

# GATEWAY TO THE WORLD

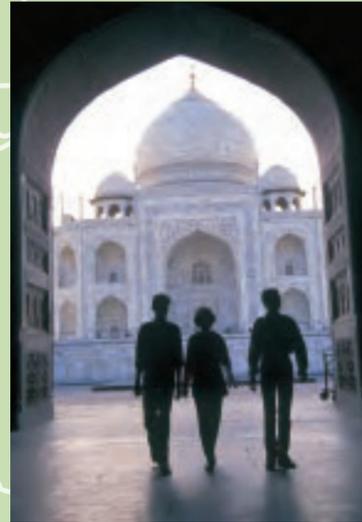
*The 21st century promises many challenges and worlds of opportunity waiting to be explored, worlds as tiny as a single human cell to as large as the universe. Worlds within ourselves. Worlds at our doorstep. And worlds beyond.*

*In the past, boys and men have typically been the ones to*



*explore these worlds. But women engineers have broken through those barriers—which makes it easier for women today to follow their own paths.*

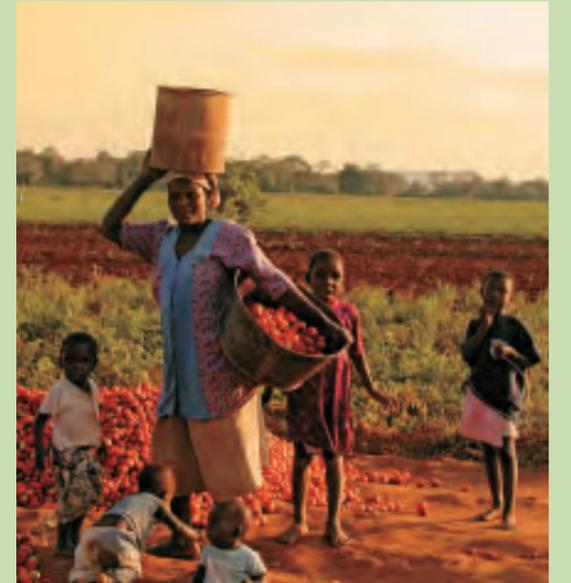
*Teams of engineers from all walks of life are needed to work together to better our lives. These teams need infusions of creativity, new approaches, and different ways of looking at*



*the world. In short, these teams need women engineers!*

*A career in engineering can be enormously creative—and can serve as the gateway to all sorts of amazing careers that may not typically be considered “engineering.” Women engineers have successfully become leaders in government, business, medicine, and law.*

*They have applied their engineering skills to tackle some of the world’s most challenging problems: pollution, hunger, and human rights. In doing so, they have made a difference. Their lives stand as shining examples of how individual women, empowered with the proper skills, can help improve the dignity and prosperity of all the world’s peoples.*



A FAMILY HARVESTING TOMATOES IN ZIMBABWE.

## TRAILBLAZERS, PATHFINDERS, SCOUTS

Engineering is a passionate profession full of brave and determined women who loved engineering so much that they fought for the right to practice it. Early, pioneering women engineers endured many minor inconveniences, such as not having a women's restroom in their workplace. They also endured larger issues, such as disrespect, hostility, and flat-out rejection.

Their strength and determination prevailed in the workplace and in the engineering profession. Today, women engineers are fully embraced by the profession. Knowing what may lie ahead for young women entering the field of engineering, many trailblazing women engineers have dedicated their life's work to making the path easier to follow.

### For Future Generations

With passage of the 19th amendment to the U.S. Constitution on May 19, 1920, American women finally won the right to vote. Sixty years later, structural engineer **RUTH V. GORDON** (b.1926) chained herself to the Pacific Stock Exchange to protest gender discrimination and to demonstrate that the Equal Rights Amendment was an economic issue. "The suffragettes did it for me," she explains. "I figured I could do it for my children." (Read more about Ruth's engineering career on page 45.)




---

*"If I have seen further,  
it is by standing on  
the shoulders of giants."*

SIR ISAAC NEWTON  
MATHEMATICIAN AND PHYSICIST (1643–1727)

---

### ENGINEER AND FIREBRAND

Civil engineer **NORA STANTON BLATCH** (1883–1971) first campaigned for suffrage—a women's right to vote—at Cornell University, where she chose civil engineering as her major because it was the most male-dominated field she could find. She graduated in 1905.

That same year, Nora was the first woman admitted (although with "junior" status) to the American Society of Civil Engineers. In 1916, despite Nora's success as an architect and civil engineer, the ASCE terminated her membership because she passed the age limit for junior status.

Nora brought her case to the Supreme Court, claiming that ASCE rejected her application for full membership not because she was professionally incapable, but because she was a woman. She lost the case. It would be 11 more years before a woman, Elsie Eaves, gained full membership in ASCE, and another 76 years before a woman, Patricia Galloway, became a president of ASCE.



### MOTHER'S AN ENGINEER

"A very nice, well-to-do lady paid for my father to go to college," explains chemical engineer **MARYLY VAN LEER PECK** (b.1930). Maryly's father, Blake Ragsdale Van Leer, went on to become dean of engineering at the University of Florida and North Carolina State, and then president of the Georgia Institute of Technology. "I've spent my life trying to give others the same opportunity."

One of Maryly's lasting legacies as the first woman president of the Polk Community College was to establish a number of endowed scholarships. Maryly is largely responsible for organizing the framework for the Society of Women Engineers' student sections, and helped to organize many of the early student sections. She is an active supporter of Girls Incorporated, which teaches young women to be the best that they can be, whatever that may be.



IN 1961, MARYLY PECK, THEN A SENIOR RESEARCHER AT ROCKETDYNE WORKING ON HYBRID FUEL COMBUSTION, WAS FEATURED IN *LIFE* MAGAZINE—ALONG WITH 100 OF THE MOST IMPORTANT YOUNG MEN AND WOMEN IN THE U.S.—AS ONE OF THE TAKEOVER GENERATION. "MOTHER'S AN ENGINEER," READ THE HEADLINE. THREE OF HER FOUR CHILDREN, HER NIECE, AND THREE NEPHEWS ARE NOW ENGINEERS.

IMAGINE BEING THE DAUGHTER OF HARRIOT STANTON BLATCH (1856–1940) (RIGHT) AND THE GRAND-DAUGHTER OF ELIZABETH CADY STANTON (1815–1902) (CENTER), BOTH FAMOUS LEADERS IN THE EARLY WOMEN'S RIGHTS MOVEMENT IN THE U.S. NORA STANTON BLATCH'S (LEFT) FATE AS A FEMINIST WAS SEALED!



### ENGINEERING NEEDS WOMEN

A good sense of humor helped electrical engineer **ELEANOR BAUM** (b.1940) put up with others who didn't take her career seriously, that, and challenging the status quo of the engineering profession. "An individual does not need to be a white male to succeed in engineering," she says.

After a number of unsatisfactory industry jobs, Eleanor went back to school for her Ph.D. in electrical engineering. She eventually became the first female dean of engineering in

ELEANOR BAUM HAS WORKED TIRELESSLY TO ENCOURAGE MINORITIES AND WOMEN TO PURSUE AN ENGINEERING EDUCATION, AND HAS INFLUENCED INSTITUTIONS AROUND THE WORLD TO WELCOME WOMEN.

the United States. She is now the dean of engineering at The Cooper Union in New York, making sure that her university provides an environment that is welcoming and nurturing to women's success. "Any creative endeavor that excludes a cross-section of the population is losing something. Engineering needs women!"

### FROM SOLO TO TEAMWORK

In graduate school, electrical engineer **IRENE CARSWELL PEDEN** (b.1925) felt extremely isolated. It was a "long, lonely path," she says about being the first woman to obtain a Ph.D. in engineering from Stanford University, but she did it!

Although Irene thrived on the quantitative nature of engineering, she was quite people-oriented, which may explain her attraction to teaching. "Back then, engineers worked alone to solve problems. Today, we know that we need to work in teams. Engineering education now reflects this."

To this end, in addition to a distinguished career as a teacher and researcher of electromagnetics, wave propagation, geophysical remote sensing, and antennas, Irene has applied her engineering style to bettering the university environment for women—through supporting, enabling, and mentoring other women. "So much of my work was done in the old male-dominated "Lone Ranger" environment once typical of engineering. We're fortunate that engineering education has changed to accommodate all learning styles and needs, not just men's."



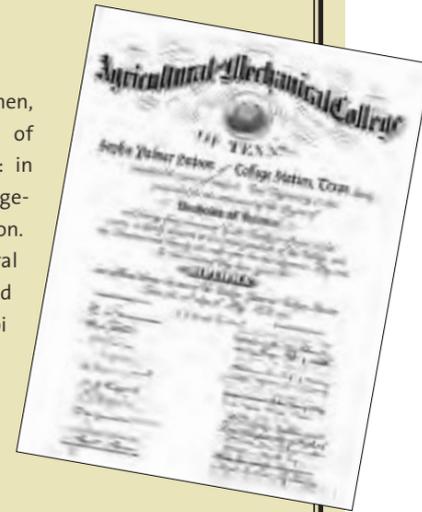
FOR FIVE YEARS, IRENE PEDEN RELIED ON DATA ABOUT THE PROPERTIES OF DEEP ICE COLLECTED BY HER MALE COLLEAGUES. THERE'S NO SUBSTITUTE FOR OBTAINING INFORMATION FIRST-HAND, THOUGH. IN 1970, IRENE (RIGHT WITH JULIA VICKERS, AN ASSISTANT FROM NEW ZEALAND), WAS THE FIRST WOMAN PRINCIPAL INVESTIGATOR TO CONDUCT FIELD STUDIES IN THE ANTARCTIC. TO THIS DAY, IRENE SWEARS THAT THEY OVERCAME SABOTAGE TO COMPLETE HER RESEARCH THERE.



### "Not Fair!"

A lot has changed since the early days when women first started studying and practicing engineering. Twins **MARY LOCKETT HUTSON** (1884–1982) and **SOPHIE PALMER HUTSON** (1884–1983) were allowed to enroll at Texas A&M—60 years before the university opened its doors to women—because their father was a professor there. They studied civil engineering and completed all requirements in 1903.

But because they were women, they were issued "certificates of completion," not true diplomas: in short, second-rate acknowledgement for their first-rate education. Mary went on to design several water pumping facilities around New Orleans and in Mississippi and Texas. It wasn't until 2002 that the university conferred degrees on the twins—posthumously.



## GOVERNMENT FOR THE WOMEN

In his 1863 Gettysburg Address, Abraham Lincoln described the democracy of the U.S. as “government of the people, by the people, [and] for the people.” At the time, “people” meant men. Women were not allowed to vote, and they were certainly not allowed to hold elected positions in the government.

In 1916, Montanan Jeannette Rankin was the first woman in the United States to serve in Congress. Women won the right to vote in 1920 with the passage of the 19th amendment to the U.S. Constitution.

If a government is an organization that has the power to make and enforce laws, and roughly half are women, why aren't women equally represented in that government?

It's one of the tough social questions that women and men have been struggling with for decades. Could the know-how of engineers help make the government workplace more equitable for women? Certainly!

WOMEN CAST THEIR FIRST VOTES FOR PRESIDENT IN NOVEMBER 1920.



“Because man and woman are the complement of one another, we need woman’s thought in national affairs to make a safe and stable government.”

ELIZABETH CADY STANTON  
A LEADER OF THE 19TH CENTURY AMERICAN  
WOMEN’S RIGHTS MOVEMENT (1815–1902)

## CHAMPION OF EQUALITY

In 1961, president John F. Kennedy asked former first lady Eleanor Roosevelt to chair the first Presidential Commission on the Status of Women. Civil engineer EVELYN “EVIE” BARSTOW HARRISON (1910–2000) worked closely with Mrs. Roosevelt on the commission to investigate questions regarding women’s equality in education, in the workplace, and under the law.

In 1963, Evie became the head of the newly formed Federal Women’s Program, part of the Civil Service Commission, with a goal of making the federal government the nation’s model employer of women. She advocated for full equality for women, and used her position in the Civil Service to further initiatives that supported the rights women enjoy today.



EVELYN HARRISON (FRONT, CENTER) WAS THE FIRST WOMAN TO GRADUATE FROM THE UNIVERSITY OF MARYLAND WITH AN ENGINEERING DEGREE. LIKE MANY WOMEN IN THIS BOOK, EVELYN WAS THE ONLY WOMAN IN A CLASS OF MEN.

## MODERNIZING MILITARY SUPPORT

After spending most of her career developing weapons systems, mechanical engineer MARY LACEY (b.1955) took over the National Security Personnel System (NSPS) to overhaul the way Department of Defense civilian employees are hired, paid, and promoted.

The question Mary gets asked most often? “Why put an engineer in charge of the NSPS?”

She responds, “It’s all about setting up a system that enables people to complete the work of the organization. Designing a personnel system is not much different than designing a complex weapons system or Navy ship. As an engineer, I know how to set up systems that

work, and this job plays to my passion. I love people and I like change.”

As military strategies change to meet new threats of the 21st century (for example, stepped-up national security and the global war on terrorism), the civilian workforce must be able to respond efficiently and quickly to meet military needs.

“A strong and flexible military is necessary to maintaining our way of life,” Mary says. “As an engineer, I’ve been able to support that cause, whether through technology development or people management.”



MARY LACEY IS USING HER ENGINEERING SKILLS ON HER MOST COMPLEX PROJECT YET: OVERHAULING THE DEPARTMENT OF DEFENSE’S CIVIL SERVICE PERSONNEL SYSTEM.

## GETTING DOWN TO BUSINESS

*Since the beginning of humankind, enterprising people have bought, made, and sold goods and services—in short, created businesses. Engineers are no different. In fact, engineers’ problem-solving skills are an ideal basis for success in the business world!*

*Running a business involves identifying a need (in business parlance, a “market”), envisioning a solution (a “product” or “service”) to fill that need, and gathering and organizing the resources (“materials” and “personnel”) needed to create the product or service. This is just what engineers do!*



### AN ENGINEER ON WALL STREET

Mechanical engineer **KRISTIN STOEHRE PEREIRA** (b.1965) compares business to machines. Each business process, whether finance or sales, has “switches” and “motors” and “gears” that make it work. If the motor doesn’t have enough power or the gears don’t mesh, the business process won’t work smoothly or efficiently.

Kristin started her career with General Electric Aircraft Engines, moved to General Electric Plastics, and became one of General Electric’s first “black belt” experts at Six Sigma, a highly disciplined process that helps businesses focus on developing and delivering near-perfect products and services.

Today, Kristin is using her engineering skills in the world of high finance. Her company, the Financial Guaranty Insurance Company (FGIC), provides insurance for many high-stakes Wall Street bonds and securities sales. As director of operations for FGIC, Kristin helps streamline the switches, motors, and gears that drive the business.

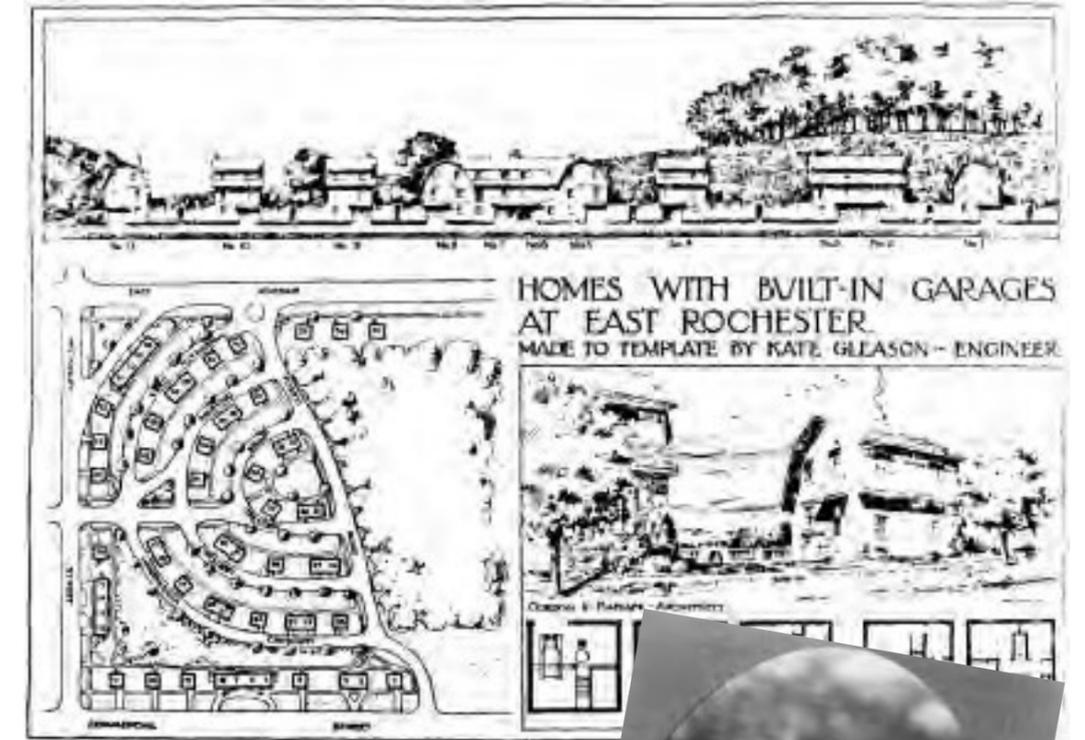
“BEING ABLE TO THINK THROUGH A PROBLEM AND DEVELOP ‘IF-THEN’ SCENARIOS MAKES IT EASY TO UNDERSTAND ALL SORTS OF DIFFERENT BUSINESS PROCESSES,” SAYS KRISTIN PEREIRA. HER OFFICE IS IN MIDTOWN MANHATTAN (NEW YORK CITY) OVERLOOKING GRAND CENTRAL STATION.

### A WOMAN BEFORE HER TIME

Automaker Henry Ford credited **KATE GLEASON** (1865–1933), not her father who was the founder of the Gleason Machine Tools Company, for designing and perfecting a machine that produced beveled gears quickly and cheaply. Ford said that it was “the most remarkable machine work ever done by a woman,” even though Kate had only a few months of formal mechanical engineering training at Cornell University.

As secretary-treasurer of the Rochester, New York, firm from 1890 to 1913, Kate’s talented leadership helped the small, family-run company grow into a prosperous and nationally prominent producer of gear-cutting machinery. She then turned her business skills toward restoring another machine-tool company to financial solvency, became president of the National Bank of East Rochester, and then became a builder of affordable housing and a land developer.

Kate left an estate of \$1.4 million at her death—worth around \$18 million today! Much of the money was bequeathed to philanthropic causes, including the Rochester Institute of Technology—where today, roughly 500 students graduate from the Kate Gleason College of Engineering each year.



ABOVE: ONE OF KATE GLEASON’S BUSINESSES, THE CONCRETE COMMUNITY, BUILT AFFORDABLE HOUSES FOR WORKING PEOPLE IN EAST ROCHESTER. PEOPLE STILL LIVE IN THE HOUSES TODAY.



ABOVE: KATE GLEASON (FAR RIGHT) STARTED HELPING OUT IN HER FATHER’S MACHINE SHOP AT THE TENDER AGE OF 11 AND BECAME THE BOOKKEEPER BY AGE 14.



## Jet-Setting Problem-Solver: A Day in the Life of Pat Galloway

Construction projects don't always go as planned. When disputes arise, civil engineer Patricia Galloway (b.1957) is called in to resolve them fairly. She handles advanced construction projects such as a bridge in Hong Kong, airports in Malaysia, a refinery in Saudi

Arabia and schools, hospitals, manufacturing plants, and sports arenas around the world. Pat even works in Australia part of the year. She is one jet-setting engineer!

Travel is a big part of Pat's life outside work, too. She regularly

visits the New Jersey winery she owns with her husband, Kris Nielsen, and the two take an annual adventure vacation. They've visited Angkor Wat in Cambodia, Machu Picchu in Peru, and Africa, Antarctica, and the North Pole, among other destinations.



AS THE CEO OF NIELSEN-WURSTER GROUP, PAT TRAVELS AROUND THE WORLD TO ANALYZE SCHEDULE DELAYS, DAMAGES, UNFORESEEN COSTS, AND OTHER ISSUES THAT CAN BRING CONSTRUCTION WORK TO A HALT. "ALL SIDES WANT AN INDEPENDENT, THIRD PARTY TO RENDER A DECISION BASED ON THE FACTS," SAYS PAT. "THAT'S WHY THEY HIRE ME."

FROM HER HOME BASE EAST OF SEATTLE, PAT AND HER BORDER COLLIE, RINGS, BOARD A CORPORATE JET HEADED FOR AN EAST COAST PROJECT. "RINGS TRAVELS EVERYWHERE WITH ME," SAYS PAT. "SOMETIMES CLIENTS ASK ME TO BRING HIM INTO THE CONFERENCE, WHERE HE ALWAYS SITS OBEDIENTLY. RINGS IS WELL-RECEIVED, AND, AS A RESULT, PEOPLE PERCEIVE ME AS SOMEONE WHO VALUES MY PERSONAL LIFE AS MUCH AS MY PROFESSIONAL LIFE."



AT LEFT, PAT REVIEWS A CONSTRUCTION CONTRACT BEFORE A MEETING. "I WAS HIRED TO DETERMINE IF A BUILDING CONTRACTOR HAD A LEGITIMATE REASON TO DELAY CONSTRUCTION," SHE SAYS. "IT MAY BE TENSE DURING THE NEGOTIATIONS, BUT WHEN THE DECISION IS MADE, EVERYONE BREATHES A SIGH OF RELIEF BECAUSE THEY CAN MOVE ON TO OTHER GOALS AND PROJECTS."

AFTER A BUSINESS MEETING, PAT MAY ADDRESS A LOCAL PROFESSIONAL GROUP, SUCH AS THE SOCIETY OF WOMEN ENGINEERS. "WHEN I SPEAK, ESPECIALLY TO WOMEN, I OFTEN REPEAT WHAT MY MOTHER TOLD ME: 'DON'T LET ANYONE TELL YOU IT CAN'T BE DONE. YOU CAN DO ANYTHING IF YOU PUT YOUR MIND TO IT.'"

AT RIGHT, PAT'S RANCH HOME NEAR THE CASCADE MOUNTAINS OFFERS RELAXATION ON WEEKENDS. "I TAKE TRAIL RIDES WHENEVER I CAN."



"IF YOU DON'T TAKE A VACATION, YOUR MIND ISN'T AS SHARP AND YOUR BODY ISN'T RESTED," SAYS PAT. AT FAR LEFT, PAT STANDS ON THE GREAT WALL OF CHINA. AT NEAR LEFT, PAT EXPLORES GREENLAND.

"IT'S IMPORTANT FOR GIRLS TO UNDERSTAND THEY CAN BE SUCCESSFUL AND HAVE A FULFILLING PERSONAL LIFE," SAYS PAT. "MY HUSBAND KRIS IS THE WIND BENEATH MY WINGS. WE'RE A REAL PARTNERSHIP." AT RIGHT, PAT AND KRIS AT AN AMERICAN SOCIETY OF CIVIL ENGINEERS DINNER.



## ENGINEERING AND LAW: A PERFECT FIT

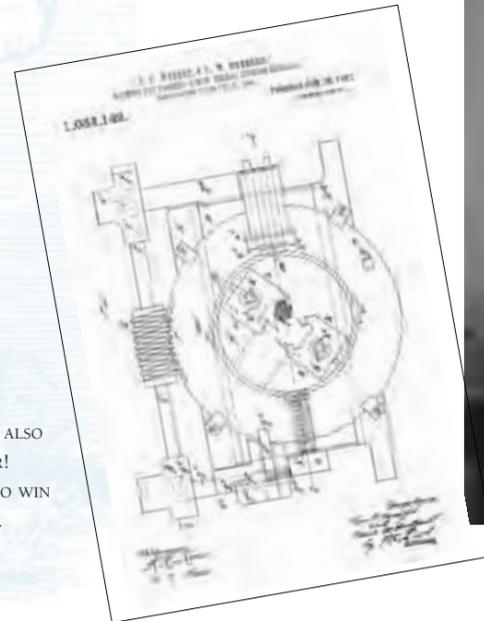
*There are nearly as many branches of law as there are types of engineering. But there are several specialties in both fields that overlap. Thus, an engineering education becomes an ideal springboard to practice law.*

*For example, a patent lawyer helps an inventor obtain a patent, which is a government-issued document that tells the world that the inventor has full rights to his or her invention. The patent lawyer must fully understand the invention and the technical field in order to advise the inventor and draft a patent application. Engineering or a similar technical background is a prerequisite to practicing patent law.*

*Many environmental issues are both technical and legal, because regulations and laws govern how humans and businesses can affect the environment.*

*In contract law, understanding how projects are designed and built—an ideal fit with engineering—helps greatly when contracts need to be written and enforced fairly.*

THE FIRST WOMAN PATENT ATTORNEY WAS ALSO A MECHANICAL AND ELECTRICAL ENGINEER! FLORENCE KING WAS THE FIRST WOMAN TO WIN A CASE BEFORE THE U.S. SUPREME COURT.



### GREAT VICTORY

Eleven women had pled cases to the U.S. Supreme Court before her, but in 1923 FLORENCE KING (1870–1924) was the first woman to win a Supreme Court case: “Crown vs. Nye,” a patent infringement suit, which is still considered a precedent today. “Yes, it was a hard grind,” she noted at the time. “I gave the best of my years to the career I had wanted since a tiny dot. But I won and I am happy.”

Florence graduated from Kent College of Law in 1895 and then enrolled in night classes at the Armour Institute of Technology (now the Illinois Institute of Technology) to earn a degree in mechanical and electrical engineering. In 1897, she became the 685th person, and the first woman registered to practice before the U.S. Patent Office. Her stellar career was cut short in 1924 when she died of breast cancer.



### ENVIRONMENTAL ADVOCATE

“There are opportunities—large and small—for everyone to do something to protect and improve our environment,” says civil engineer and attorney CONNIE H. KING (b.1953). “However, it just so happens that many environmental issues are both technical and legal.”

That’s why Connie’s environmental engineering background is such an incredibly valuable asset to her law practice and her clients. Connie went into environmental engineering because she feels that if you help the environment, you also help people.

She emphasizes that her knowledge of engineering and law enables her to look at problems in a broader way. She’s then able to come up with interesting solutions that other people might not consider.

### AN INTRIGUING PROFESSION

In the engineering world, two plus two always equals four, explains mechanical engineer and patent attorney JANDA’ CARTER (b.1965). “This appeals to my objective and rational side. But with patent law, there are so many variables that appeal to my creative side.”

As an engineer, Janda’ worked at General Motors in the Buick, Oldsmobile, and Cadillac divisions. She then moved into new food processing technology at Quaker Oats. There, she met a corporate attorney. “Law was new. It was intriguing. I got hooked.”

Janda’ now represents clients with a limitless breadth of inventions. She has to under-

stand each one. “I love working with the inventions—and with the inventors. They’ve worked hard to come up with something exciting and new. I help them secure the recognition they deserve.”

Connie tells the story of a landfill in Colorado Springs that contaminated surrounding properties. Many years back, a judge ruled that the landfill owners didn’t have to clean up the contamination. However, when it came time for the owners to sell some adjacent property, Connie helped bring together a team of state and local government officials, attorneys, and technical people to make sure the landfill owners funded the clean-up of their mess before selling the property. Connie’s team won, and the clean-up has been completed!



CONNIE KING PRACTICED ENVIRONMENTAL ENGINEERING FOR 13 YEARS WITH EXXON AND EASTMAN-KODAK. IN 1989 SHE WAS ADMITTED TO THE COLORADO STATE BAR AND HAS BEEN PRACTICING LAW EVER SINCE—DESPITE UNDERGOING TWO BOUTS OF BREAST CANCER. “ALTHOUGH I WORKED FEWER HOURS, MY WORK WAS A GOOD DISTRACTION FROM THE SIDE-EFFECTS OF CHEMOTHERAPY,” SHE SAYS.



“ENGINEERING DEFINITELY APPEALS TO MY CREATIVE SIDE,” SAYS JANDA’ CARTER, “AND SO DOES PATENT LAW.”

## THE ENGINEER AMBASSADOR: WAGING PEACE

*In honor of the new millennium, the United Nations issued its Millennium Development Goals, demonstrating its commitment to freeing the entire human race from want. The eight goals include: (1) eradicate extreme poverty and hunger, (2) achieve universal primary education, (3) promote gender equality and empower women, (4) reduce child mortality, (5) improve maternal health, (6) combat HIV/AIDS, malaria, and other diseases, (7) ensure environmental sustainability, and (8) develop a global partnership for development.*

*Engineers, being a central element of human society, are in a unique position to make significant progress toward these goals!*

LILIA ABRON WANTED CLEAN, BRIGHT HOMES FOR SOUTH AFRICAN FAMILIES, SO HER COMPANY, PEER, HELPS BUILD ENERGY-EFFICIENT HOUSES THAT COST ABOUT \$3,500. HERE LILIA (FAR RIGHT) IS PICTURED WITH NEW HOMEOWNERS. SHE'S NOW HELPING RESIDENTS GET ENERGY-EFFICIENT APPLIANCES FOR COOKING AND HEATING THEIR NEW HOUSES.



### ENERGY-SAVING HOMES

In 1994, when South Africa ended its enforced racial segregation—called apartheid—millions of people needed homes.

“Private contractors started building little more than concrete shacks as a move toward formal housing. It took a woman to say, ‘that’s not right,’” says chemical engineer LILIA A. ABRON (b.1945). “Everybody deserves decent housing, especially families.” She knows firsthand as the mother of three sons.

Lilia’s company, PEER, went to work with an architect designing affordable, environmentally friendly, energy-efficient houses. “We developed the science inside the house, including a thermal insulation design, windows for solar heating, and solar hot water heaters.” Local contractors were then able to build the houses.

“I call it ‘compassionate engineering,’” says Lilia. “Engineers have the skills to work the right way. They just need to remember that people’s needs are an integral part of the project.”

In 1999, Lilia won an award from the United Nations for helping to solve the housing problem without negatively affecting the environment. Her homes use 50 to 60 percent less energy than traditional houses.

### THE ROAD OUT OF POVERTY

One of the many wrongdoings committed by the former apartheid regime of South Africa was a systematic denial of a decent education to non-white South Africans. In fact, the Republic of South Africa banned arithmetic from non-white schools in 1947 and didn’t restore it until the late 1980s!

Civil engineer GLORIA JEFF (b.1952) was the associate administrator of the U.S. Federal Highway Administration in 1993 when the apartheid system crumbled. President Bill Clinton asked Gloria to head a technology transfer program with South Africa designed to help South Africans learn to build roads into the isolated interior of the country.

“In the U.S., we use sophisticated equipment and technology to design and construct roads with the least amount of costly labor,” Gloria explains. “In South Africa, however, our goal was to put as many to work as possible. In an economy where there was 75 percent unemployment within the black community, our first priority was to give people meaningful jobs.”

Gloria tells about one community project, a “two-hitter” she calls it. A town needed new roads. There was a brick-making factory in town, but not much demand for brick. So they trained the townspeople to build brick roads. This put the brick-makers—and the road-builders—to work

### LOW-TECH, HIGH-IMPACT

By day, civil engineer CATHY LESLIE (b.1961) manages a staff of 30 planners and engineers in Denver who design roads, pipelines, and stormwater projects. At night, as executive director of Engineers Without Borders-USA, Cathy spends three to five hours managing an ever-growing number of volunteers—half of whom are women.

Cathy, who loves to travel, began her work in developing countries as a Peace Corps volunteer in Nepal, where she developed solutions related to drinking water and sanitation projects. Today EWB-USA partners with developing communities around the world to improve their quality of life.

EWB-USA believes in creating environmentally and economically sustainable engineering projects. It also believes in creating internationally responsible engineering students. “The villages that partner with EWB-USA put their hope in us,” says Cathy. “I get a great deal of satisfaction knowing that we are making the children’s lives better than their parents’.”



ABOVE: CATHY LESLIE (SEATED, LEFT) AND COLLEGE STUDENTS FROM THE UNIVERSITY OF COLORADO AT BOULDER, PROFESSIONALS, TRANSLATORS, COOKS, AND OTHERS JOINED WITH VILLAGERS FROM FOUTAKA ZAMBOUGOU, MALI, TO BRING MUCH-NEEDED CLEAN WATER AND SANITATION TO THE VILLAGE. IT WAS CATHY’S VERY FIRST PROJECT WITH EWB-USA.

AT RIGHT: IMAGINE THE DELIGHT IN SEEING A PHOTOGRAPH OF AN OCEAN AND BREACHING WHALE FOR THE FIRST TIME. EWB-USA COORDINATED THE EFFORTS OF STUDENTS AT THE UNIVERSITY OF COLORADO AT BOULDER IN COOPERATION WITH THE HIMALAYAN LIGHT FOUNDATION TO INSTALL A SOLAR-POWERED COMPUTER IN KOT-TIMAL, A HIMALAYAN VILLAGE AT 12,000 FEET.

FAR LEFT: AS THE DIRECTOR OF THE MICHIGAN DEPARTMENT OF TRANSPORTATION, GLORIA JEFF HAS PLENTY OF OPPORTUNITIES TO TALK TO PEOPLE ABOUT TRANSPORTATION—AND ABOUT THE IMPORTANCE OF EQUAL OPPORTUNITY AND PREVENTING DISCRIMINATION.

LEFT: CHILDREN IN SOUTH AFRICAN SHANTY TOWN

## STORMY WEATHER

In October 1998, “Mitch,” a category five hurricane, with 180 m.p.h. winds, decimated much of Central America. Honduras and Nicaragua were especially hard hit. Thousands of people died, and millions were left homeless. Floods and mudslides ravaged the landscape.

Hydraulic engineer SONIA MAASSEL JACOBSEN (b.1955) joined other U.S. Department of Agriculture employees traveling to Nicaragua to assess damage and determine the aid needed. Despite crumbling roads and bridges, Sonia headed into areas so isolated she carried a global positioning system (GPS) device to track her location.

Sonia met with local farmers and non-profit organizations to evaluate damages, recommend projects, and estimate costs. Many projects involved assessing the condition of roads, water systems, and other agricultural



ABOVE: SONIA JACOBSEN IS AN AGRICULTURAL ENGINEER WITH THE U.S. DEPARTMENT OF AGRICULTURE—NATURAL RESOURCES CONSERVATION SERVICE (NRCS) IN ST. PAUL, MINNESOTA.

infrastructure that had been damaged by erosion, debris, sediment, and boulders. How could it be restored? Should the land be abandoned for farming?

Says Sonia, “My experience in Nicaragua was a remarkable adventure in my life. I’m happy I chose a career where I can work with farmers and landowners to protect the earth and provide food for the world.”

ABOVE LEFT: IN THE AFTERMATH OF HURRICANE MITCH, SONIA FOUND MANY SMALL STREAMS AND CULVERTS IN NICARAGUA FILLED WITH DEBRIS, WHICH BLOCKED DRAINAGE AND THREATENED FARMLAND WITH MORE FLOODING WHEN THE NEXT RAINY SEASON BEGAN. “WAS THE BEST SOLUTION TO CLEAN OUT DEBRIS OR RE-ROUTE WATER? HOW COULD STREAMBANKS BE STABILIZED? THESE WERE SOME OF THE ISSUES I HAD TO CONFRONT,” RECALLS SONIA.

## WHEN DISASTER STRIKES

“Engineering is an essential skill to be able to meet basic human needs,” says civil engineer JO DA SILVA (b.1967). “Oddly, in the past, relief agencies did not recognize the importance of engineers, so it was difficult for many to identify and recruit engineers after a natural or humanitarian disaster.” Registered Engineers for Disaster Relief (RedR), was founded to create a register of engineers who could be called on at short notice to work with front-line relief agencies.

Jo is a founding member of RedR-

International. Her first assignment was to provide humanitarian relief to the massive exodus of people from Rwanda into Tanzania in 1994, after an estimated 800,000 Rwandans were killed. A quarter of a million people flocked into the village of Ngara, Tanzania. Jo employed up to 200 refugees a day to set up huge camps from scratch—things as basic as shelter, water, latrines, and first-aid stations.



JO DA SILVA SPENT SEVEN MONTHS IN SRI LANKA OVERSEEING THE CONSTRUCTION OF 55,000 SHELTERS TO PROVIDE HOUSING FOR THE HALF-MILLION PEOPLE DISPLACED BY THE DEVASTATING TSUNAMI THAT HIT THE COASTAL REGIONS IN LATE DECEMBER 2004.

## TIKUN OLAM

In the Jewish tradition, Tikun Olam means “repairing the world,” making the world a better place for all. It is one of industrial engineer SHULAMITH “SHULA” KOENIG’S guiding principles, which she first put to use in Israel designing and manufacturing water-saving devices for irrigation.

“Water—just as human rights—means life, growth, health, and well-being,” says Shula. She describes human rights as the banks of a river in which life can flow free. Human rights—learning the “rules of the game”—strengthen those banks. Within those banks, every drop of water has value. If you add a drop, the river will run faster. Take one drop out, the river will flow slower. Take too many drops out, and the river will dry up. Human rights defines the value of every woman, man,

and child. In the river of life, people must know human rights to transform the world.”

In 2003, Shula won the prestigious 2003 United Nations Award for Outstanding Achievement in the field of Human Rights for her work with PDHRE (the People’s Movement for Human Rights Education), an organization she founded to energize, organize, and facilitate learning about human rights, and make human rights education relevant to people’s daily lives. In this, Shula says, she is fulfilling her commitment to Tikun Olam, one drop at a time.



YUVA (YOUTH FOR UNITY AND VOLUNTARY ACTION) WORKS ON THE ISSUES OF HOUSING AND LIVELIHOOD FOR MARGINALIZED WOMEN, CHILDREN, AND YOUTH IN URBAN AND RURAL AREAS OF INDIA. SHULA KOENIG (ABOVE, FAR RIGHT) ATTENDED THE INAUGURATION OF THE YUVA CENTER IN MUMBAI, INDIA. AT LEFT, SHULA (SECOND FROM THE RIGHT) JOINS COMMUNITY LEADERS FROM MALI IN THE INAUGURATION OF PDHRE AFRICA IN MALI.

## IRRIGATION ’ROUND THE GLOBE

Agricultural engineer DOROTA ZOFIA HAMAN (b.1951), an expert in irrigation water management, has traveled throughout the world helping farmers learn more about growing healthy food by using various methods of irrigation.

Many non-governmental organizations (NGOs) distribute simple drip irrigation kits that contain plastic pipe that connects to a water source; farmers operate them by a foot treadle pump to circulate water. While these kits are simple, drip irrigation can be very complex. That’s where Dorota excels in helping farmers operate their systems more efficiently.

“By happy accident, I fell into my career while reviewing some interesting data during a math project. Now I find tremendous reward in helping people worldwide grow more and better food while putting less stress on the environment.”

IN ZIMBABWE, DOROTA HAMAN JOINED A TEAM FROM THE UNITED NATIONS FOOD & AGRICULTURAL ORGANIZATION TO TEACH SMALL FARMERS HOW TO MAKE THE MOST OF THEIR WATER SUPPLIES. HER COURSE DREW STUDENTS FROM ALL OVER SOUTH AND EAST AFRICA WHO WANTED TO LEARN ABOUT DRIP IRRIGATION. HERE, DOROTA IS SHOWN OPERATING A TREADLE PUMP USED FOR IRRIGATION.

