U.S.-Australian company Ausra just outside of Bakersfield, Calif., it's relatively small: just 5 megawatts, enough to supply electricity to 3,500 homes. But more solar plants are on the way. Silicon Valley venture capital firms are hot on solar power; many are investing heavily in companies like Ausra and BrightSource Energy, one of its competitors. BrightSource also got funding from Google.org, the philanthropic arm of the ubiquitous Internet giant.

The rush to solar power will certainly keep engineers from a variety of fields busy for years to come. Because of the mechanics involved — heat transfer, power distribution, new materials — solar-power re-

PHOTOGRAPH BY GRAFISSIMO/ISTOCKPHOTO

search and development is multidisciplinary, involving mechanical, electrical, and materials engineers.

The technology pushing the current solar boom is concentrated solar power. The Bakersfield plant, for example, uses mirrors to intensify the sun's rays and create heat, which is then used to boil water and make steam to power a turbine. CSP plants can store excess heat in oil or molten salt and then use it later to keep the plant running at night or on cloudy days. Ausra claims that plants requiring just 92 square miles of desert land could provide enough juice to meet all of the United States' electricity needs. CSP costs are falling, and engineers are working on ways to make it even cheaper. Graduate mechanical engineering students at MIT, for example, are working on solar collectors that use ordinary bathroom mirrors and off-the-shelf components.

Solar cells, or photovoltaics, have a future, too, especially for non-grid power. Engineers are looking for cheaper materials and more efficient technologies. An Ohio State University team — made up of a chemist, an electrical engineer, and a materials engineer — recently developed a promising hybrid material from plastic and the metals molybdenum and titanium. Unlike silicon, it absorbs all of the energy sunlight produces. For engineers who opt for a career in solar power, the future's so bright, they'd better wear shades.

Action Replay

Amateur and pro athletes turn to engineers to analyze their every move.

Forty years after sending a man to the moon, scientists have figured out how to add 10 mph to a fastball. Joe Levecchio, a high school pitcher living in Daytona Beach, Fla., was scuffling along with a heater that barely crept above 80 mph, a speed that wasn't going to blow away many batters or impress many scouts. It wasn't for lack of trying: He put so much into every pitch that he strained his back. But that's in the past. In just a few months, he gained both a 92-mph pitch and a scholarship to the University of Miami. All he needed was a lesson in biomechanical physics.

Every sport from baseball to badminton is really physics in action. The flight of a javelin, the spiral of a perfectly thrown football — any game you see is full of enough physics problems to fill a textbook. Players and coaches are undeniably experts in their sports, but it takes a scientist to understand the forces at work and to truly push the bounds of athletic possibility.

Mont Hubbard, a professor of mechanical and aeronautical engineering and the director of the Sports Biomechanics Laboratory at the University of California at Davis, is a world-renowned expert in the science of sports. Some aeronautical engineers specialize in airplanes and space shuttles; Hubbard has studied Frisbees and bobsleds. He and his students are currently working on computer simulations and mathematical models for uneven bars routines in women's gymnastics. Research in his lab has measured the joint strength needed to perform each move, knowledge that gymnasts can exploit with focused exercises.

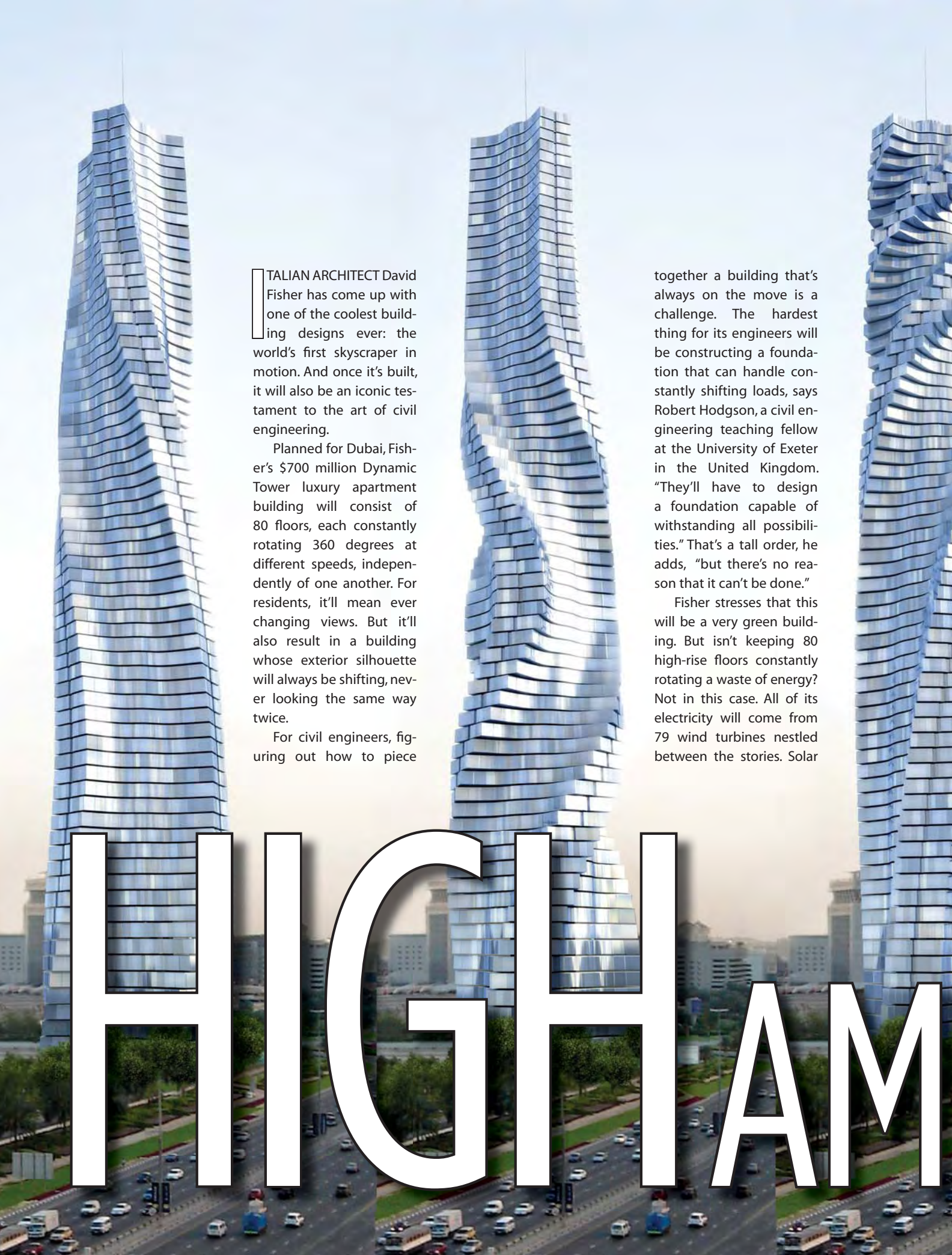
Computer models show that the flashiest tricks are very sensitive to the body mass of the gymnast; it's no accident that the best female gymnasts are pixies. Ultimately, Hubbard believes, his computer models could someday discover new moves that have never been tried in the gym. And although his lab has had grants from the U.S. Olympic Committee, he's not especially interested in improving any particular athlete's performance. Instead, he wants to understand each sport at its deepest levels.

In contrast to Hubbard, Levecchio has more than an academic interest in fastballs. To master his delivery, he visited the American Sports Medicine Institute in Birmingham, Ala. Engineers there covered his body in reflective markers and tracked his pitching movements with cameras snapping 450 frames per second, a process called motion capture analysis. Computers modeled his motions in three dimensions and compared them with a database of elite pitchers. Levecchio learned that weakness in his abdominal muscles was keeping the springlike power in his lower body from reaching his arm. He also discovered that his pitching arm wasn't fully cocked when he fired his pitch.

"It's hard to be your best when you can't see what you're doing wrong," Levecchio says. "You can pick up things on a computer that you'd never see on videotape."

SHAUN WHITE: MARC PISCOTTY/ICON SMI, NEWSCOM; KATIE HOFF: NEWSCOM; DEREK JETER: GETTY IMAGES; DENG LINLIN: NEWSCOM; PEYTON MANNING: NEWSCOM; LEBRON JAMES: NEWSCOM; MARIA SHARAPOVA: NEWSCOM.


Riddell
18
PALDING
23



HIGH AM

ITALIAN ARCHITECT David Fisher has come up with one of the coolest building designs ever: the world's first skyscraper in motion. And once it's built, it will also be an iconic testament to the art of civil engineering.

Planned for Dubai, Fisher's $700 million Dynamic Tower luxury apartment building will consist of 80 floors, each constantly rotating 360 degrees at different speeds, independently of one another. For residents, it'll mean ever changing views. But it'll also result in a building whose exterior silhouette will always be shifting, never looking the same way twice.

For civil engineers, figuring out how to piece together a building that's always on the move is a challenge. The hardest thing for its engineers will be constructing a foundation that can handle constantly shifting loads, says Robert Hodgson, a civil engineering teaching fellow at the University of Exeter in the United Kingdom. "They'll have to design a foundation capable of withstanding all possibilities." That's a tall order, he adds, "but there's no reason that it can't be done."

Fisher stresses that this will be a very green building. But isn't keeping 80 high-rise floors constantly rotating a waste of energy? Not in this case. All of its electricity will come from 79 wind turbines nestled between the stories. Solar

BITIONS

A jaw-dropping new building will put a whole new spin on architectural engineering.

panels on the roof of each floor will generate additional power. And besides, Fisher says, very little energy is actually needed to keep a floor spinning around like a CD — no more than what a washing machine requires.

The skyscraper's other claim to fame: It will be the world's first prefabricated high-rise. Each floor will consist of sections — built in a factory in Italy — that are pieced together on-site. Hodgson says it's smart engineering to divide each floor into sections, or modules, because it would be impossible to prefabricate and then lift entire floors to such heights. Moreover, the construction method means that each unit can be customized at the factory well in advance. The modules will arrive at the site with all necessary plumbing, electrical wiring, fixtures, and even furniture already in place.

Fisher says it's such an efficient construction method that an entire floor can be completed in just seven days. Quick construction not only saves energy, he says, but greatly reduces fumes, waste, noise, and other pollution at the building site.

Fisher's Dynamic Tower is definitely aimed at the wealthy. Apartment prices will range from $3.7 million to $36 million. But Fisher says civil engineers can adapt his module-based, prefab construction process to many other lower-cost projects, too — even if they don't spin.

COURTESY DYNAMIC ARCHITECTURE/DAVID FISHER ARCHITECT

New digital technologies allow everyone to be a guitar hero.

SonicBoo

Next time you're listening to your favorite music on an MP3 player or shredding out a wailing solo while playing Guitar Hero, give a nod of thanks to the unsung engineers who made it possible. Engineering is key to how music is played, recorded, distributed, and consumed. That's why engineers can have long and fruitful careers in the music business — which is more than you can say for most wanna-be pop idols.

Consider the iPod. The device ushered in the digital music era and remains the world's best-selling portable audio player.

It's a beautiful example of how the engineer's art can make the complex appear simple. IPods may be crammed with cutting-edge technology, but they're sleekly designed and easy to operate, which is why they're popular. That's also true of Guitar Hero's mini-guitars. Their simple push-button controls mask elaborate engineering that can faithfully mimic the sound of a real, screeching guitar.

Well-tuned engineering also explains why the electric guitar is little changed since its invention nearly 80 years ago. However, engineers are now starting to update that classic, six-string technology. A few years ago, Gibson introduced the first fully digital electric guitar, based on a prototype by Adrian Freed, an electrical engineer at the University of California–Berkeley's Center for New Music and Audio Technologies. The sound and volume of each string can be controlled separately and then sent via an Ethernet cable to a computer, effects box, or amplifier. Gibson's engineers have also produced a line of self-tuning guitars.

Engineers are creating completely new instruments and sounds, as well. Freed, for example, uses newly developed fibers, fabrics, and malleable materials to construct electric instruments from scratch. There is a growing market for new electronic instruments like the Haken Continuum Fingerboard, which has a large, flat surface that produces myriad sounds when stroked. Laser harps allow players to pluck celestial notes from beams of light.

In the recording studio, musicians rely on the skills of engineers to sweeten their sounds. Music engineers use digital technologies to mix and layer countless tracks into a seamless whole. And they devise software that can make flat voices sound tuneful and lush. Sound engineers are in demand because music permeates nearly all media — including films, television, radio, Web sites, and electronic games. Now, many schools offer degrees in audio and music engineering, like the University of Miami.

Engineers have even created instrument-playing robots, which have become a hit on YouTube. Frivolous fun? Perhaps. Freed admits that bot-bands won't have much of a future "once the current novelty of seeing robots play instruments wears off." But someday, he adds, the same robotic technologies will be used to help physically handicapped people play musical instruments. And that's an outcome worthy of a standing ovation.

Earth Day,

Want to save the planet? Opportunities for

Hawaii native Alexandria Boehm is passionate about her career in environmental engineering. When she's not traveling the world to aid coastal communities, she's teaching a course on environmental law and science policy through the Stanford University Law School. Boehm and her fellow professors dive into topics like beach pollution and disappearing wetlands. Her students enjoy brainstorming their own ideas for tackling these problems, she says. And Boehm gets the chance to test out her own solutions during her frequent travels.

Boehm recently spent three months studying polluted drinking water in Dar es Salaam, Tanzania. She brought some Stanford engineering students with her to try and find out whether giving individual households information about the quality of their water would help them make changes to keep it clean. Since houses don't have pipes, residents bring well water into their homes and store it in containers. "When the water comes out of the well, it's very clean, but when they store it in their homes, that's when it gets dirty," explains Boehm. "So far, we've found that there's a lot more bacteria on people's hands and in their water than we thought. We were really surprised at that."

To test the water, Boehm and her team converted an apartment in Dar es Salaam into a laboratory. They bought tables to serve as lab benches and built their own filtration devices and portable incubators. They tested more than a hundred samples of water a day from homes, wells, and people's hands. Boehm hopes the information will prove valuable, because Tanzania has one of the highest death rates for children under 5 for gastroenteritis, which comes from poor drinking water.

Boehm also works closer to home. She spent a week in the Catalina Islands off the California coast to study how sunlight affects harmful microbes in the water. "The beach is really polluted, and there's a big study here on how often people get sick from the water," she says. "We're wondering: Can sun disinfect the water? And if so, how is that happening?"

In the future, Boehm would like to do more work in her home state of Hawaii. There's plenty to keep an environmental engineer like her busy: More than one-third of the world's people live in coastal communities. But for now, she loves her work at Stanford. "I'd like to stay here and continue doing what I'm doing," she says, "and continue to branch out a little bit more."

PHOTOGRAPH BY SIAN KENNEDY


Every Day
environmental engineers run wide and deep.

FOCUSED Like a Laser

Military engineers concentrate on creating new weapons for the battlefield.

Ray guns that zap bad guys with a lethal beam of light have long been mainstays of science fiction, from *Buck Rogers* to *Star Wars*. Now, after more than 40 years of trying, engineers are close to making high-energy battlefield lasers a reality.

Recently, defense contractor Northrop Grumman demonstrated a prototype of an electric laser gun that shoots out a 105-kilowatt beam of light. A laser beam of 100 kilowatts or more is considered weapons-grade. Northrop's laser has a light intensity that's about the same as the surface of the sun.

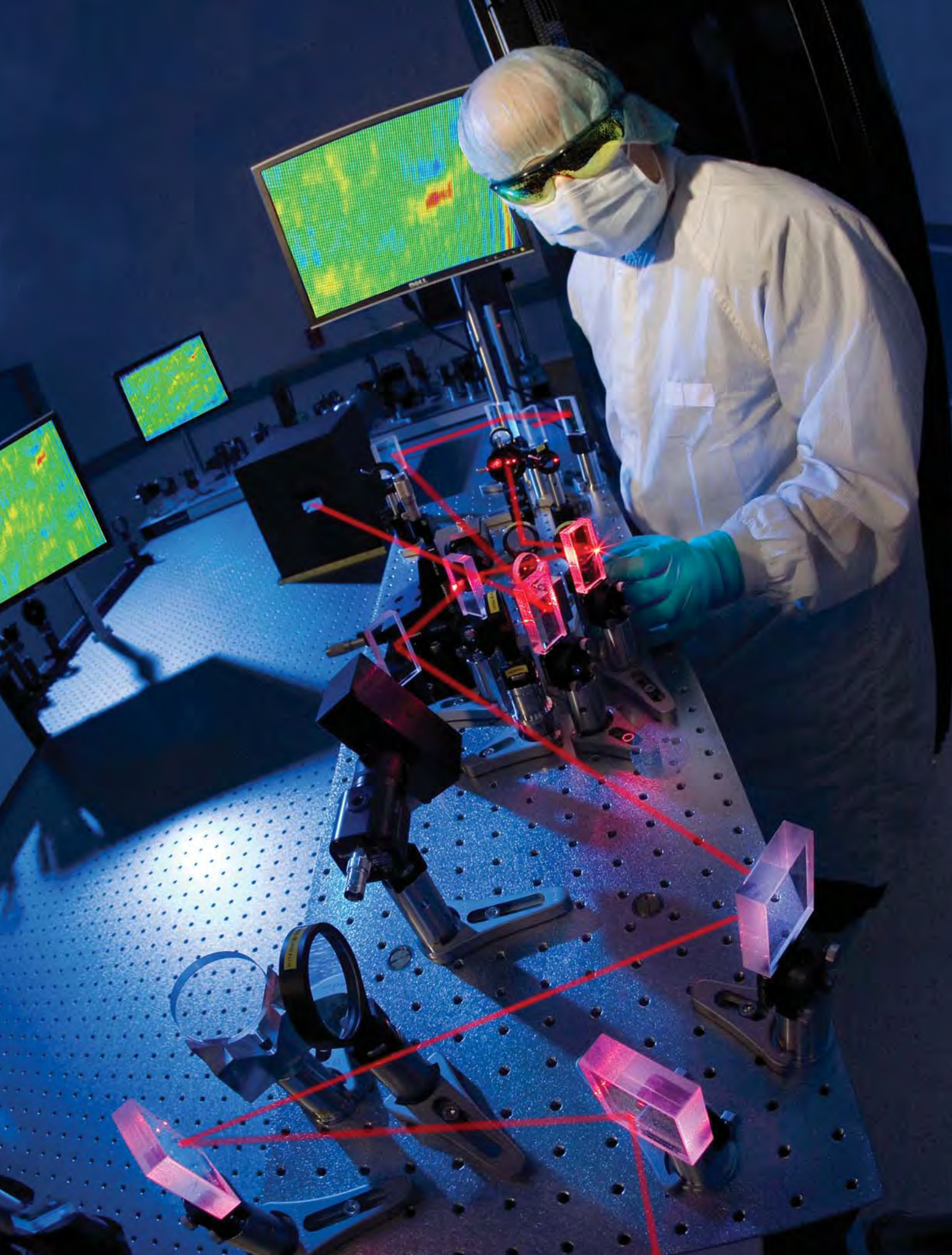
It's strong enough to knock out the rockets, mortars, and artillery shells bedeviling U.S. troops in Iraq and Afghanistan. But Northrop says the weapon can easily be ratcheted up to much higher levels of force. That means future versions could be mounted in jet fighters to shoot down enemy aircraft in a split second.

Other types of future laser weapons would be adjustable, able to emit low-power stun beams as well as high-power killer ones. The military is eager to field so-called directed-energy weapons because they're ultra-precise and much faster than bullets.

Developing a workable laser weapon like Northrop's required "a complete host of engineering disciplines," explains Nasser Peyghambarian, a professor of materials science and engineering at the University of Arizona. Optical, mechanical, electrical, and materials engineers all contributed. And although Northrop's engineers are civilians, they work closely with their counterparts in the military.

Why do some engineers gravitate toward weapons program research? Peyghambarian says it's often a combination of wanting to help defend the country while working on "gee-whiz," cutting-edge technology. Many Northrop engineers admit to being influenced by the futuristic weapons portrayed in science fiction, Bishop says, and "are doing everything they can to make gunpowder a 20th-century technology."

While that goal is now within reach, the deployment of laser weapons is still years away. That means young, aspiring engineers of today could still be part of the effort to deliver what Bishop calls "the promise of defense at the speed of light."



The digitally created villain Davy Jones

The Arrrrt of Engineering

A software designer helped 'Pirates' come to life.

One of the key moments in the blockbuster movie *Pirates of the Caribbean: At World's End* was a battle between two ships in a raging ocean storm. The 15-minute scene featured a gigantic whirlpool and lots of lightning, waves, and spray. It wasn't the type of thing that could be faked in a neighborhood swimming pool or even on a Hollywood soundstage. So the directors came up with a solution: They created the scene on a computer with software developed by Industrial Light & Magic, the special effects company created by George Lucas when he made the first *Star Wars* film in the 1970s.

Frank Petterson, a production technology supervisor at ILM, was a member of the team that developed the fluid simulation software. "I have always been interested in math and computers," he says. "I was your standard computer kid who got my first one when I was 4 or 5 years old."

Computer games piqued his interest in computer graphics, and he went on to get a Ph.D. in computer science at Stanford University. There, Petterson began to realize that working in movies offered a more creative outlet for his talents than developing games. Now, his specialty is designing software that can simulate water. "Water is probably the most difficult special effect to do — tougher than smoke and fire," he says. "The reason is we all know what it looks like. We live around it. If you see water that looks wrong, you know it."

Petterson got his start in water simulation working on *Poseidon*, the 2006 film about survivors who fight to escape a sinking ship. "The visual-effects supervisor said, 'We need a giant ship to be hit by a giant wave and then turn over and sink. Can we do this? And how can we do this?'" he recalls.

For his work on developing the fluid simulation software used on the *Pirates* movie, Petterson received an Academy Award for scientific and engineering achievement in 2008. He also worked on an important water scene for *Harry Potter and the Half-Blood Prince*.

"What I enjoy about my work is that it's artistic," Petterson says. "The tools that we use to generate the images aren't as important as the images themselves. Ultimately, I work for a company of artists — and I love it."

The PAX Scientific impeller (top) efficiently moves water with a design inspired by a lily.

NATURE

Engineers find elegant design solutions in the natural world.

In the not-so-distant past, engineering and biology were two distinct fields of study that rarely had much to do with each other. No more. Nature, once strictly the realm of biologists, is increasingly being scrutinized by engineers, who appreciate that it can offer sustainable, energy-efficient solutions to vexing human problems.

Biomimicry is a fast-growing, multidisciplinary field of industrial design based on several billion years' worth of research and development — courtesy of evolution. Here's a small sample of the many engineering innovations inspired by the natural world.

IN A SWOON OVER SWIRLS PAX Scientific designs products inspired by the elegance of vortices — the whirlpools you see when water runs down a drain. The spiral shape of a vortex is such a useful design that it regularly appears in natural things such as nautilus shells, galaxies, and DNA, says PAX founder Jay Harmon. The company incorporates the shape into products such as fan and boat propellers, wind-turbine blades, and the impellers that push water through pumps, making them more energy-efficient.

BUMPS FOR SMOOTH STROKES Whales are such graceful swimmers that they can swiftly change direction with the greatest of ease — despite their girth.

LILY AND IMPELLER: CHARLIE NUCCI; BIRD: ISTOCK; CAR: COURTESY MERCEDES

The low drag of this Mercedes-Benz concept car comes from the streamlined shape of a boxfish (right).

The shape of a kingfisher's beak (left) influenced the quiet, efficient design of the Shinkansen bullet train.

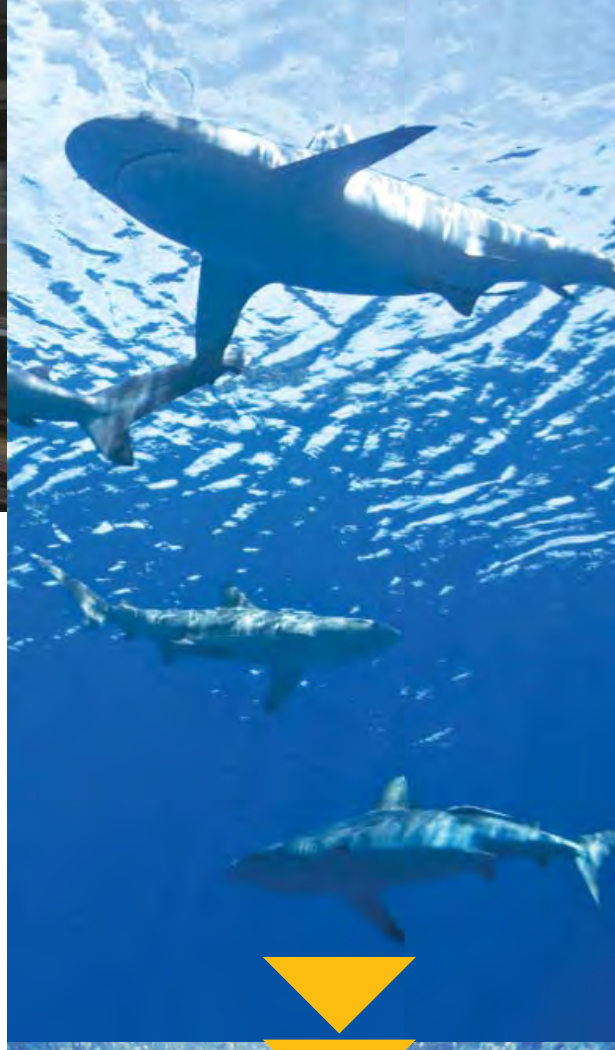
E'S WAY

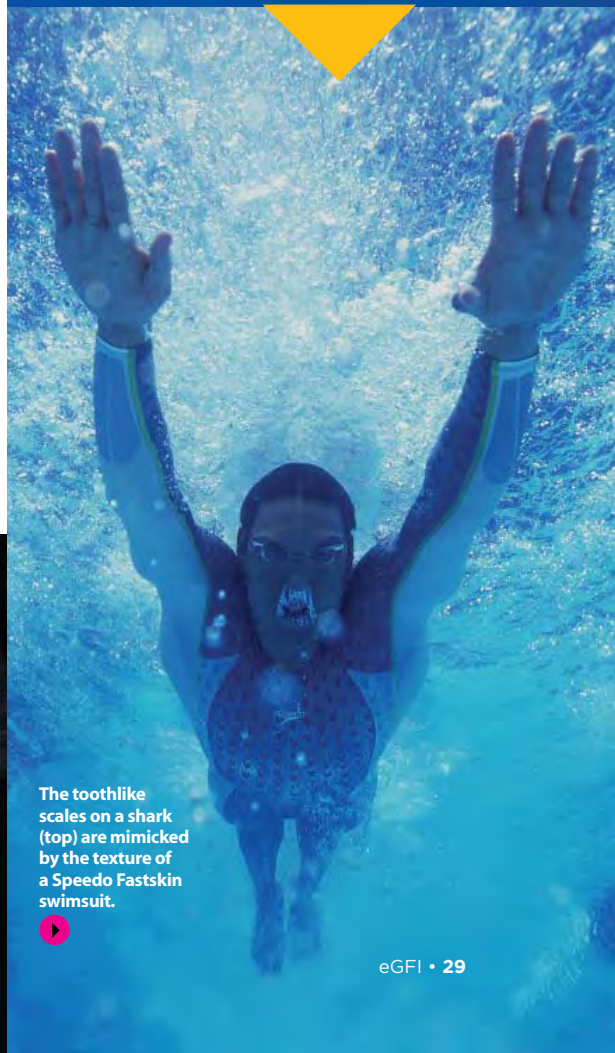
Frank Fish, an expert in the biomechanics of sea animals at West Chester University, discovered that whales swim so effectively because of their tubercles — the bumps along the leading edge of their flippers. Inspired by that concept, he started WhalePower, a company that designs bump-edged blades for wind turbines. The blades don't stall as easily, improving their effectiveness.

AS COOL AS A TERMITE The massive Eastgate shopping center in Harare, Zimbabwe, eschews air conditioning. Instead, it relies on a system of passive cooling inspired by African termite mounds. Termite mounds capture breezes and ventilate hot air via chimneys to maintain a constant temperature inside — despite outside temperatures that fluctuate between 35 degrees Fahrenheit at night and 104 degrees during the day. At Eastgate, fans suck in fresh air from outside and expel warm, stale air through flues. The system uses 90 percent less energy than traditional air conditioning.

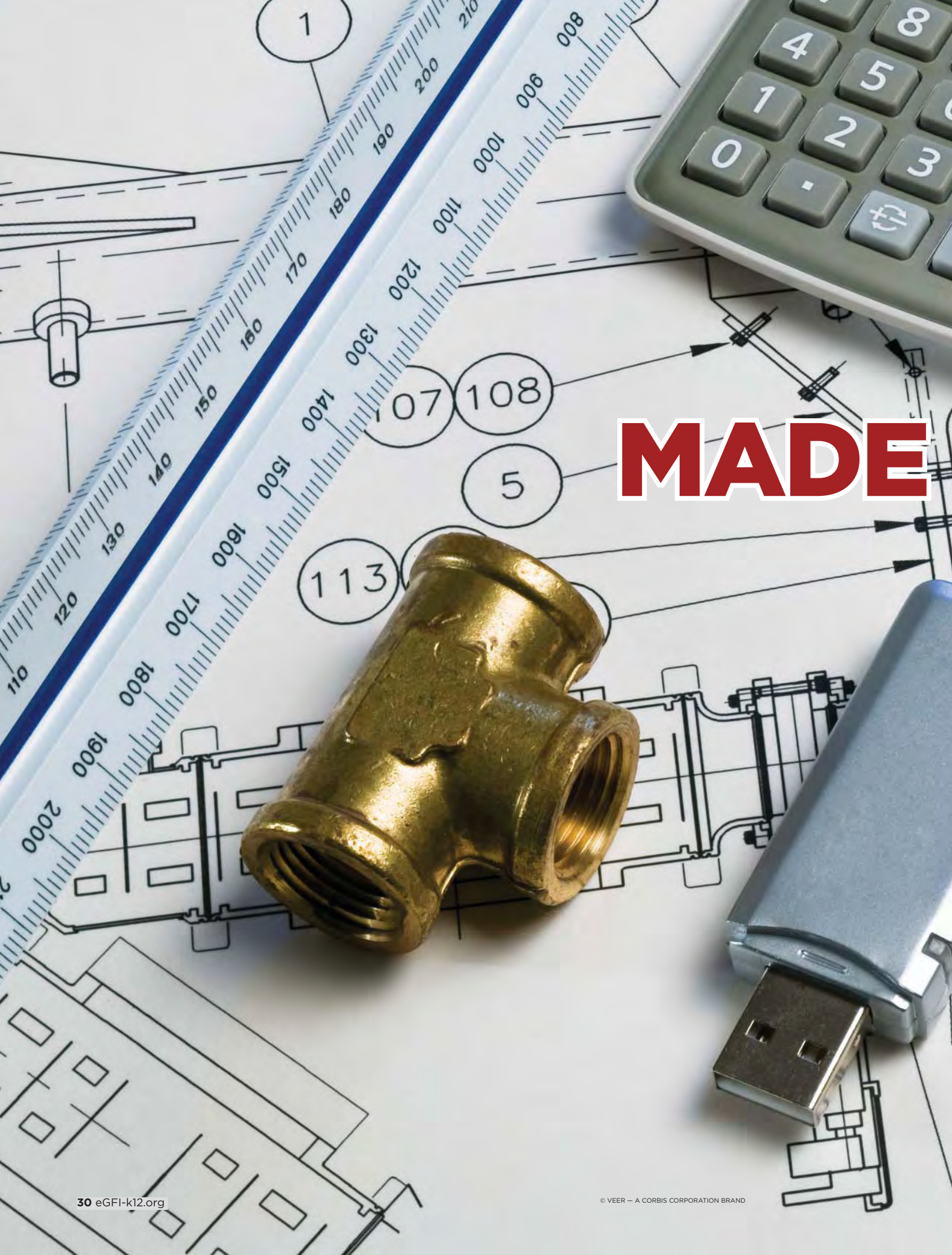
CYBER SCAMPERERS Robert J. Full runs a University of California–Berkeley bioengineering lab that's dedicated to unlocking the locomotion secrets of insects, lizards, centipedes, and other critters. Full's Ariel is a crab-inspired robot that can maneuver in surf. His RiSE robot mimics the gecko and can crawl up walls. And his six-legged, cockroach-like RHex bot can scamper across rough terrain.

TRAIN AND SWIMMER: GETTY IMAGES; SHARK: ISTOCK





The toothlike scales on a shark (top) are mimicked by the texture of a Speedo Fastskin swimsuit.



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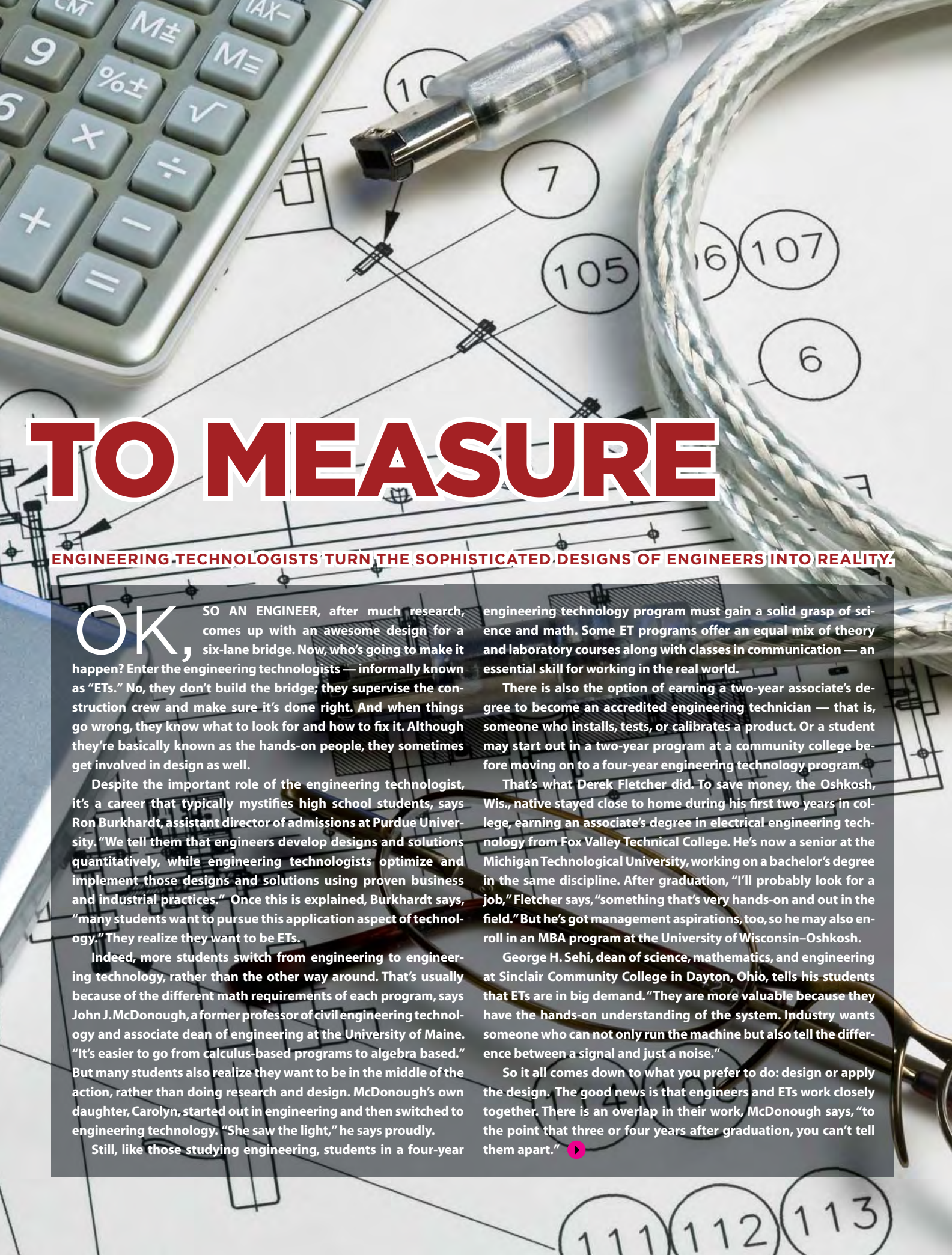


TO MEASURE

ENGINEERING TECHNOLOGISTS TURN THE SOPHISTICATED DESIGNS OF ENGINEERS INTO REALITY.

OK, SO AN ENGINEER, after much research, comes up with an awesome design for a six-lane bridge. Now, who's going to make it happen? Enter the engineering technologists — informally known as "ETs." No, they don't build the bridge; they supervise the construction crew and make sure it's done right. And when things go wrong, they know what to look for and how to fix it. Although they're basically known as the hands-on people, they sometimes get involved in design as well.

Despite the important role of the engineering technologist, it's a career that typically mystifies high school students, says Ron Burkhardt, assistant director of admissions at Purdue University. "We tell them that engineers develop designs and solutions quantitatively, while engineering technologists optimize and implement those designs and solutions using proven business and industrial practices." Once this is explained, Burkhardt says, "many students want to pursue this application aspect of technology." They realize they want to be ETs.

Indeed, more students switch from engineering to engineering technology, rather than the other way around. That's usually because of the different math requirements of each program, says John J. McDonough, a former professor of civil engineering technology and associate dean of engineering at the University of Maine. "It's easier to go from calculus-based programs to algebra based." But many students also realize they want to be in the middle of the action, rather than doing research and design. McDonough's own daughter, Carolyn, started out in engineering and then switched to engineering technology. "She saw the light," he says proudly.

Still, like those studying engineering, students in a four-year engineering technology program must gain a solid grasp of science and math. Some ET programs offer an equal mix of theory and laboratory courses along with classes in communication — an essential skill for working in the real world.

There is also the option of earning a two-year associate's degree to become an accredited engineering technician — that is, someone who installs, tests, or calibrates a product. Or a student may start out in a two-year program at a community college before moving on to a four-year engineering technology program.

That's what Derek Fletcher did. To save money, the Oshkosh, Wis., native stayed close to home during his first two years in college, earning an associate's degree in electrical engineering technology from Fox Valley Technical College. He's now a senior at the Michigan Technological University, working on a bachelor's degree in the same discipline. After graduation, "I'll probably look for a job," Fletcher says, "something that's very hands-on and out in the field." But he's got management aspirations, too, so he may also enroll in an MBA program at the University of Wisconsin–Oshkosh.

George H. Sehi, dean of science, mathematics, and engineering at Sinclair Community College in Dayton, Ohio, tells his students that ETs are in big demand. "They are more valuable because they have the hands-on understanding of the system. Industry wants someone who can not only run the machine but also tell the difference between a signal and just a noise."

So it all comes down to what you prefer to do: design or apply the design. The good news is that engineers and ETs work closely together. There is an overlap in their work, McDonough says, "to the point that three or four years after graduation, you can't tell them apart."

run

chael

Bionic limbs give wounded soldiers a leg up.

Not long ago, prosthetic limbs had all of the function and mobility of a peg leg from a pirate movie. But in this bionic age, wood and plastic are no longer acceptable replacements for nerve, bone, and muscle. When Sgt. 1st Class Michael McNaughton (left) lost his leg to a land mine in Afghanistan in 2003, he got more than a rigid limb that would simply hold him upright. He got a leg with brains.

Throughout history, wars have spurred advances in medicine, and current conflicts are no exception. The hundreds of soldiers who have lost limbs in Iraq and Afghanistan have inspired a revolution in prosthetic design. Perhaps the most important innovations have been the C-Leg and the newer Rheo Knee, bionic limbs that have become standard equipment for soldiers missing legs. The limbs have microprocessors that constantly sense force and the direction of the user's gait. The tiny computers then send a signal to hydraulic shafts that let the knee flex as naturally as possible.

For McNaughton — one of the first soldiers to get a C-Leg and one of the first to move up to the stronger, more durable Rheo Knee — the circuitry in the legs provides freedom to think about something other than taking the next step. "I can go down stairs holding my baby girl without worrying about it," McNaughton says. He can also run, play soccer, and even get in a few basketball games.

Despite these advances, the field of prosthetic engineering is still in its relative infancy, says Gerald Loeb, a professor of biomedical engineering at the University of Southern California. Lifelike hands, he says, are the next big challenge. Scientists have already created hands that can pick up grapes and other small objects. The trick now, he says, is to develop sensors that can precisely move fingers according to a person's thoughts. "The brain uses a complex code that we're still trying to understand," Loeb says. "It's not just engineering — it's discovering."

Amputees of all types can benefit from cutting-edge prosthetics, but soldiers tend to make ideal patients, Loeb says. Unlike people who have lost limbs to cancer or diabetes, soldiers tend to be young, relatively healthy, and able to push themselves to get the most out of rehabilitation. "Being a soldier is their career, and they often want to get back to it," he says.

McNaughton — who received his leg free of charge from Walter Reed Medical Hospital — now works for the Veterans Administration in his home state of Louisiana. He says he doesn't mind stares when he walks through Wal-Mart. "I have three kids, and they think it's really cool," he says.

PHOTOGRAPH BY PETER GREGOIRE

Fasten Your Seat Belts

New spacecraft will soon be fulfilling tourists' astronautical dreams.

Want to indulge your inner Buzz Lightyear? You may soon have that chance. Space tourism, once an idea confined to science fiction, is fast becoming a reality. Teams of engineers at several companies are furiously developing spacecraft to send tourists on suborbital flights into space, perhaps as early as 2010. Space travel for the masses won't come cheap. At a minimum, it'll cost you around $100,000 to become a real astronaut and gaze down upon Earth. Despite the astronomical prices, space tourists may number 20,000 per year by 2020. Here's a look at five pioneers of a burgeoning industry.

VIRGIN GALACTIC

British entrepreneur Richard Branson, whose Virgin brand encompasses everything from airlines to Internet services, expects his venture will be whizzing tourists into space by 2010. A mother ship, the WhiteKnightTwo, will carry the six-passenger SpaceShipTwo (below) to 50,000 feet. At that point, SpaceShipTwo will rocket beyond the stratosphere to a peak altitude of 62 miles. Voyagers will experience weightlessness and unearthly views. The price? A steep $200,000. Nevertheless, Virgin Galactic has already booked several hundred reservations. It's also building a cool, eco-friendly spaceport in the New Mexico desert designed by iconic architects Foster + Partners.

BLUE ORIGIN

Backed by Jeff Bezos, the billionaire founder of Amazon.com, Blue Origin hopes to start weekly treks into space by 2010 from a port in rural Texas. Blue Origin's craft, the New Shepard, is a cone-shaped, computer-controlled rocket that will carry three passengers and take off and land vertically. The company has successfully tested a prototype of the craft at least three times.

SPACE ADVENTURES

So far, only a handful of extremely rich civilians have journeyed into space as tourists, thanks to Space Adventures. It books passengers aboard the Russian Soyuz rockets that routinely fly to the international space station in orbit approximately 215 miles above Earth. Google co-founder Sergey Brin plunked down $5 million toward the $30 million trip. For non-billionaires, Space Adventures is engineering a spacecraft that will whisk a pilot and three passengers to an altitude of 62 miles. Expected cost? The bargain price of $102,000.

EADS ASTRIUM

This subsidiary of EADS, the European aeronautics company that makes Airbus jetliners, is working on a rocket plane the size of a business jet that will shoot four passengers 60 miles into space for three minutes of gravity-free fun, starting in 2012. Cost: at least $240,000.

XCOR AEROSPACE

For budget-minded budding astronauts, there's this California manufacturer of rockets and engines. XCOR is building — and expects to test in 2012 — a pocket-sized rocket plane called Lynx that will zap a pilot and one passenger 38 miles into space for a 90-second taste of weightlessness. Cost: a mere $100,000.

These ventures won't blast tourists to infinity — and certainly not beyond. But cutting-edge engineering ensures they'll soon be providing infinitely amazing adventures.

Women in Abheypur, India, spend most of their day fetching fresh water.

University of Hartford engineering students move flexible piping for a solar-powered well in Abheypur.

MANY COMMUNITIES DESPERATELY NEED ACCESS TO CLEAN

Pure Intentions

Showing off new water storage tanks

Success!

WATER. SOME ENGINEERING STUDENTS ARE MAKING IT THEIR MISSION TO PROVIDE IT.

IN SUMMER 2007, four civil engineering students from the University of Dayton visited the tiny village of Barombi in Cameroon. They were just tourists for the day, on a break from service work in the nearby city of Kumba. But that all changed when the chief there told them that villagers were becoming ill and dying because the lake they depended on for drinking water was contaminated. Cleaner water was available from a stream half a mile outside the village, he said, but reaching it involved an uphill trek through thick jungle. That's when Justin Forzano had a brainstorm. "If a system can flow by gravity, you don't have to worry about power," explains Forzano, a junior at UD at the time. He and the other students proposed to build a pipeline that would allow the stream water to flow downhill into the village. They were careful not to make any promises to the chief but hoped to return the next summer to follow through with their plan.

Of course, you don't have to stumble into an African village in trouble to find an opportunity to make a difference. A growing number of engineering students tap into safe-water projects through campus chapters of Engineers Without Borders USA, a nonprofit humanitarian organization that works with developing communities worldwide to improve quality of life through sustainable engineering projects. Students from the University of Hartford EWB chapter, for example, have made three trips to the Indian village of Abheypur to install a solar-powered pump in the town's main well to bring clean water to residents. And four teams of students from the EWB chapter at Valparaiso University have worked to create a windmill-powered water system in Nakor, Kenya. The system has substantially reduced the rate of waterborne illnesses among villagers and provided irrigation for their crops.

After returning to the United States, the UD students worked to make the Barombi pipeline a reality. They raised $15,000 for supplies and successfully lobbied the civil engineering department to create an independent study class that would allow them to get credit for the project. In summer 2008, two more students joined the original four in Cameroon to work alongside villagers and local professionals to build the pipe, a spigot for communal access, and simple filtration systems in each villager's home. Plenty of naysayers questioned the students' ability to get the project up and running in such a short time, recalls UD graduate Hayley Ryckman. But any lingering doubt was washed away the day they turned the water on, she says. "It opened our minds to what we're capable of doing after we graduate."

PHOTOS BY DAVID COOLEY AND NADIA GLUCKSBERG

Keep your eye on these engineers who are changing the world.

FRESH FACES

The Clean Dirt-Biker

Playing with toys all day — that's how **Neal Saiki** describes his job. The engineer worked with a group to design the first-ever human-powered helicopter, which flew about 8 inches off the ground. It didn't travel too far but was cool enough to be shown off at a museum in Washington, D.C. More recently, Saiki created an electric dirt bike. It costs just 1 cent per mile to operate — way cheaper than gas. Also, the batteries it uses are completely recyclable. Saiki says designing environmentally friendly products was important to him because he loves camping, hiking, and rock climbing and wants to preserve the great outdoors from pollution. Now, so many people want his electric motorcycles that there's a three-month waiting list.

A Green Go-Getter

A slum in India has gotten cleaner water, thanks to filters developed by engineers in an organization that **Regina Clewlow** created. Clewlow started Engineers for a Sustainable World to encourage fellow engineers to brainstorm ways to improve the lives of people in poor countries. As a high school student, she learned about environmental issues through Amnesty International. In college, she was disappointed to find that there weren't many opportunities to connect engineering to social problems. Her organization now has about 3,000 members. Clewlow is currently getting a Ph.D. in engineering systems and studying how developing countries can use renewable energy.

Wake Up...Or Else

Pressing "snooze" in the morning a little too often? No worries — to the rescue is **Gauri Nanda** with her "Clocky." How it works: If you hit "snooze," the alarm clock jumps off your nightstand and lands on its wheels, beeping the whole time. Then it's time to play hide-and-seek. The gadget rolls, bumps into things, backs up, and eventually stops. When the clock rings again, the sleepy owner has to walk around and find it to turn it off. Nanda invented the alarm clock for herself while she was studying design at MIT's Media Lab. She says engineering helped her figure out which parts were needed and how they could be put together. She started her own design company, Nanda Home, and has sold more than 130,000 of the clocks in three years.

NEAL SAIKI PHOTO BY MICHAEL LEWIS

World Banker

A Web site that allows people to make small, $25 loans has become a pretty big deal. **Matt Flannery** used his programming skills to develop Kiva.org, which allows people to lend money to entrepreneurs in developing countries after browsing their profiles online. Kate Ewhrugakpo in Nigeria borrowed $350 to buy sewing machines and fabric for designing clothes and paid back the loan in eight months. Ana Glora Ventura borrowed $150 to buy meat and vegetables to sell stuffed pastries outside her home. The venture paid for her children's schooling. More than 250,000 lenders have helped about 40,000 borrowers in 40 countries through Kiva. When the lenders get their money back, they can relend to someone else, donate their funds to Kiva, or withdraw their money.

'The Apprentice' Takes Charge

Randal Pinkett is most famous for winning the TV reality show competition, *The Apprentice*, but his passion is helping those less fortunate. He has multiple engineering degrees from Rutgers University, Oxford University, and MIT. As a graduate student, he created online software for low-income families to gather community information on after-school programs, churches, and libraries in their area. He chatted with residents to find out what they needed and let them contribute information to the database. Now, he manages his own consulting firm to help companies figure out how to use technology to organize and convey their information. Pinkett often gets recognized in public since his *Apprentice* win and has used his celebrity status to launch a lucrative public-speaking career.

A Real Rocket Scientist

Laurie Carrillo is an aerospace engineer at the NASA-Johnson Space Center who's working on the Orion CEV spacecraft, slated for a moon launch after the current space shuttle retires in 2010. She's experimenting with different materials to find the best combinations for keeping the temperature ideal inside the spacecraft. She says it can't be too cold or else condensation will form. As a child, Carrillo was fascinated by space and remembers watching the U.S. astronaut Sally Ride on *Sesame Street*. Before being a part of this project, Carrillo helped organize and analyze wind particles, meteorites, and lunar rocks brought back from NASA missions.

MATT FLANNERY PHOTO BY MELISSA BARNES

He's Got the Multi-Touch

Music fans can rock out with virtual guitars on an interactive wall, thanks to a touch-screen technology that **Jeff Han** tinkered with. Most touch-screens, such as the ones at airport check-in kiosks, allow only one finger touch at a time. But Han's large, multitouch screens can be activated by touching or sweeping several fingertips across the surface. Users can slide digital photos around as if they were prints on a desk, and several people can edit different photos at the same time. Han, a consulting research scientist at New York University, studied computer science and electrical engineering — subjects that helped him develop technology that lets many people collaborate.

Ideas at Play

Saul Griffith likes to create things — pretty cool things. He invented low-cost eyeglass lenses that can mold into various shapes within 10 minutes to correct people's vision. It's one project from Squid Labs, a company he started dedicated to engineering design and technology innovation. His labs have also created a smart rope that can save the lives of firefighters and rock climbers. A spinoff company called Monkeylectric sells colorful lights for bike wheels. He also coauthors a comic called *Howtoons* that shows kids how to build things themselves. Griffith was awarded a MacArthur Foundation "genius grant" to help keep his innovations going. His degrees in materials science and mechanical engineering helped him figure out how to make his ideas a reality.

Edifice Expert

Working for the SmithGroup architectural firm, **Cynthia Cogil** uses engineering to make buildings that are better for the environment. She helped design one that turns off the lights when it senses enough daylight coming in. Also, its roof collects water that gets filtered before coming out of the faucet. What's more, the toilet doesn't use water. Instead, chutes bring waste into a holding tank where it decomposes. Cogil says her job as an architectural engineer allows her to use the math and science skills that always were her strengths in school. And she gets to work on cool projects like the International Spy Museum in Washington, D.C., which is one of the city's most popular attractions.

JEFF HAN PHOTO BY AMY GUIP; SAUL GRIFFITH PHOTO BY KATY RADDATZ

Java Queen

Coffee lover **Michelle Gass** spends her days figuring out what others like about coffee. She got a chemical engineering degree from Worcester Polytechnic Institute and now is senior vice president of marketing and category at the Starbucks Corp. She launched the Caramel Frappuccino, and it was her idea to have a caramel drizzle instead of a little squirt. She also wanted domed lids and green straws instead of red ones to give the slush a more appealing look. Gass finds out what customers want by talking to them and taking her team to Starbucks shops around the world. The trips help them understand other cultures and spark new coffee ideas.

Soap Star

With his high school buddy, **Adam Lowry** created household cleaning products that are stylish, nice smelling, and kind to the environment. You may have seen his Method line at Target or Safeway stores. The cleaners are made with natural ingredients that are less toxic. Lowry worked with designers on cool containers that look decorative on shelves, including a soap bottle shaped like an hourglass. Lowry, who has a degree in chemical engineering, thinks that cleaners shouldn't have to be hidden away and that they should add a little pizzazz to people's home decor. People like the idea and have bought more than $75 million worth of his products.

Robotics for Real People

It may sound like science fiction, but this is the real deal: **Yoky Matsuoka** is figuring out how to make robotic arms that can be guided by the human brain. As a young tennis player, she often wondered how her body moved to help her play the sport. When she got injured, she puzzled over how her body recovered and relearned everything. Now, as a neurobotics researcher at the University of Washington, she gets paid to find out. Matsuoka focuses her research on the hands and arms. She says it will probably be at least 20 years before neurobotics technology on hands can be used on a real person. But knowing that her work will eventually change people's lives and affect society has kept her in the field.

MICHELLE GASS PHOTO BY PATRICK O'CONNOR

GIVING BACK

Google Does Good

Don't be evil" is Google's informal corporate motto. Far from being evil, Google is trying to use its vast wealth to do good. Since becoming a public company in 2004, it has set aside 1 percent of its equity and profits — around $1 billion — to fund good causes and invest in promising technologies.

For example, Google.org, the mega search engine's philanthropic arm, has invested $2.75 million each in Aptera Motors of California and ActaCell of Texas. Aptera is designing a fuel-efficient car that combines an aerodynamic shape, lightweight materials, and electric hybrid technology. ActaCell is developing a better battery for such vehicles, which can be charged by plugging them into an electrical outlet. The goal is to develop cars that can cruise for 100 miles on one gallon of gas.

Google.org also supports projects in developing renewable energy sources that are cheaper than coal, halting emerging infectious diseases, improving public services in developing countries, and investing in small-to-medium-sized businesses in developing countries. Google employees are encouraged to take time to do charitable work. Founders Larry Page and Sergey Brin say they want to "address some of the world's most urgent problems." They've certainly put their company's money where their mouths are.

PHOTO BY ROBERT CARDIN/REDUX

Diane Gulyas joined DuPont 30 years ago — starting "at the bottom," as she puts it — with a newly minted B.S. degree in chemical engineering from the University of Notre Dame. Today, many different duties and promotions later, she's a group vice president heading one of DuPont's largest divisions: Performance Materials.

Being a top manager is about analyzing problems and then mobilizing people to solve them, which is why her degree has served her well as she has risen through the ranks. "Engineering is one of the best ways to learn advanced problem-solving skills, both individually and in teams," she says.

Gulyas realizes that she's a role model for younger women. "Mentoring is a real passion of mine," she says. "I learned a lot from the women ahead of me, and I now try to help those who come after me." Accordingly, Gulyas mentors 12 women at DuPont, offering them coaching and counseling on a one-to-one basis.

Because she travels often, she regularly meets with women at DuPont operations worldwide, from Russia to Taiwan. Gulyas also has advised a young female business owner in India as part of a U.S. State Department mentoring program.

Gulyas and her husband, Ed, have been married 27 years. She admits that juggling a high-profile career with family life can be tough at times and that it helps to have a network of supporters, including family, friends, and colleagues: "It is a team effort." Of course, knowing the value of teamwork is something else that Gulyas learned from engineering.

PHOTO BY JIM GRAHAM

STUDENT VOICES

Flyin

STYLIST: PASCALE LEMAIRE (T.H.E. ARTIST AGENCY); HAIR & MAKEUP: KATHY ARAGON (T.H.E. ARTIST AGENCY)

g High

We asked eight students to share what gets them excited about engineering.

PHOTOGRAPHER: STEVE MARSEL

Kellen Knowles graduated from Indiana University-Purdue University Indianapolis with a major in biomedical engineering. After taking some time off to pursue personal goals (including learning how to fly a plane), he plans to get a Ph.D. and continue doing tissue engineering and biomaterials research.

Kellen Knowles

I've always had a real interest in chemistry. So being able to combine that with engineering and finding a field where I can do that has been really great. In the area of tissue engineering and biomaterials, there's a lot of chemistry involved. That's something I'm really passionate about. It's so amazing: being able to get a device that you can put into the body, changing certain features of the material so that the body won't reject it, and working with the biology to integrate the living and the nonliving. For my senior design project, we're looking at pacemaker leads, which are commonly made out of polyurethane and silicone. Those are two biocompatible materials, but we want to find a way to make those materials release antibacterial agents over time, so that it will help reduce infection. When I was first looking up engineering, I didn't even know biomedical was out there. The only reason I found out was research over time.

Elyse Rester is a senior at Georgia Tech majoring in environmental engineering. Ultimately, she wants to use her training to get basic sanitation and clean water to rural areas in developing countries.

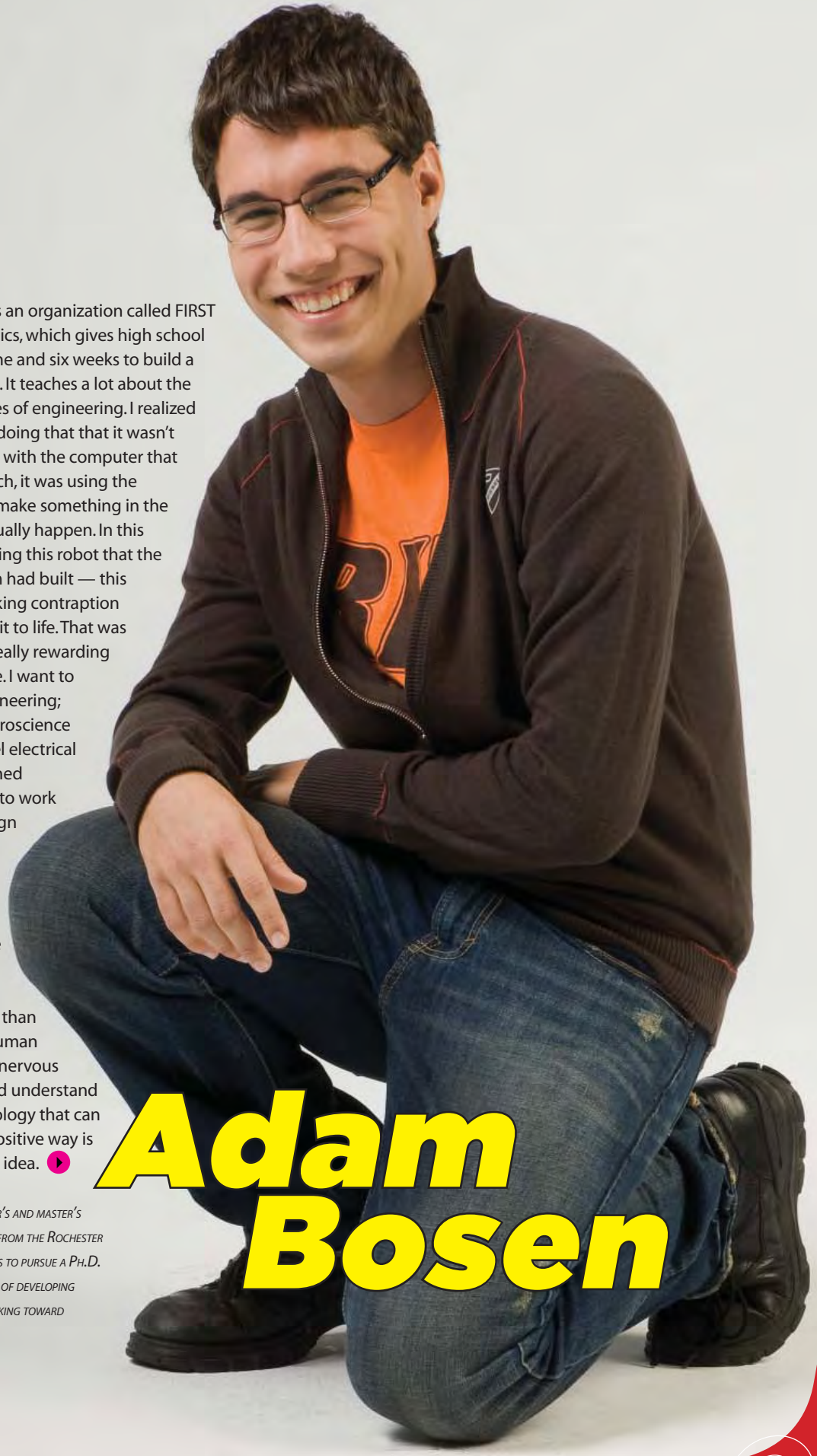
Elyse Rester

I chose environmental engineering for several reasons. I really wanted to do something hands-on. I wanted to be outside, working in the field, and I thought environmental engineering would be a great way to do that. Also, I wanted to help improve sustainability and work with people. When I first spoke to my adviser, I was a little unsure of what I wanted to do for a major. He told me about a professor at Georgia Tech who was building solar pumps to pump clean water to different parts of rural Africa. When he told me that, I instantly knew that that was something I wanted to be a part of. I'm a member of ESWB, Engineering Students Without Borders, and they design projects with similar subject matter. Growing up, we were camping all the time. We'd go hiking and snowboarding. We were always outdoors. Living in Atlanta has made that a little difficult, but I still run outside. I'm a big fan of doing things outside if at all possible.

Rebeca Rodriguez

Rebeca Rodriguez graduated from the University of Arizona with a major in aerospace engineering and a minor in Japanese. She enjoys skateboarding and playing sports like softball, soccer, and Ultimate Frisbee.

When I was 11 years old, my family took a trip to Texas, and we went to the Space Center Houston. From that moment on, I wanted to be an astronaut. I researched what astronauts studied, and most of them were aerospace engineers. To me, engineers try to make sense of the world around them. They truly explore how things work and how they can better the lives of others. I did a year abroad in Japan and then did research with one of the professors at a university there, so I was able to see how engineering works in another country. I also had the chance to go to Thailand and do some research on solar cells. If the chance arises, I'd really like to travel to space. Now, I really want to mix engineering with international work and hopefully work with space agencies from different countries.



Adam Bosen

There's an organization called FIRST Robotics, which gives high school kids a game and six weeks to build a robot for it. It teaches a lot about the practicalities of engineering. I realized while I was doing that that it wasn't just working with the computer that I liked so much, it was using the computer to make something in the real world actually happen. In this case, it was taking this robot that the rest of the team had built — this 130-pound, hulking contraption — and bringing it to life. That was my job. It was a really rewarding experience for me. I want to go into neuroengineering; it's kind of half neuroscience and half upper-level electrical engineering combined together. The idea is to work with prosthetics design — taking this idea of robotic movement and using it to help amputees improve their quality of life. I love a challenge, and I think there's no single greater challenge to us right now than understanding how the human body works, especially the nervous system. The ability to try and understand bits of that and build technology that can improve people's lives in a positive way is phenomenal to me. I love the idea.

Adam Bosen earned his bachelor's and master's degrees in computer engineering from the Rochester Institute of Technology. He wants to pursue a Ph.D. in neuroengineering, with the goal of developing advanced prosthetics. Bosen is working toward earning a black belt in aikido.

Kristen Scudder is a junior at the University of Southern California studying civil engineering with an emphasis on architecture. She is a member of a dance company and teaches ballet.

Kristen Scudder

Growing up, I've always liked architecture, but specifically, I'm into bridges. Watching the Springfield [Va.] interchange get built inspired me. They conquered one of the worst traffic problems in the nation. The bridges are huge. The fact that somebody had to design and fix that problem — I want to be that person. Right now, I'm on a steel bridge team at school. We're designing a bridge for one of the national competitions for the American Society of Civil Engineers. You're given certain conditions, and you have to use those parameters to make your design, and whatever can hold the most weight wins. You learn a lot through that process. It's a team of 20 people, so it's a big group. From an architectural aspect, whenever I go over bridges or underpasses or regular roads — things that seem pretty boring to most people — I see them in a different light. And that's always really neat.

Mitch Springer

Mitch Springer graduated from the University of Wisconsin-Madison with a major in mechanical engineering. In his spare time, he enjoys running and kayaking. He plans to pursue a Ph.D. in biomedical engineering and work on medical devices.

As soon as I was able to walk, I was taking apart things and basically just being a household destruction unit. Eventually, I started seeing why things broke, and I started telling my parents, "I wish they would have done it this way," or "I wish they could have changed it." And one day, my parents said, "Well, stop wishing and start doing." That's when I decided that being an engineer would be how I could do that. For my senior design project, we're working on building stair lifts inside people's homes. Straight stair lifts are fairly common, but if people have curving banisters, the problem is getting the lifts in there at a low cost. We want to turn it into something that can be made into pieces — like a Lego set, almost — so they can be manufactured cheaper and made for any staircase. We want to make it so people can get up there and stay in their lives and be happy. I'm really excited about that. I think engineering all comes down to being creative, applying yourself, working hard, and having fun with what you do.

Joy Barrett is a senior working on a double major in chemical engineering and physics at Tuskegee University. Her focus is environmental engineering. Outside of class, she does community service and mentors local high school students.

Joy Barrett

You might not always see engineers, but they work in almost every company. My dad is a mechanical engineer, and he always used to take me up to his jobs to see what he worked on. I was one of those kids who would take things apart and put them back together. I didn't know what that meant as a little girl, but I see that that was my first step into engineering. This past summer, I worked as a chemist for a nuclear company. I got to see engineers at work using what I'm going to school for. That gives me hope to keep striving. People look at engineering as one of the hardest majors. And I'm always letting them know that as long as you put your heart and mind into something, anything can be accomplished. Just like there's always a need for a doctor, there's always a need for an engineer.

Appropriate technology is about helping people to build what they need and not what is going to make you the most money. It's also about the environment and using what's available locally. I was blessed to go to Tanzania for three weeks after working with a team for two years to develop a wood-turning lathe. We went to several villages in Tanzania telling people about these ideas, and then we partnered with them to bring it into real life. We started working with a craftsman there, orphans, students — and worked together to build some machines that they can now use to earn money. Sometimes, you don't choose engineering, but engineering chooses you. There are some people who are just wired to fix things. If you see something that's not right in the world, and you don't say, "Man, someone should do something about that." Instead, you say, "I should do something about that" — then you might be an engineer.

Alex Moseson

Alex Moseson is a graduate student at Drexel University researching appropriate technology for the developing world. He hopes to be a professor someday and use that opportunity to get others excited about the field. He volunteers with Engineers Without Borders, and his hobbies include photography and the performing arts.

GOOD ADVICE

So how do you prepare for engineering school? We asked current college engineering students — all members of ASEE — for their advice to high school students thinking about pursuing engineering. Naturally, they all said that you should take plenty of math and science. But they also offered these suggestions:

"Develop an **interest in the arts.** This helps in developing creative thinking ability."

"Take a drafting or **drawing class** in high school that makes you think in 3-D when designing something."

"Take your English classes seriously. Your ability to communicate is important in college and, later, in the workplace."

"Get your hands on things, **take them apart,** repair them. Develop your mechanical intuition and reasoning."

"Stay well-rounded, and **pursue other interests** besides engineering. Good engineers know the needs and wants of culture and society."

"**Get summer internships** with firms in your field of interest. A little experience early on can significantly influence your ultimate career choice."

"Get in touch with a local branch of an engineering society to **meet with real engineers.**"

"Find someone — an older friend, student, cousin — who's been through it before and can cheer you on or tutor you. Don't be afraid to get help, because **the first two years are the toughest.**"

"Don't be afraid to **challenge yourself.** The only way you can learn what you are truly capable of is to test yourself."

"Explore the world. See things from a different perspective. Don't just do what everyone else does. **Be yourself.**"

Colleges offer women engineering students sisterhood and support.

GIRL POWER

Coming into Virginia Tech's engineering program, Angela Walker knew that as a woman, she would be in the minority. That's why she chose to live in Hypatia, an all-female engineering community, her first two years. "Nothing can replace the ability to walk down the hallway and get help on homework," says Walker, now a junior majoring in mechanical engineering. "If it weren't for the network of people you meet through this program, many girls might feel intimidated to the point that they decide to drop out of engineering," she says. "We empower each other."

Programs like Hypatia make a difference. Many women in engineering programs report feeling isolated. That's no surprise: Women make

Residents of Hypatia, Virginia Tech's all-female engineering dorm

up 57 percent of the total undergraduate population but just 17 percent of engineering undergraduates. Engineering educators want those numbers to go up — not only to fill a serious engineer shortage in this country but also to diversify the profession. The more diverse an engineering team is, the greater the potential for creative ideas and solutions. That's why schools like Virginia Tech and the Pennsylvania State University are doing everything they can to provide moral support for women engineering students.

Carly Petrarca admits that visiting engineering schools her senior year of high school was a little intimidating after all the hype she had heard about the lack of women in the field. But her confidence got a boost when she learned about Penn State's Women in Engineering Program.

Starting with a three-day orientation before classes begin, the program puts together teams of female students and matches them with mentors, laying a foundation of support for their freshman year and beyond. "Even though women are a minority, the program is huge, and you don't feel like you're a minority at all," Petrarca says.

Attending monthly meetings kept her on top of everything from study skills to building a résumé that eventually landed her an internship at Walt Disney World. Her mentor became a friend that she still e-mails for advice. Now a senior in industrial engineering and a mentor herself, Petrarca says the network also helped her through some rough spots: "The curriculum is definitely challenging, but having these resources, you're constantly reminded not to give up."

Support doesn't always have to come through a formal program. At Tufts University, electrical engineering professor Karen Panetta is leading a team of undergraduate women from different engineering disciplines through several projects. They're building a solar-powered car for the World Solar Challenge in Australia and designing all-new solar-energy systems for two historic lighthouses on Thacher Island off the coast of Massachusetts. The "Nerd Girls," as they proudly call themselves, invite K-12 students to their campus to dispel myths about engineering. They have even inspired a reality TV show. "They are cool, hip young women," Panetta says, "who show how having interdisciplinary interests in music, art, drama, dance, and sports — coupled with math and science — makes incredible engineers who can change the world."

PHOTO BY NED DISHMAN

These profs love helping students to thrive.

CLASS ACTS

A Probing Mind

REBECCA RICHARDS-KORTUM sees the engineer in everyone. It's one way this **Rice University** professor of bioengineering helps undergraduates in many disciplines create solutions to global health problems.

She leads a program called Beyond Traditional Borders, which allows students to tackle specific challenges faced by health care providers in developing countries. One group, for instance, helped a community in Lesotho make low-cost incubators to improve hospital neonatal care. "It's a great opportunity for students to learn science and put engineering into action to solve problems," Richards-Kortum says. "It's a real source of inspiration for me to see how engaged and enthusiastic they are and how much they want to make a difference in their careers."

Making a difference fuels her own research. She has won numerous awards for her work in developing miniature microscopes to identify precancerous tissue without need for invasive procedures such as biopsies. This is particularly important in developing countries where expensive screening methods often aren't available. Her lab is now collaborating with doctors in India to test battery-powered versions of the microscopes to detect oral cancer.

Traveling and seeing firsthand what life is like for impoverished groups has been a "humbling and inspiring experience," she says. "It's changed a lot about what I think is important in my career."

Rogue Scholar

ODDSMAKERS probably wouldn't have bet money that Armando Rodriguez would one day become a professor. He grew up in a rough New York City neighborhood in the 1960s and 1970s, and many of his friends were lost to the streets. His mother died of cancer when he was 13, and his father was a window cleaner. "He couldn't provide much advice to me other than, 'Go to school or I'm going to kill you,'" Rodriguez says. But his father did steer him to someone in the neighborhood who Rodriguez says saved his life. "He was the guy who saved me from juvenile delinquency and worse later on. He bought me books and helped me with projects. I know the difference an individual can make in a person's life — I've lived it."

Today, as a professor of electrical engineering at **Arizona State University,** Rodriguez teaches courses about control systems in spacecraft, robots, submarines, and missiles. He leads a mentoring program funded by the National Science Foundation that has provided scholarships to hundreds of undergraduates in science, technology, engineering, and mathematics. "I wish I could provide such scholarships to millions more across the nation," he says. "For many of the students I target, it often represents the difference between being able to focus on studies and concentrating on the degree versus dropping out to work."

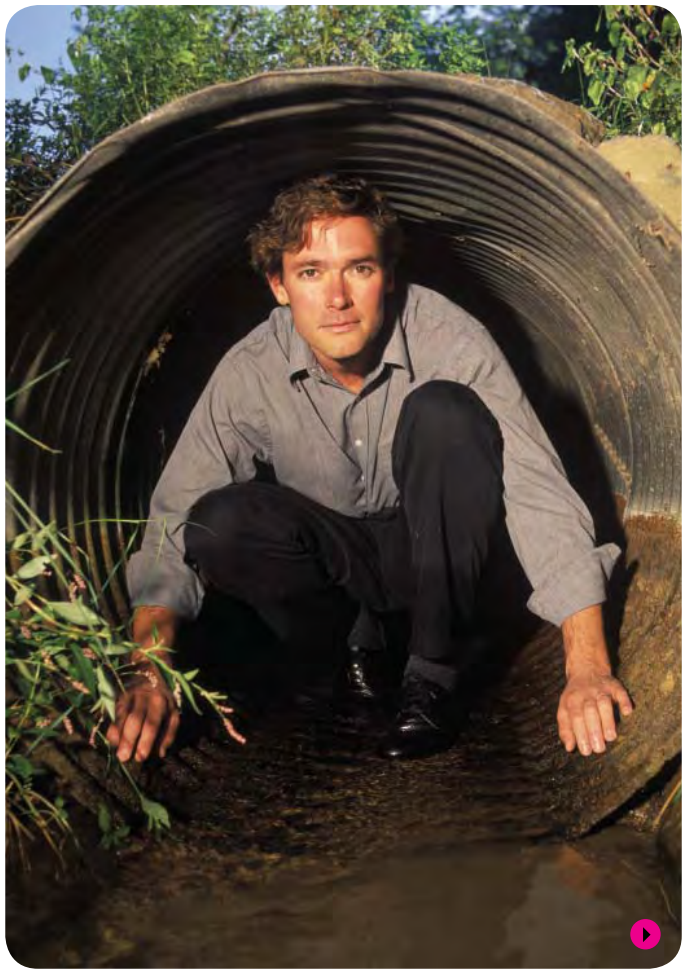
RODRIGUEZ PHOTO BY KEVIN MOLONEY; KORTUM PHOTO BY GREG KOLANOWSKI; ASHFORD PHOTO BY WYATT MCSPADDEN; EDWARDS PHOTO BY MATTHEW GIRARD

Driving Force

WHEN MARCUS ASHFORD was studying mechanical engineering at **Louisiana State University,** there wasn't a single black faculty member in the department. Now, as an assistant professor at the University of Alabama, he hopes to inspire change. "A lot of kids don't see themselves in certain positions because they've never seen anyone like them doing it," he says. "We are our own best recruiters. If the work that we do is exciting enough, and you can get people to see that, we'll draw them in."

In 2004, the National Society for Black Engineers named Ashford Graduate Student of the Year for his revolutionary design of a fuel preprocessor for the Lincoln Navigator. It reduced emissions by 80 percent, improved fuel economy, and helped start the SUV in cold weather. Part of his doctoral dissertation at the University of Texas at Austin, the invention was patented by UT and Ford. Now, Ashford is working on hydrogen, which he calls "the ultimate fuel of the future."

Ashford enjoys his role as a teacher. "When you're discussing something in class, occasionally you'll notice that 'deer in the headlights' look that says they don't quite get it. You start tweaking what you're saying, and then you see the lights going on. You can see it in their eyes. 'Oh! That's what he's saying!' And that's an amazing feeling."



The Water Guy

WHEN HE WAS a senior in high school, Marc Edwards was sure he wanted to be a veterinarian. But after he spent a summer working with pets and getting bitten, he realized that "vets end up treating the owners more than the animals." So he switched to civil engineering. Edwards is now a private consultant and professor at **Virginia Tech.**

In 2004, homeowners in Washington, D.C., contacted him about leaks in their home plumbing. Working in part for the District of Columbia Water and Sewer Authority and the Environmental Protection Agency, Edwards set out to investigate. He found astronomically high levels of lead — which can cause birth defects and mental retardation — in D.C.'s water. After he alerted WASA and the EPA, both agencies fired him. But Edwards continued investigating, aided by three keen graduate students. Eventually, he discovered that the lead was due to chloramine, a chemical disinfectant WASA had begun using in 2000. The whole experience taught him not only about fighting bureaucracy but also about the quality of today's engineering students. "You often hear that North American students don't have a work ethic, and they don't know this and they don't know that," he says. "But I will tell you that it almost brings tears to my eyes to think about my students' commitment and the hours they invested. It was remarkable."

DIRECTORY

ASEE's engineering and engineering technology schools

ENGINEERING SCHOOLS

ALABAMA

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Normal, AL 35762
http://www2.aamu.edu/set/
(256) 372-5560

University of Alabama
Tuscaloosa, AL 35487
www.eng.ua.edu
(205) 348-6400

University of Alabama, Birmingham
Birmingham, AL 35294
http://www.uab.edu/engineering/
(205) 934-8410

University of Alabama, Huntsville
Huntsville, AL 35899
http://www.uah.edu/engineering/
(205) 824-6474

Auburn University
Auburn, AL 36830
www.eng.auburn.edu
(334) 844-2308

University of South Alabama
Mobile, AL 36688
www.usouthal.edu/engineering
(251) 460-6140

Tuskegee University
Tuskegee, AL 36088
www.tuskegee.edu
(334) 727-8356

ALASKA

University of Alaska, Anchorage
Anchorage, AK 99508
www.engr.uaa.alaska.edu
(907) 786-1900

University of Alaska, Fairbanks
Fairbanks, AK 99775
www.uaf.edu/cem
(907) 474-7730

ARIZONA

Arizona State University
Tempe, AZ 85287
http://engineering.asu.edu/
(480) 965-1726

University of Arizona
Tucson, AZ 85721
www.engr.arizona.edu
(520) 621-6594

Northern Arizona University
Flagstaff, AZ 86011
http://www.cefns.nau.edu/
(928) 523-2408

ARKANSAS

Arkansas State University
State University, AR 72467
engr.astate.edu
(870) 972-2088

Arkansas Tech University
Russellville, AR 72801
engr.atu.edu
(479) 964-0877

University of Arkansas
Fayetteville, AR 72701
www.engr.uark.edu
(479) 575-7780

University of Arkansas, Little Rock
Little Rock, AR 72204
http://ualr.edu/eit/
(501) 569-8203

CALIFORNIA

California Institute of Technology
Pasadena, CA 91125
www.eas.caltech.edu
(626) 395-4100

California Polytechnic State University
San Luis Obispo, CA 93407
ceng-web.calpoly.edu
(805) 756-2131

California State Polytechnic University, Pomona
Pomona, CA 91768
www.csupomona.edu/~engineering
(909) 869-2600

California State University, Fresno
Fresno, CA 93740
http://www.csufresno.edu/engineering/index.shtml
(559) 278-2500

California State University, Fullerton
Fullerton, CA 92634
www.fullerton.edu/ecs
(714) 773-3362

California State University, Long Beach
Long Beach, CA 90840
www.csulb.edu/colleges/coe
(562) 985-5123

California State University, Los Angeles
Los Angeles, CA 90032
www.calstatela.edu/academic/engr/tmp/et
(323) 343-4512

California State University, Northridge
Northridge, CA 91330
www.csun.edu/~ecsdean/degprog.html
(818) 885-4501

California State University, Sacramento
Sacramento, CA 95819
hera.ecs.csus.edu
(916) 278-6127

University of California, Berkeley
Berkeley, CA 94720
www.coe.berkeley.edu
(510) 642-5771

University of California, Davis
Davis, CA 95616
http://engineering.ucdavis.edu/
(530) 752-1979

University of California, Irvine
Irvine, CA 92697
www.eng.uci.edu
(949) 824-4333

University of California, Los Angeles
Los Angeles, CA 90095
www.engineer.ucla.edu
(310) 825-9580

University of California, Riverside
Riverside, CA 92521
www.engr.ucr.edu
(951) 827-5190

University of California, San Diego
La Jolla, CA 92093
www.soe.ucsd.edu
(858) 534-6237

University of California, Santa Barbara
Santa Barbara, CA 93106
www.engr.ucsb.edu
(805) 893-3141

University of California, Santa Cruz
Santa Cruz, CA 95064
www.cse.ucsc.edu
(831) 459-2158

Harvey Mudd College
Claremont, CA 91711
http://www.hmc.edu/academicsclinicresearch/academicdepartments/engineering.html
(909) 607-3883

Loyola Marymount University
Los Angeles, CA 90045
www.lmu.edu/page21304.aspx
(310) 642-2834

Naval Postgraduate School
Monterey, CA 93943
www.nps.edu
(831) 656-2727

University of the Pacific
Stockton, CA 95211
http://www.pacific.edu/x6908.xml
(209) 946-2151

San Diego State University
San Diego, CA 92182
www.engineering.sdsu.edu
(619) 594-6061

University of San Diego
San Diego, CA 92110
www.sandiego.edu/usdengr
(619) 260-4627

San Francisco State University
San Francisco, CA 94132
www.sfsu.edu/~cse/
(415) 338-1571

San Jose State University
San Jose, CA 95192
www.engr.sjsu.edu
(408) 924-3800

Santa Clara University
Santa Clara, CA 95053
www.engr.scu.edu
(408) 554-4600

University of Southern California
Los Angeles, CA 90089
http://viterbi.usc.edu/
(213)-740-7832

Stanford University
Stanford, CA 94305
soe.stanford.edu
(630) 723-3938

COLORADO

Colorado School of Mines
Golden, CO 80401
http://engineering.mines.edu/
(303) 273-3650

Colorado State University
Fort Collins, CO 80523
www.engr.colostate.edu
(970) 491-3366

Colorado State University, Pueblo
Pueblo, CO 81001
http://ceeps.colostate-pueblo.edu/engineering/Pages/default.aspx
(719) 549-2890

University of Colorado, Boulder
Boulder, CO 80309
www.colorado.edu/engineering
(303) 492-5071

University of Colorado, Colorado Springs
Colorado Springs, CO 80918
www.eas.uccs.edu
(719) 255-3543

University of Colorado, Denver
Denver, CO 80217
www.cudenver.edu
(303) 556-4768

University of Denver
Denver, CO 80208
www.du.edu/secs
(303) 871-3787

U.S. Air Force Academy
U.S.A.F.A., CO 80840
http://www.usafa.af.mil/
(719) 333-1110

CONNECTICUT

University of Bridgeport
Bridgeport, CT 06601
www.bridgeport.edu/sed
(203) 576-4111

University of Connecticut
Storrs, CT 06269
www.engr.uconn.edu
(203) 486-2221

Fairfield University
Fairfield, CT 06430
http://www.fairfield.edu/soe/index.html
(203) 254-4000

University of Hartford
West Hartford, CT 06117
uhaweb.hartford.edu/ceta
(860) 768-4844

University of New Haven
West Haven, CT 06516
http://www.newhaven.edu/8/
(203) 932-7168

U.S. Coast Guard Academy
New London, CT 06320
http://www.cga.edu/display.aspx?id=486
(860) 444-8547

Yale University
New Haven, CT 06520
www.eng.yale.edu
(203) 432-4200

DELAWARE

University of Delaware
Newark, DE 19716
www.udel.edu/engg
(302) 831-2401

DISTRICT OF COLUMBIA

Catholic University of America
Washington, DC 20064
engineering.cua.edu
(202) 319-5160

University of the District of Columbia
Washington, DC 20008
http://www.udc.edu/academics/soe/
(202) 274-5220

George Washington University
Washington, DC 20052
www.seas.gwu.edu
(202) 994-6080

Howard University
Washington, DC 20059
www.howard.edu/ceacs
(202) 636-6565

FLORIDA

University of Central Florida
Orlando, FL 32816
www.cecs.ucf.edu
(407) 823-2156

Embry-Riddle Aeronautical Univ., Daytona Beach
Daytona Beach, FL 32114
www.db.erau.edu
(386)-226-6000

Florida A&M University/Florida State University
Tallahassee, FL 32310
www.eng.fsu.edu
(850) 487-6161

Florida Atlantic University
Boca Raton, FL 33431
www.eng.fau.edu
(561) 297-2049

Florida Gulf Coast University
Fort Myers, FL 33965
www.fgcu.edu/cob/eng
(239) 590-7390

Florida Institute of Technology
Melbourne, FL 32901
www.coe.fit.edu
(407) 768-8020

Florida International University
Miami, FL 33199
www.eng.fiu.edu
(305) 348-2522

University of Florida
Gainesville, FL 32611
www.eng.ufl.edu
(352) 392-0944

University of Miami
Coral Gables, FL 33124
www.eng.miami.edu
(305) 284-2404

University of North Florida
Jacksonville, FL 32224
www.unf.edu/cocse
(904) 620-1350

University of South Florida
Tampa, FL 33620
www.eng.usf.edu
(813) 974-3780

GEORGIA

Georgia Institute of Technology
Atlanta, GA 30332
www.coe.gatech.edu
(404) 894-3350

University of Georgia
Athens, GA 30602
www.engr.uga.edu
(706) 542-1653

Mercer University
Macon, GA 31207
www.mercer.edu/engineering
(912) 752-2012

HAWAII

University of Hawaii at Manoa
Honolulu, HI 96822
www.eng.hawaii.edu
(808) 956-7727

IDAHO

Boise State University
Boise, ID 83725
coen.boisestate.edu
(208) 426-1153

Idaho State University
Pocatello, ID 83209
www.isu.edu/engineer
(208) 282-2902

University of Idaho, Moscow
Moscow, ID 83844
www.uidaho.edu/engr
(208) 885-6479

ILLINOIS

Bradley University
Peoria, IL 61625
www.bradley.edu/cegt
(309) 677-2721

Illinois Institute of Technology
Chicago, IL 60616
http://www.iit.edu/engineering/
(312) 567-3009

University of Illinois, Chicago
Chicago, IL 60607
www.uic.edu/depts/enga
(312) 996-3463

University of Illinois, Urbana-Champaign
Urbana, IL 61801
www.engr.uiuc.edu
(217) 333-2151

Northern Illinois University
Dekalb, IL 60115
www.ceet.niu.edu
(815) 753-1442

Northwestern University
Evanston, IL 60208
www.tech.northwestern.edu
(847) 491-7379

Olivet Nazarene University
Bourbonnais, IL 60914
engn.olivet.edu
(815) 939-5391

Southern Illinois University, Carbondale
Carbondale, IL 62901
howard.engr.siu.edu
(618) 453-4321

Southern Illinois University, Edwardsville
Edwardsville, IL 62026
www.siue.edu/engineering
(618) 692-2541

INDIANA

University of Evansville
Evansville, IN 47722
http://www.evansville.edu/schools/engineering.cfm
(812) 488-2651

Indiana Institute of Technology
Fort Wayne, IN 46803
www.indianatech.edu/engineering
(800) 937-2448

Indiana University Purdue University, Indianapolis
Indianapolis, IN 46202
www.engr.iupui.edu
(317) 274-9726

University of Notre Dame
Notre Dame, IN 46556
www.nd.edu/~engineer
(574) 631-5534

Purdue University, Calumet (Eng.)
Hammond, IN 46323
www.calumet.purdue.edu/ems
(219) 989-2468

Purdue University, West Lafayette
West Lafayette, IN 47907
www.ecn.purdue.edu/Engr
(765) 494-5345

Rose-Hulman Institute of Technology
Terre Haute, IN 47803
www.rose-hulman.edu/academics
(812) 877-8288

Trine University
Angola, IN 46703
http://www.trine.edu/academics/schools/engineering_technology/
(260) 665-4100

Valparaiso University
Valparaiso, IN 46383
www.valpo.edu/engineering
(219) 464-5121

IOWA

Dordt College
Sioux Center, IA 51250
www.dordt.edu
(712) 722-6000

Iowa State University
Ames, IA 50011
www.eng.iastate.edu
(515) 294-5933

University of Iowa
Iowa City, IA 52242
www.engineering.uiowa.edu
(319) 335-5763

KANSAS

Kansas State University
Manhattan, KS 66506
www.engg.ksu.edu
(785) 532-5590

All of the four-year, U.S. engineering colleges and engineering technology schools on this list are either ABET accredited or applying for accreditation.
This list contains ASEE institutional member schools.

University of Kansas
Lawrence, KS 66045
www.engr.ku.edu/index.php
(785) 864-3881

Wichita State University
Wichita, KS 67260
www.engr.wichita.edu
(316) 978-3400

KENTUCKY

University of Kentucky
Lexington, KY 40506
www.engr.uky.edu
(859) 257-1687

University of Louisville
Louisville, KY 40292
www.louisville.edu/speed
(502) 852-6281

Western Kentucky University
Bowling Green, KY 42101
http://www.wku.edu/ogden/
(270) 745-2461

LOUISIANA

Louisiana State University
Baton Rouge, LA 70803
www.eng.lsu.edu
(225) 578-5731

Louisiana Tech University
Ruston, LA 71272
www.latech.edu/tech/engr
(318) 257-4647

University of Louisiana, Lafayette
Lafayette, LA 70504
engineering.louisiana.edu
(337) 482-6685

McNeese State University
Lake Charles, LA 70606
http://www.mcneese.edu/engineering
(337) 475-5237

University of New Orleans
New Orleans, LA 70148
coe.uno.edu/
(504) 286-6328

Southern University and A&M College
Baton Rouge, LA 70813
www.engr.subr.edu
(504) 771-5290

Tulane University
New Orleans, LA 70118
www.sse.tulane.edu
(504) 865-5764

MAINE

University of Maine
Orono, ME 04469
www.engineering.umaine.edu
(207) 581-2216

MARYLAND

Capitol College
Laurel, MD 20708
www.capitol-college.edu
(301) 369-2800

Johns Hopkins University
Baltimore, MD 21218
www.wse.jhu.edu
(410) 516-4050

University of Maryland, Baltimore County
Baltimore, MD 21250
www.umbc.edu/engineering
(410) 455-3270

University of Maryland, College Park
College Park, MD 20742
www.eng.umd.edu
(301) 405-3865

Morgan State University
Baltimore, MD 21251
www.eng.morgan.edu
(443) 885-3231

U.S. Naval Academy
Annapolis, MD 21402
http://www.usna.edu/EngineeringandWeapons/
(410) 293-6310

MASSACHUSETTS

Boston University
Boston, MA 02215
www.bu.edu/eng
(617) 353-2800

Harvard University
Cambridge, MA 02138
www.seas.harvard.edu
(617) 495-2833

Massachusetts Institute of Technology
Cambridge, MA 02139
http://engineering.mit.edu/
(617) 253-3291

University of Massachusetts, Amherst
Amherst, MA 01003
www.ecs.umass.edu
(413) 545-0300

University of Massachusetts, Dartmouth
North Dartmouth, MA 02747
www.umassd.edu/engineering
(508) 999-8539

University of Massachusetts, Lowell
Lowell, MA 01854
www.uml.edu/engineering
(978) 934-2570

Northeastern University
Boston, MA 02115
www.coe.neu.edu
(617) 437-2153

Franklin W. Olin College of Engineering
Needham, MA 02492
www.olin.edu
(781) 292-2300

Smith College
Northampton, MA 01063
www.science.smith.edu/departments/engin
(413) 585-7000

Tufts University
Medford, MA 02155
ase.tufts.edu/engineering
(617) 628-3237

Wentworth Institute of Technology
Boston, MA 02115
www.wit.edu
(617) 989-4135

Western New England University
Springfield, MA 01119
www1.wne.edu/engineering/
(413) 782-1285

Worcester Polytechnic Institute
Worcester, MA 01609
www.wpi.edu
(508) 831-5000

MICHIGAN

Central Michigan University
Mount Pleasant, MI 48859
www.cst.cmich.edu
(989) 774-1870

University of Detroit Mercy
Detroit, MI 48221
eng-sci.udmercy.edu
(313) 993-1216

Grand Valley State University
Grand Rapids, MI 49504
www.engineer.gvsu.edu
(616) 331-6750

Kettering University
Flint, MI 48504
www.kettering.edu
(810) 762-9500

Lake Superior State University
Sault Ste. Marie, MI 49783
www.lssu.edu
(906) 635-2206

Lawrence Technological University
Southfield, MI 48075
www.ltu.edu/engineering
(248) 204-2500

Michigan State University
East Lansing, MI 48824
www.egr.msu.edu
(517) 355-5113

Michigan Technological University
Houghton, MI 49931
www.engineering.mtu.edu
(906) 487-2005

University of Michigan
Ann Arbor, MI 48109
www.engin.umich.edu
(734) 647-7010

University of Michigan, Dearborn
Dearborn, MI 48128
www.engin.umd.umich.edu
(313) 593-5290

Oakland University
Rochester, MI 48309
www.oakland.edu/secs
(313) 370-2217

Saginaw Valley State University
University Center, MI 48710
http://www.svsu.edu/set/home.html
(989) 964-4144

Wayne State University
Detroit, MI 48202
www.eng.wayne.edu
(313) 577-3776

Western Michigan University
Kalamazoo, MI 49008
www.wmich.edu/engineer
(269) 276-3253

MINNESOTA

University of Minnesota, Duluth
Duluth, MN 55812
www.d.umn.edu/cse
(218) 726-7585

Minnesota State University, Mankato
Mankato, MN 56001
cset.mnsu.edu
(507) 389-5998

University of Minnesota, Twin Cities
Minneapolis, MN 55455
http://cse.umn.edu/index.php
(612) 624-2006

St. Cloud State University
St. Cloud, MN56301
http://www.stcloudstate.edu/cose/
(320) 308-2192

University of St. Thomas
St. Paul, MN 55105
www.stthomas.edu/engineering
(651) 962-5750

MISSISSIPPI

Jackson State University
Jackson, MS 39217
http://www.jsums.edu/cset/index2.htm
(601) 979-2153

Mississippi State University
Mississippi State, MS 39762
www.engr.msstate.edu
(662) 325 - 2270

University of Mississippi
University, MS 38677
http://www.engineering.olemiss.edu/
(662) 915-7407

MISSOURI

University of Missouri, Columbia
Columbia, MO 65211
www.engineering.missouri.edu
(573) 882-4375

University of Missouri, Kansas City
Kansas City, MO 64110
www.sce.umkc.edu
(816) 235-2399

Missouri University of Science & Technology
Rolla, MO 65409
www.mst.edu
(573) 341-4111

St. Louis University, Parks College of Eng.
St Louis, MO 63103
www.parks.slu.edu
(314) 977-8203

Southeast Missouri State University
Cape Girardeau, MO 63701
http://www6.semo.edu/pep/index.asp
(573) 651-2167

Washington University in St. Louis
St. Louis, MO 63130
http://www.engineering.wustl.edu/
(314) 935-6350

MONTANA

Montana State University
Bozeman, MT 59717
www.coe.montana.edu
(406) 994-2272

NEBRASKA

University of Nebraska, Lincoln
Lincoln, NE 68588
http://engineering.unl.edu/
(402) 472-3181

NEVADA

University of Nevada, Las Vegas
Las Vegas, NV 89154
www.egr.unlv.edu
(702) 895-3699

University of Nevada, Reno
Reno, NV 89557
http://www.unr.edu/engineering/
(702) 784-6925

NEW HAMPSHIRE

Dartmouth College
Hanover, NH 03755
thayer.dartmouth.edu
(603) 646-2606

University of New Hampshire
Durham, NH 03824
www.ceps.unh.edu
(603) 862-1781

NEW JERSEY

The College of New Jersey
Ewing, NJ 08628
http://www.tcnj.edu/~engsci/
(609) 771-2538

Monmouth University
West Long Branch, NJ 07764
http://www.monmouth.edu/academics/schools/science/default.asp
(732) 571-3421

New Jersey Institute of Technology
Newark, NJ 07102
http://nce.njit.edu/#
(973) 596-3000

Princeton University
Princeton, NJ 08544
http://www.princeton.edu/engineering/
(609) 987-2260

Rowan University
Glassboro, NJ 08028
http://www.rowan.edu/open/colleges/engineering/
(856) 256-5300

Rutgers, The State University of New Jersey
Piscataway, NJ 08854
http://soe.rutgers.edu/
(732) 445-2212

Stevens Institute of Technology
Hoboken, NJ 07030
www.stevens.edu/ engineering
(201) 216-5000

NEW MEXICO

New Mexico Institute of Mining & Technology
Socorro, NM 87801
www.nmt.edu
(505) 835-5227

New Mexico State University
Las Cruces, NM 88003
http://engr.nmsu.edu/
(575) 646-7234

University of New Mexico
Albuquerque, NM 87131
www.soe.unm.edu
(505) 277-5521

NEW YORK

Alfred University
Alfred, NY 14802
engineering.alfred.edu
(607) 871-2422

Clarkson University
Potsdam, NY 13699
www.clarkson.edu/engineering
(315) 268-6446

Columbia University
New York, NY 10027
http://www.engineering.columbia.edu/
(212) 854-2993

Cooper Union
New York, NY 10003
http://cooper.edu/albert-nerken-school-of-engineering
(212) 353-4285

Cornell University
Ithaca, NY 14853
www.engineering.cornell.edu
(607) 255-4326

Hofstra University
Hempstead, NY 11549
www.hofstra.edu
(516) 463-5544

Manhattan College
Riverdale, NY 10471
http://www.manhattan.edu/academics/engineering/
(718) 862-7281

Binghamton University
Binghamton, NY 13902
watson.binghamton.edu
(607) 777-6203

City College of the City University of New York
New York, NY 10031
http://www1.ccny.cuny.edu/prospective/gsoe/index.cfm
(212) 650-5435

College of Staten Island, City University of New York
Staten Island, NY 10314
www.csi.cuny.edu/
(718) 982-2430

New York Institute of Technology
Old Westbury, NY 11568
www.nyit.edu
(516) 686-7931

University at Buffalo, SUNY
Buffalo, NY 14260
www.eng.buffalo.edu
(716) 645-0972

State University of New York, College of Env. Sci.
Syracuse, NY 13210
www.esf.edu
(315) 470-6633

State University of New York, Maritime College
Bronx, NY 10465
www.sunymaritime.edu
(212) 409-7412

Polytechnic Institute of New York University
Brooklyn, NY 11201
www.poly.edu
(718) 260-3600

Rensselaer Polytechnic Institute
Troy, NY 12180
www.eng.rpi.edu
(518) 276-6203

University of Rochester
Rochester, NY 14627
http://www.hajim.rochester.edu/
(585) 275-4151

Rochester Institute of Technology (COE)
Rochester, NY 14623
www.rit.edu/~630www
(585) 475-2146

Stony Brook University
Stony Brook, NY 11794
www.ceas.sunysb.edu
(631) 632-8380

Syracuse University
Syracuse, NY 13244
www.lcs.syr.edu
(315) 443-2545

U.S. Merchant Marine Academy
Kings Point, NY 11024
http://www.usmma.edu/academics/departments/Engineering.shtml
(516) 726-5705

U.S. Military Academy
West Point, NY 10996
www.usma.edu
(845) 938-4041

Union College
Schenectady, NY 12308
http://www.union.edu/academic_depts/engineering/index.php
(518) 388-6000

Webb Institute
Glen Cove, NY 11542
www.webb-institute.edu
(516) 671-2213

NORTH CAROLINA

Duke University
Durham, NC 27708
http://www.pratt.duke.edu/
(919) 660-5386

North Carolina A&T State University
Greensboro, NC 27411
www.eng.ncat.edu
(336) 334-7589

North Carolina State University
Raleigh, NC 27695
www.engr.ncsu.edu
(919) 515-2311

University of North Carolina, Charlotte
Charlotte, NC 28223
www.coe.uncc.edu
(704) 687-8272

NORTH DAKOTA

University of North Dakota
Grand Forks, ND 58202
www.und.edu/dept/sem
(701) 777-3411

North Dakota State University
Fargo, ND 58108
http://www.ndsu.edu/cea/
(701) 231-7525

OHIO

Air Force Institute of Technology
Wright-Patterson AFB, OH 45433
www.afit.edu
(937) 255-5654

University of Akron
Akron, OH 44325
http://www.ecgf.uakron.edu/
(330) 972-6978

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Cleveland, OH 44106
www.engineering.case.edu
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Cedarville University
Cedarville, OH 45314
http://www.cedarville.edu/Academics/Engineering-and-Computer-Science.aspx
(937) 766-7680

University of Cincinnati
Cincinnati, OH 45221
http://www.ceas.uc.edu/
(513) 556-5417

Cleveland State University
Cleveland, OH 44115
www.csuohio.edu/engineering
(216) 687-2555

University of Dayton
Dayton, OH 45469
http://www.udayton.edu/engineering/
(937) 229-2736

Miami University
Oxford, OH 45056
http://seasnews.eas.muohio.edu/
(513) 529-0700

Ohio Northern University
Ada, OH 45810
http://www.onu.edu/academics/engineering
(419) 772-2371

Ohio State University
Columbus, OH 43210
http://engineering.osu.edu/
(614) 292-2651

Ohio University
Athens, OH 45701
http://www.ohio.edu/engineering/
(614) 593-1474

University of Toledo
Toledo, OH 43606
www.eng.utoledo.edu
(419) 530-8000

West Virginia University Inst. of Technology
Bowling Green, OH 43403
http://engineering.wvutech.edu/
(304) 442-3161

Wright State University
Dayton, OH 45435
www.engineering.wright.edu
(937) 775-5001

Youngstown State University
Youngstown, OH 44555
www.eng.ysu.edu
(330) 941-3009

OKLAHOMA

University of Central Oklahoma
Edmond, OK 73034
http://www.uco.edu/cms/engineering/index.asp
(405) 974-2000

Oklahoma Christian University of Science and Arts
Oklahoma City, OK 73136
www.oc.edu/academics/prof-studies/engineering
(405) 425-5425

Oklahoma State University
Stillwater, OK 74078
www.ceat.okstate.edu
(405) 744-5140

University of Oklahoma
Norman, OK 73019
http://www.ou.edu/coe
(405) 325-2621

University of Tulsa
Tulsa, OK 74104
www.ens.utulsa.edu
(918) 631-2478

OREGON

George Fox University
Newberg, OR 97132
engr.georgefox.edu
(503) 554-2786

Oregon Institute of Technology
Klamath Falls, OR 97601
www.oit.edu
(541) 885-1000

Oregon State University
Corvallis, OR 97331
http://engr.oregonstate.edu/
(541) 737-3101

Portland State University
Portland, OR 97207
www.pdx.edu/cecs
(503) 725-2820

University of Portland
Portland, OR 97203
http://engineering.up.edu/
(503) 943-7180

PENNSYLVANIA

Bucknell University
Lewisburg, PA 17837
http://www.bucknell.edu/Engineering.xml
(570) 577-2000

Carnegie Mellon University
Pittsburgh, PA 15213
www.cit.cmu.edu
(412) 268-5090

Drexel University (Eng.)
Philadelphia, PA 19104
http://www.drexel.edu/coe/
(215) 895-2210

Gannon University
Erie, PA 16541
www.gannon.edu
(814) 871-7618

Grove City College
Grove City, PA 16127
www.gcc.edu
(724) 458-2000

Lafayette College
Easton, PA 18042
www.lafayette.edu/admissions/majors
(610) 250-5000

Lehigh University
Bethlehem, PA 18015
http://www3.lehigh.edu/engineering/
(610) 758-4025

Pennsylvania State University, Erie
Erie, PA 16563
http://psbehrend.psu.edu/school-of-engineering
(814) 898-6153

Pennsylvania State University, Harrisburg
Middletown, PA 17057
http://harrisburg.psu.edu/science-engineering-technology
(717) 948-6541

Pennsylvania State University, University Park
University Park, PA 16802
www.engr.psu.edu
(814) 865-7537

University of Pennsylvania
Philadelphia, PA 19104
www.seas.upenn.edu
(215) 898-7246

Philadelphia University
Philadelphia, PA 19144
http://www.philau.edu/engineering-gandtextiles/
(215) 951-2750

University of Pittsburgh
Pittsburgh, PA 15261
http://www.engineering.pitt.edu/
(412) 624-9800

Robert Morris University
Moon Township, PA 15108
http://www.rmu.edu/web/cms/schools/sems/engineering/Pages/default.aspx
(412) 397-2559

Swarthmore College
Swarthmore, PA 19081
www.engin.swarthmore.edu
(610) 328-8082

Temple University
Philadelphia, PA 19122
http://www.temple.edu/engineering/
(215) 204-7800

Villanova University
Villanova, PA 19085
http://www.villanova.edu/engineering/
(610) 519-4940

Widener University
Chester, PA 19013
http://www.widener.edu/academics/collegesandschools/engineering
(610) 499-4037

Wilkes University
Wilkes-Barre, PA 18766
http://www.wilkes.edu/pages/372.asp
(570) 408-4603

PUERTO RICO

Polytechnic University of Puerto Rico
San Juan, PR 00919
www.pupr.edu
(787) 754-8000

University of Puerto Rico, Mayaguez Campus
Mayaguez, PR 00681
www.uprm.edu/engineering
(787) 265-3822

Universidad del Turabo
Gurabo, PR 00778
http://www.suagm.edu/turabo/
(787) 743-7979

RHODE ISLAND

University of Rhode Island
Kingston, RI 02881
www.egr.uri.edu
(401) 782-2186

Roger Williams University
Bristol, RI 02809
www.rwu.edu
(401) 254-3314

SOUTH CAROLINA

The Citadel
Charleston, SC 29409
engineering.citadel.edu
(843) 953-6499

Clemson University
Clemson, SC 29634
http://www.clemson.edu/ces/
(864) 656-3202

South Carolina State University
Orangeburg, SC 29117
http://www.scsu.edu/academicdepartments/departmentofcivilmechanicalengineeringtechnologyandnuclearengineering.aspx
(803) 536-7117

University of South Carolina
Columbia, SC 29208
www.engr.sc.edu
(803) 777-3270

SOUTH DAKOTA

South Dakota School of Mines and Technology
Rapid City, SD 57701
http://sdmines.sdsmt.edu/sdsmt
(605) 394-2511

South Dakota State University
Brookings, SD 57007
http://www3.sdstate.edu/engr/index.cfm
(605) 688-4161

TENNESSEE

Christian Brothers University
Memphis, TN 38104
http://sun.cbu.edu/cbu/Academics/SchoolofEngineering/index.htm
(901) 321-3405

Lipscomb University
Nashville, TN 37204
engineering.lipscomb.edu
(615) 966-5887

University of Memphis
Memphis, TN 38152
http://www.memphis.edu/herff/index.php
(901) 678-2171

Tennessee State University
Nashville, TN 37209
http://www.tnstate.edu/engineering/
(615) 963-5101

Tennessee Technological University
Cookeville, TN 38505
www.tntech.edu/engineering
(931) 372-3172

University of Tennessee, Chattanooga
Chattanooga, TN 37403
http://www.utc.edu/Academic/EngineeringAndComputerScience/
(423) 425-2256

University of Tennessee, Knoxville
Knoxville, TN 37996
www.engr.utk.edu
(865) 974-5321

Vanderbilt University
Nashville, TN 37235
http://engineering.vanderbilt.edu/Home.aspx
(615) 322-2762

TEXAS

Baylor University
Waco, TX 76798
www.baylor.edu/ecs
(254) 710-4188

University of Houston (CoE)
Houston, TX 77204
www.egr.uh.edu
(713) 743-4246

University of Houston, Clear Lake
Houston, TX 77058
http://prtl.uhcl.edu/portal/page/portal/SCE
(281) 283-3700

Lamar University
Beaumont, TX 77710
http://dept.lamar.edu/engineering/COE/
(409) 880-8741

LeTourneau University
Longview, TX 75607
http://www.letu.edu/opencms/opencms/_Academics/Engineering/
(903) 233-3210

University of North Texas
Denton, TX 76203
http://engineering.unt.edu/
(940) 565-4300

Prairie View A&M University
Prairie View, TX 77446
www.pvamu.edu
(936) 261-9900

Rice University
Houston, TX 77005
engr.rice.edu
(713) 348-4955

Southern Methodist University
Dallas, TX 75275
http://www.smu.edu/lyle.aspx
(214) 768-3050

Texas A&M University
College Station, TX 77843
http://engineering.tamu.edu/
(979) 845-1321

Texas A&M University, Kingsville
Kingsville, TX 78363
http://www.tamuk.edu/engineering/
(361) 593-2001

Texas Christian University
Fort Worth, TX 76129
www.engr.tcu.edu
(817) 257-7677

Texas State University, San Marcos
San Marcos, TX 78666
www.science.txstate.edu
(512) 245-2119

Texas Tech University
Lubbock, TX 79409
http://www.depts.ttu.edu/coe/
(806) 742-3451

University of Texas, Arlington
Arlington, TX 76019
www.uta.edu/engineering
(817) 272-5725

University of Texas, Austin
Austin, TX 78712
www.engr.utexas.edu
(512) 471-1166

University of Texas, Dallas
Richardson, TX 75083
www.utdallas.edu/dept/eecs
(972) 883-2974

University of Texas, El Paso
El Paso, TX 79968
http://engineering.utep.edu/
(915) 747-6444

University of Texas, Pan American
Edinburg, TX 78539
http://portal.utpa.edu/utpa_main/daa_home/coecs_home
(956) 665-3510

University of Texas, San Antonio
San Antonio, TX 78249
engineering.utsa.edu
(210) 458-4490

University of Texas, Tyler
Tyler, TX 75799
cecs.uttyler.edu
(903) 565-5529

Trinity University
San Antonio, TX 78212
http://web.trinity.edu/x6151.xml
(210) 999-7511

UTAH

Brigham Young University
Provo, UT 84602
www.et.byu.edu
(801) 378-4326

Utah State University
Logan, UT 84322
www.engineering.usu.edu
(435) 797-2775

University of Utah
Salt Lake City, UT 84112
www.coe.utah.edu
(801) 581-6911

VERMONT

Norwich University
Northfield, VT 05663
www.norwich.edu/academics/engineering
(802) 485-2256

University of Vermont
Burlington, VT 05405
http://www.uvm.edu/~cems/soe/
(802) 656-0978

VIRGINIA

George Mason University
Fairfax, VA 22030
http://volgenau.gmu.edu/
(703) 993-1500

Hampton University
Hampton, VA 23668
http://set.hamptonu.edu/
(757) 728-6970

Old Dominion University
Norfolk, VA 23529
www.eng.odu.edu
(757) 683-3787

Virginia Commonwealth University
Richmond, VA 23284
http://www.egr.vcu.edu/
(804) 828-3925

Virginia Military Institute
Lexington, VA 24450
www.vmi.edu
(540) 464-7311

Virginia State University
Petersburg, VA 23806
http://engrtech.vsu.edu/engineering-home.html
(804) 524-8989

Virginia Tech
Blacksburg, VA 24061
www.eng.vt.edu
(540) 231-9752

University of Virginia
Charlottesville, VA 22904
www.seas.virginia.edu
(434) 924-3072

WASHINGTON

Gonzaga University
Spokane, WA 99258
www.gonzaga.edu/engineering
(509) 313-3523

Seattle Pacific University
Seattle, WA 98119
www.spu.edu/depts/ee
(206) 281-2296

Seattle University
Seattle, WA 98122
www.seattleu.edu/scieng
(206) 296-5500

Walla Walla University
College Place, WA 99324
http://www.wallawalla.edu/academics/areas-of-study/undergraduate-programs/engineering/
(509) 527-2765

Washington State University
Pullman, WA 99164
www.cea.wsu.edu
(509) 335-6613

University of Washington
Seattle, WA 98195
www.engr.washington.edu
(206) 543-0340

WEST VIRGINIA

West Virginia University
Morgantown, WV 26506
www.cemr.wvu.edu
(304) 293.4821

WISCONSIN

Marquette University
Milwaukee, WI 53201
http://www.marquette.edu/engineering/
(414) 288-6591

Milwaukee School of Engineering
Milwaukee, WI 53202
www.msoe.edu
(414) 277-6763

University of Wisconsin, Madison
Madison, WI 53706
www.engr.wisc.edu
(608) 262-3482

University of Wisconsin, Milwaukee
Milwaukee, WI 53201
http://www4.uwm.edu/ceas/
(414) 229-4126

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University of Wisconsin, Platteville
Platteville, WI 53818
www.uwplatt.edu/ems
(608) 342-1561

University of Wisconsin, Stout
Menomonie, WI 54751
http://www.uwstout.edu/
(715) 232-1122

WYOMING

University of Wyoming
Laramie, WY 82071
www.eng.uwyo.edu
(307) 766-4253

CANADA

University of Alberta
Edmonton, AB T6G 2V4
www.engineering.ualberta.ca
(800) 407-8354

University of Calgary
Calgary, AB T2N 1N4
http://schulich.ucalgary.ca/
(403) 220-5732

University of Manitoba
Winnipeg, MBR3T 5V6
www.umanitoba.ca/faculties/engineering
(204) 474-9807

Dalhousie University
Halifax, NS B3J 2X4
engineering.dal.ca
(902) 494-6217

Lakehead University
Thunder Bay, ON P7B 5E1
engineering.lakeheadu.ca
(807) 343-8321

McMaster University
Hamilton, ONL8S 4L7
http://www.eng.mcmaster.ca/
(905) 525-9140

Queen's University
Kingston, ON K7L 3N6
http://engineering.queensu.ca/index.php
(613) 533-2055

University of Toronto
Toronto, ON M5S 1A4
http://www.engineering.utoronto.ca/home.htm
416-978-3131

University of Waterloo
Waterloo, ON N2L 3G1
http://www.engineering.uwaterloo.ca/
(519) 888-4567

University of Western Ontario
London, ON N6A 5B9
http://www.uwo.ca/
(519) 661-2111

University of Windsor
Windsor, ON N9B 3P4
http://www.uwindsor.ca/engineering/
(519) 253-3000

Concordia University
Montreal, QC H3G 1M8
encs.concordia.ca
(514) 848-2424

Ecole de Technologie Supérieure
Montreal, QC H3C 1K3
www.etsmtl.ca
(514) 396-8800

Ecole Polytechnique de Montréal
Montreal, QC H3C 3A7
www.polymtl.ca/etudes
(514) 340-4711

McGill University
Montreal, QCH3A 2K6
www.mcgill.ca/engineering
(514) 398-7257

Université de Sherbrooke
Sherbrooke, QC J1K 2R1
www.usherbrooke.ca/genie
(819) 821-7000

CHINA

Tsinghua University
Beijing, China 100084
http://www.tsinghua.edu.cn/publish/then/index.html
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COSTA RICA

Colegio Federado de Ingenieros y de Arquitectos de Costa Rica
San Jose, Costa Rica 2346-1000
www.cfia.or.cr
(506) 2202-3900

DUBAI

American University in Dubai
Dubai, Dubai 28282
www.aud.edu
(971) 431-83405

FRANCE

Ecole Nationale d'Ingénieurs de Metz (ENIM)
57045 Metz Cedex 01,
www.enim.fr
(00) 333-87-34-69-00

KUWAIT

Kuwait University
Safat, Kuwait 13060
http://www.kuniv.edu/ku
(965) 248-42040

LEBANON

American University of Beirut
Beirut, Lebanon
http://webfea.fea.aub.edu.lb/fea/
(961) 1-347-952

MALAYSIA

Universiti Teknologi Malaysia
Johor Bahru, Takzim, Malaysia
www.utm.my
(+6) 07-55-30370

MEXICO

Tecnologico de Monterrey (ITESM)
San Luis Potosi, SLP, Mexico 78211
www.itesm.mx
(52) 81-8328 4087

Universidad Autonoma de Nuevo Leon
San Nicolas, Nuevo Leon, Mexico 66451
www.fime.uanl.mx
(52) 81-83 29 4020

NEW ZEALAND

University of Auckland
Auckland, New Zealand
www.engineering.auckland.ac.nz/
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PORTUGAL

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Lisboa, Portugal 1957-007
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SAUDI ARABIA

King Khalid University
Abha, Asir, Saudi Arabia 61421
http://www.kku.edu.sa
(966) 7 241 7079

SINGAPORE

National University of Singapore
Singapore, 117576
http://www.eng.nus.edu.sg
(65) 6516 2101

TURKEY

Eastern Mediterranean University
Mersin, Turkey 10
http://www.eng.emu.edu.tr
90 392 630 1381

UNITED ARAB EMIRATES

Khalifa University of Science, Technology and Research
Abu Dhabi, U.A.E.
www.kustar.ac.ae
(971) 2-401-8117

ENGINEERING TECHNOLOGY SCHOOLS

ALABAMA

Alabama A&M University
Normal, AL 35762
http://www2.aamu.edu/set/
(256) 372-5560

ARIZONA

Arizona State University, Polytechnic campus
Mesa, AZ 85212
http://technology.asu.edu/
(480) 727-2727

ARKANSAS

University of Arkansas, Little Rock
Little Rock, AR 72204
http://ualr.edu/eit/
(501) 683-7117

CALIFORNIA

California State Polytechnic University, Pomona
Pomona, CA 91768
www.csupomona.edu/~engineering
(909) 869-2600

COLORADO

Colorado State University, Pueblo
Pueblo, CO 81001
http://ceeps.colostate-pueblo.edu/Pages/Default.aspx
(719) 549-2696

Metropolitan State College of Denver
Denver, CO 80217
http://www.mscd.edu/et/
(303) 556-2503

CONNECTICUT

Central Connecticut State University
New Britain, CT 06050
http://www.ccsu.edu/page.cfm?p=457
(860) 832-1800

University of Hartford
West Hartford, CT 06117
http://www.hartford.edu/ceta/
(860) 768-5163

GEORGIA

Georgia Southern University
Statesboro, GA 30460
http://cost.georgiasouthern.edu/
(912) 478-5111

Southern Polytechnic State University
Marietta, GA 30060
www.spsu.edu
(678) 915-7778

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http://new.ipfw.edu/etcs/
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