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FEATURES

30 Women Ahead of Their Time
This spring, two of SWE’s past Achievement Award recipients each received top honors in recognition of their stellar accomplishments.

34 SWE Retention Study and Work/Life Balance
This follow-up to the SWE Retention Study includes emerging research and proactive strategies.

42 Function Meets Brainwaves
From heart-rate monitors to sleep-apnea breathing stimulators, to an experimental mind-controlled handheld gadget, wearable computing represents the future of computing that is a part of our person, not just worn on the person.

48 University Labs: Where Women Excel
What propels women to head university labs, especially when tenure and biological calendars collide? Three SWE members who direct engineering labs offer keen and encouraging insights.

54 Women Engineering Leaders in Academe 2009
The eighth installment of SWE’s annual series profiles Deirdre Meldrum, Ph.D., who leads Arizona State University’s Ira A. Fulton School of Engineering, and Cherrice Traver, Ph.D., dean of engineering at Union College in Schenectady, N.Y.

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ABOUT SWE:
The Society of Women Engineers (SWE), founded in 1950, is a not-for-profit educational and service organization. SWE is the driving force that establishes engineering as a highly desirable career aspiration for women. SWE empowers women to succeed and advance in those aspirations and be recognized for their life-changing contributions and achievements as women engineers and leaders.
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“Don’t cry because it’s over. Smile because it happened.”

– Dr. Seuss

I’ve been doing a lot of smiling lately, and you should, too. FY09 was a fabulous year for SWE, so let’s “walk” through the year and take pride in our growth and achievements.

The importance of always putting people first was reinforced throughout my term (see more on my Navy lesson below), so I will begin by thanking everyone who supported me. Both my family and my company, Medtronic, have been very accommodating. I could not have done it without my family’s support. And it would have been impossible without the many Medtronic “godfathers and godmothers,” who worked to make sure this would be a very successful year for both SWE and Medtronic. I am forever indebted to them, and equally indebted to the innumerable SWE leaders and volunteers who do the work of SWE every day. Because of your efforts, the Society is successful.

Connect, build, and grow

FY09 began with an international focus. We launched our international pilot programs at the start of the SWE year — which also coincided with the 14th International Conference of Women Engineers and Scientists (ICWES) meeting, held in France and attended by a contingency of members and staff. We have pilots active in Germany, which operates much like a traditional section; Japan and Nigeria, which exist in partnership with other organizations; and India, which partners with Corporate Partnership Council members. The international thrust was reinforced at our own conference in Baltimore, where many SWE hearts were touched when the international group sere-naded us with beautiful music at the Celebrate SWE! competition.

In February we held a congressional briefing on proactive strategies that the STEM community can use to recruit and retain more women in science, technology, engineering, and math (STEM). SWE was on the hill in D.C. for so many events that my eight trips there made it my most visited city.

In April, SWE participated in “Congressional Visits Day,” when many technical
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organizations gathered to visit Congress all on the same day. We began with training on how to speak with the members’ staff, and then we went out to speak with the staff from our home states and districts. SWE had 10 members participate in this grassroots effort to make our positions known.

We have deepened and expanded our partnerships with like-minded organizations. During my terms as president and president-elect, I was fortunate to attend the Society of Hispanic Professional Engineers (SHPE), National Society of Black Engineers (NSBE), and American Indian Science and Engineering Society (AISES) conferences. All of the engineering diversity organizations benefit from our respective growth, learning, and sharing of best practices. In January, we met with AISES leadership in their hometown of Albuquerque, N.M., in conjunction with our annual strategic plan review. The final board meeting of FY09 occurred in San Francisco, to align with SHPE’s leadership conference and the farewell to SHPE President Diana Gomez, who served six years at the helm.

I was honored to represent SWE at the 2009 FIRST (For Inspiration and Recognition of Science and Technology) championships, where I met founder Dean Kamen and John Abele, chairman. They were quick to let me know that SWE members have been strong supporters and great volunteers at FIRST events, and that FIRST would like to develop a stronger relationship with SWE. It is nice to know that our volunteers’ precious time wisely by creating an infrastructure that supports volunteers doing what they do best.

It seems fitting to end where FY09 began, at the IDS Center in Minneapolis, the site of the FY09 board installation and backdrop for the noted 70s TV program, the Mary Tyler Moore Show. The lead character, Mary Richards, was the first independent, single woman I remember seeing on TV, and she quickly became a role model for me.

Parting thoughts

I leave the board after nearly a decade of board-level involvement. I am grateful for many wonderful experiences and the behind-the-scenes support I received. And I’m amazed at how much SWE, and the world, has changed in that “relatively” short time. SWE has adapted well, and worked to ensure we are using our volunteers’ precious time wisely by creating an infrastructure that supports volunteers doing what they do best.

It seems fitting to end where FY09 began, at the IDS Center in Minneapolis, the site of the FY09 board installation and backdrop for the noted 70s TV program, the Mary Tyler Moore Show. The lead character, Mary Richards, was the first independent, single woman I remember seeing on TV, and she quickly became a role model for me.

Years later, SWE and my SWE sisters came along and let me know that it is OK to define success in my own way and to “be successful on my own terms.”
Congratulations to SWE Magazine

Recipient of APEX Grand Award for Design & Illustration:
Connie Conklin, designer
“From Research to Reality” opening spread
Spring 2009

Recipient of Three APEX 2009 Awards of Excellence:

Feature Writing
Meredith Holmes, Contributor
“First Lady: The ‘Second-hardest Job in America’”
Spring 2009

Charlotte Thomas, Contributor
“SWE Members Engineer the Grand Challenges”
Winter 2009

Magazines & Journals
Anne M. Perusek, Director of Editorial and Publications
Winter 2009 issue

Sponsored by Communications Concepts Inc., the APEX Competition is in its 21st year and covers a broad array of communications. Awards are given to communications professionals in print and electronic media to recognize outstanding work in categories ranging from magazines and newsletters to annual reports, marketing campaigns, brochures, video, and Web sites. This year’s competition included more than 3,700 entries from North America and abroad.

The panel of judges noted that this year’s entries “displayed an extraordinary level of quality,” presenting the judges with the difficult task of selecting the award-winning entries. In addition, the judges often were “more impressed by the quality of creative ideas and concepts shown by entries than they were by the expense entailed in their execution.”

A total of 100 Grand Awards were presented in 11 major categories to honor the outstanding works in those main categories, while 1,158 Awards of Excellence were presented in 122 individual categories.

Of the areas in which SWE placed, there were 659 entries that fell under the general category of Writing; 392 under the category of Design & Illustration; and 706 under the category of Magazines & Journals.

Congratulations to the entire SWE Magazine Team:
Anne M. Perusek, Director of Editorial and Publications
Carol Polakowski, Associate Editor
Sandra Guy, Contributor
Meredith Holmes, Contributor
Charlotte Thomas, Contributor
Connie and John Conklin, Custom Concepts & Design
John Goodrich, UniDiversity, for tremendous advertising support
SWE Magazine Editorial Board, Linda Reed, FY09 Chair
Betty Shanahan, CAE, F. SWE, SWE Executive Director and CEO
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1. When did you join SWE? What prompted you to join?
I became aware of SWE’s existence after I was well into my career. In 1997 a co-worker at Northrop Grumman recruited me, and right away, I knew SWE was an organization that I wanted to be a part of.

2. Can you tell us a bit more about your background?
I was born and raised in Taiwan. There were seven children in our family — six girls and one boy. Math and science came easily to me, so studying physics in college was a natural choice. I completed my B.S. in physics in Taiwan, and received my master’s, also in physics, from the University of Alabama at Birmingham. However, I come from a traditional Chinese culture that expects the man to be the provider and the woman to help her husband succeed. For a long time, my life goals were defined largely by this cultural expectation, so I thought I would complete my education, find a good husband, be a housewife, and raise a family. When I was very young, I was inspired by the achievements of many outstanding people. For example, in 1957 Chen Ning Yang and Tsung-Dao Lee were the first Chinese to receive the Nobel Prize in physics; Peggy Fleming won an Olympic Gold Medal in figure skating in 1968; and Neil Armstrong became the first human being to set foot on the moon in 1969. I admired their achievements but never really thought that I could achieve something, too, by having an interesting career of my own.

3. What happened next?
Looking back, it was a turning point. Fortunately, McDonnell Douglas (now Boeing, St. Louis) hired me within a month, and so I began my career in engineering and in the defense industry. I have now worked in defense for 26 years, the last 16 with Northrop Grumman Corporation. It has been a challenging and satisfying career. [Editor’s note: See page 20 for career details.]

4. Tell us what SWE has done for you professionally and personally.
Working with other women engineers to advance SWE’s mission brings me joy and self-fulfillment. I have made many good friends across the country during my SWE journey, and expanded my network more than tenfold. I like to be surrounded by so many talented people and high achievers, as they inspire and encourage me to advance and achieve my own career dreams. I feel that I have gained much more from my SWE involvement than I have contributed.

SWE has provided many opportunities for me. Through various leadership positions, I have been able to further develop my abilities in project management, public speaking, networking, strategic planning, and interpersonal skills, to name just a few. Many skills I learn and sharpen through SWE experiences are directly applicable to my career, so I am always becoming a better engineer and leader at work.

Many skills I learn and sharpen through SWE experiences are directly applicable to my career, so I am always becoming a better engineer and leader at work.
My favorite SWE moment took place when I met a young woman who told me that she decided to stay in engineering, finish her degree, and launch her engineering career because of my visit to her SWE collegiate section a few years earlier. During my visit, I shared my career path and lessons learned. It was gratifying to know that I had made such a difference in her life.

5. What strengths do you bring to the position?

Being in industry for many years, I have had firsthand experience on how to work effectively within the company — with executive management, colleagues, and other employees — to address important workplace issues that concern women engineers. I have many opportunities to work with HR managers to recruit engineers and provide support to SWE collegiate sections, giving me a clear understanding of collegiate needs. These experiences have given me a background and perspective that will definitely help me work with other leaders to provide valuable programs and services to SWE’s membership and stakeholders.

I have served on the board for three years, plus two years as region governor, so I have been part of the leadership team that sought to define our direction and goals. Prior to serving nationally, I held many region and section positions, so I have experienced the organization on a number of levels.

Before deciding to run for president-elect, I spoke with several past presidents to have a clear sense of the role and responsibilities, time commitment, and financial needs of the president. The SWE president-elect position also provides a solid point of transition and preparation for the incoming president. I have worked closely with the FY09 president, the executive director, and members of the board of directors to understand all aspects of SWE programs and needs. Many planning activities, such as setting the strategic priorities, determining the budget and the leadership team for the coming year, have been worked on months in advance, so everything was ready to go by July 1, the start of our fiscal year.

6. Where has SWE made the greatest progress in the last five years?

We have made the most significant strides in the areas of government relations and public policy; professional development; and diversity and inclusion.

The government relations and public policy committee was formed seven years ago, and just five years ago, we were a faint voice in public policy discourse. Now we are invited to lead the planning of the diversity caucus meetings and to testify before Congress. During the 2008 presidential election, we partnered with the Association of Women in Science to pose questions to both candidates. Not only did they answer our questions, but we also met with members of the Obama transition team following the election to discuss the importance of diversity in science, technology, engineering, and math. Our members now participate in Congressional Visits Day, and most recently, we provided testimony to the House Committee on Science and Technology’s subcommittee on research and science education.

In terms of professional development, we have increased the value of our programming such that attendance at our conference has jumped from 3,500 to 6,000 in just a few years. We provide high-quality webinars that are available 24/7 from our Web site and incorporate the most recent advances in Web education.

The face of SWE leadership is also changing — a very encouraging sign. Over the past few years we have engaged in serious conversations and training in diversity and inclusion. Our current board has two Asians and one African-American. Four years ago we instituted joint memberships with the National Society of Black Engineers, Society of Hispanic Professional Engineers, and American Indian Science and Engineering Society, and these joint memberships continue to grow substantially.

7. What is the Society’s focus in FY10?

We begin our 60th anniversary celebration at the conference in Long Beach and will leverage this significant history throughout the year, wrapping it up at the FY11 conference in Orlando. The anniversary is an opportunity to amplify our success as an organization and as individual women engineers. Our anniversary theme, success on your own terms, will be reinforced throughout the year, and will inspire more women to become engineers and achieve their own goals.

We will also focus on financial operations, moving beyond monitoring revenues and I come from a traditional Chinese culture that expects the man to be the provider and the woman to help her husband succeed. For a long time, my life goals were defined largely by this cultural expectation, so I thought I would complete my education, find a good husband, be a housewife, and raise a family.
It is essential to follow your heart and to set your own goals. Then you will find your inner strength and potential, and be able to use them to expand your abilities and accomplish great things on your own terms.

8. What areas of strategic opportunity do you see for the Society in the next few years?

I am passionate about making sure our services reach all members, at all career stages, and in all career environments. We need to have a clearer understanding of all member needs, and a vehicle for integrating all member segments. For the next few years we need to look carefully at what we offer women in academia and women in government. There are many opportunities and ways we can provide programs, support, and assistance for these segments of our membership. I am very pleased that Mary Anderson-Rowland, Ph.D., has joined the FY10 board as special director for academia. This is the first time we have had a special director to focus on academia, and Dr. Anderson-Rowland’s insights and experience will be valuable.

Another area of opportunity is international. We had four international pilot programs in FY09, each with a unique, culturally driven personality and pace of growth, and they will continue. With the global economy, there is great potential to further develop our international membership in ways suited for each country and culture.

Diversity and inclusion remain key, because we really just got started (see question #6), and the momentum needs to continue. The same is true with government relations and public policy. It takes time to make meaningful change and measurable progress. We must increase our discussions with influencers and policymakers in government, academia, and industry.

9. What is your message for each SWE member?

Take advantage of the Society’s supportive environment, networking, and many professional and leadership development opportunities. SWE is a place you can practice and sharpen your skills and experience personal and professional growth.

Don’t let others set boundaries for you — whether it is your family, culture, or environment. It is essential to follow your heart and to set your own goals. Then you will find your inner strength and potential, and be able to use them to expand your abilities and accomplish great things on your own terms.

Please remember that success is actually the journey, not the destination. During the journey you will grow, change, and transform, becoming a more capable engineer, leader, and all-around better person.
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Honoring a SWE Pioneer

On May 17, Betty Preece, one of the most impactful and passionate members of SWE, passed away. This issue of SWE Magazine is dedicated to her memory and lifetime of service to SWE; to science, technology, engineering, and mathematics (STEM) education; and the engineering and science professions.

Like a polished gem, Betty had many facets; each facet contributed light to create a radiant whole. My words can’t capture the overall sparkle that was Betty, but I can highlight the many facets in her SWE life. Please turn to page 78 for a full obituary.

Betty’s commitment to SWE as an organization and a driving force for encouraging girls into engineering chiseled many facets of her life. One of our pioneers, she joined in 1951, helping to define and shape the Society for six decades.

The great collaborator, Betty leveraged her leadership in numerous teacher, outreach, and professional organizations to create partnerships. Because she was committed to increasing SWE’s visibility and impact, Betty was a catalyst behind the Society’s participation in National Science Teachers Association conferences and outreach activities with other professional organizations.

But capturing the radiance of Betty Preece goes beyond a résumé listing her contributions. The remaining facets are the numerous qualities that she brought to every discussion and every project.

Betty was quiet elegance. Her voice was bold and strong when expressing her convictions, but almost silent when speaking about herself. Largely through the stories of others, I learned of her many accomplishments. Frequent chats with her beloved husband, Ray, offered a glimpse at their interests and adventures outside the engineering and education communities.

If quiet elegance was your first impression of Betty, uncovering her will and determination could be a shock. Her resolve could topple any opposition. Through persuasion, negotiation, and sustained efforts, she turned a vision into a reality. Her will overcame even the physical limitations of her petite frame. When planning the SWE exhibit for conferences we attended, I insisted she leave the booth setup to me. With significantly more height, weight, and strength, I was the obvious team member to raise banners and lift boxes. But show after show, I arrived to find our booth already set up and an impish smile on Betty’s (and Ray’s) face.

As an independent thinker, Betty brought a perspective that was often unique and challenging. She possessed a timelessness that made her comfortable in any environment. She combined seemingly endless energy with passion to contribute to her profession, her local community, and to SWE.

We are a stronger organization because Betty contributed to our sections, regions, and publications. We are a stronger organization because Betty channeled her passion through our programs. I believe the best way to honor Betty Preece and her lifetime of contributions is through continuing her commitment to the next generation of engineers.

Betty Shanahan, CAE, F. SWE
SWE Executive Director & CEO
IBM employees can design their own lives like never before—choosing the company that honors who they are and what they do with their time outside of work. The message of diversity has always been, “Come as you are.” Today, that invitation has expanded to say, “Work for us and we will support the life you want to create.” IBM honors SWE for empowering women to succeed. To find out more about IBM’s commitment to diversity, visit www.ibm.com/diversity
News reached us just days before the spring editorial board meeting that longtime board member Betty Preece had died. At our meeting, we shared a moment of silence and favorite memories. In many ways, Betty had reached the stature of legend, with her nearly six decades of service to SWE, dedication to outreach, education, and all issues related to women in science, technology, engineering, and math. Her commitment was expressed not only within the Society, but with other organizations throughout the United States and overseas.

Betty joined the editorial board in 1998, a time of transition for this magazine and all of SWE. For the first time in its history, there was an advertising director dedicated solely to selling ad space in the magazine. Also for the first time, there was a full-time editor, myself. So in the excitement of new possibilities, Betty joined the board. She brought so much to the table — her enthusiasm, fresh ideas, and wisdom. And her presence provided a spectrum of age diversity we hadn’t had.

Appearances are often misleading and this was certainly true in Betty’s case. With her diminutive frame, gentle manner, and years, one might be surprised to discover her strong, youthful spirit and seeking mind. Betty was “in the know” on just about everything relevant to the topics covered in this magazine, and then some.

Her contributions to the board were far reaching. They ranged from her annual coverage of the WEPAN conference, to “Report from WES,” the Women’s Engineering Society in the United Kingdom, which she belonged to for many years and whose conferences she and her husband, Ray, attended faithfully.

Betty’s network was expansive, and with her generous spirit of collaboration and goodwill, she connected people and ideas to the magazine, at times providing story leads, contacts, and, occasionally, writers. With an eye toward the future and mentoring successive generations, she recruited younger members of SWE, often collegiate members or young professionals, to provide material to the magazine or lend a youthful perspective.

There is no more appropriate issue of the magazine to dedicate to Betty than this, the back to school issue. From our articles, “University Labs: Where Women Excel” (see page 48), to “Women Engineering Leaders in Academe 2009,” beginning on page 54, and all the rest, Betty’s legacy is present.

Thank you so much, Betty, for all that you have done.
Supporting education for women and girls around the world is a smart use of everyone’s energy.

When women and girls get the educational and professional support they need, we all benefit. That’s why ExxonMobil backs a range of global initiatives that improve educational and career opportunities for women, especially in science, technology, engineering and mathematics. Helping the world’s women reach their potential is one of the best investments anyone can make.

The story continues at exxonmobil.com
**Following Dad into Engineering**

A few days before Father’s Day this year, I received the online issue of the summer edition of *SWE Magazine*. As I was going through it I noticed your news item, “Did you Follow Your Dad into Engineering?” on page 90 [Engineering World]. Since, as a matter of fact, I did follow my dad into engineering, I decided to send a copy of *SWE Magazine* to my dad.

He was thrilled about that column and felt proud of doing a great job of encouraging me to go into an engineering career. He asked me to send you a note, saying how grateful he is that the Society gave this wonderful gift to dads of women engineers on Father’s Day, recognizing the fathers who believe in their daughters and transferred their valuable knowledge to them so their daughters could be successful. For which, on behalf of my dad, Eng. Jose M. Del Valle-Landron, P.E., I want to thank you for publishing this column.

Eng. Ivelisse Del Valle-Figueroa, EIT

**Learning More about Women’s History**

Thank you for highlighting Victoria Woodhull in your Editor’s Page [Spring 2009 issue, page 9]. I am not too sure that I had heard of her, at least by name, before. [Note: Victoria Woodhull ran for president of the United States in the 1872 election, more than 40 years before women had the right to vote, making equal rights key to her campaign.]

Thank you,
Natalie Villwock
Purdue University Collegiate Section

The Readers’ Forum provides an opportunity to respond to articles or comment on topical issues. Letters are printed on a space available basis; we reserve the right to edit letters for clarity or to meet space requirements. All opinions are those of the writer and in no way the responsibility of the Society of Women Engineers or *SWE Magazine*.

Please send comments, opinions, or observations to swemag@swe.org or by regular mail to: Letters, *SWE Magazine*, Society of Women Engineers, 230 East Ohio Street, Suite 400, Chicago, IL 60601.

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– Universum Undergraduate Survey, 2009
INTRODUCING THE FY10 SOCIETY OF WOMEN ENGINEERS

Board of Directors

The installation of the FY10 board of directors took place at Chicago’s Palmer House in late July. The new board includes, back row from left: Lana Fountain Flakes, director of education; Erin McGinnis, director of membership initiatives; Melissa Tata, director of external affairs; Alyse Stofer, director of regions; Linette Patterson, director of professional development; and Martha Addison, collegiate board representative. In the front, from left, are Betty Shanahan, SWE executive director and CEO; Siddika Demir, president-elect; Nora Lin, president; Fran Stuart, secretary; and Joan Graf, treasurer. Not shown are Bernice Brody, speaker of the senate; and Mary Anderson-Rowland, Ph.D., special director, women in academia.

Nora Lin, President

Nora Lin has gained broad working experience in engineering from more than 26 years in the defense industry. She has been an employee of Northrop Grumman Corporation, Electronic Systems for 16 years. She started her career as an associated scientific programmer and later became a technical lead/manager in software engineering, leading engineering teams in the development of relational database applications and real-time software for several military programs.

In 2001, Lin became independent research and development coordinator before moving into her current position as manager of supportability engineering in 2002. She also led the Capability Maturity Model Integration (CMMI®) initiative and obtained the accreditation of CMMI Maturity Level 3 rating for systems and software engineering at her site in 2007.

A senior life member of SWE, Lin has served at the local, regional, and national levels. Her positions include director of regions; Region H governor; section vitality task force chair; Region H deputy director; leadership coach; and Chicago Regional Section (CRS) president, vice president, and treasurer. She initiated the creation of a corporate-wide Northrop Grumman women engineers group and served as its first chair.

Lin was a recipient of the Women of Color in Technology Career Achievement Award in 2008. This year, she was named the Asian American Engineer of the Year. She has also received the SWE-CRS Individual Contributor Award, the SWE-CRS Consistent Contributor Award, the SWE-CRS National Contribution Award, and the Region H Distinguished Service Award.

She earned her bachelor’s degree in physics in Taiwan and a master’s in physics from the University of Alabama at Birmingham. She and her husband have two daughters. Lin enjoys cooking and entertaining, and serves in the children’s ministry at her church.

Siddika Demir, President-elect

Siddika Demir is associate director of corporate engineering, operational excellence (OE) for Genentech, one of the world’s leading biotech companies. Demir oversees the OE department, which supports engineering and corporate facilities services. She leads OE in meeting corporate engineering’s goals in continuous process improvement, customer service, staff development, safety, quality, compliance, and efficiency.

Before joining Genentech, Demir worked for Bechtel Corporation as manager of corporate services Six Sigma. During her 11 years with Bechtel, she contributed to a broad range of activities, holding positions in engineering, procurement, contracts, estimating, and corporate services. Demir obtained her bachelor’s degree in civil engineering from the University of Houston and master’s in civil engineering from Purdue University.

She joined SWE in 1990 as a student at the University of Houston. She served as president of the UH section, which received the Best Section Award in Region C in 1992. Demir also has been Region A governor; coordinator of two national-level awards; Golden Gate Section representative; Houston Area Section president, vice president, and treasurer; and the 1998 national convention publicity chair. She was recognized as the SWE Emerging Leader in Quality, SWE Distinguished New Engineer, UH Outstanding Young Alumna, and Houston Young Engineer of the Year.

Demir is an avid reader and enjoys exchanging books with her friends. She and her husband, Emre Velipasaoglu, Ph.D., enjoy traveling and dancing.

Fran Stuart, Secretary

Fran Stuart is semi-retired after a 19-year career as an industrial/manufacturing engineer with various aerospace companies. She is a partner in Stuart Technical Services, a consulting firm specializing in package testing services. After a three-year enlistment in the U.S. Army Security Agency as an electronic warfare linguist, Stuart received her B.S. in industrial management from Georgia Tech in 1979.
Since joining SWE as a student at Georgia Tech, Stuart has served at all levels of the organization, particularly in Region B, including as last region director and first region governor. She also has served two sections, as well as the members-at-large in numerous positions, most recently as Region B MAL representative and MAL secretary. She conceived “Celebrate SWE!” and has a long history with Sonora Region B conferences and career fairs. She has sponsored five space campers and issued numerous certificates of merit.

Stuart is an avid reader, a cross-stitcher, a quilter, and enjoys playing the game Mah Jongg with an interesting and eclectic group of women. She was named the volunteer operations chair for the 2007 Intel International Science and Engineering Fair in Albuquerque, N.M. Stuart lives with her husband on 10 rural acres in Rio Rancho, N.M.

Joan Graf, Treasurer

Joan Graf is an IT manager for Qwest Communications in Denver. She received her bachelor’s degree in mathematics from the University of Minnesota, Minneapolis, and has worked in the telecommunications industry for more than 30 years. During her more than three decades in the workforce, Graf has gained experience in the engineering, construction, engineering cost analysis, budgeting, and information technology fields. Currently, she manages a program office for an organization of more than 1,800 employees. She is responsible for the implementation of new standard processes for the development organization, resource management, and the administration of a $30-million-plus maintenance budget. Graf was responsible for mentoring a team in Arlington, Va., to implement standard processes for efficiency and cost improvements, and is now developing organizational-wide implementation plans based on what she learned from that project.

She has been a SWE member for more than 25 years, holding a variety of sectional, regional, and national positions. As finance chair, Graf helped to develop new budgeting processes to include program and strategic budgets. On the local level, her positions have been with the Rocky Mountain and Minnesota sections. Graf led the bylaws rewrite committees for both Region I and the Rocky Mountain Section.

She is a volunteer for her church’s Habitat for Humanity group and for a local theater. Graf also likes to bead in her spare time.

Erin McGinnis, Director of Membership Initiatives

Erin McGinnis recently joined Boeing Space and Intelligence Systems (S&IS) Business Development organization after completing a growth assignment as the chief of staff for Boeing Commercial and Civil Satellite programs. S&IS is a world leader in the design, development, and manufacturing of satellites for government, civil, and commercial customers.

McGinnis directly supports key business opportunities for Space Superiority and Special Missions and is responsible for the development of strategy and tactics using in-depth knowledge of customer needs, Boeing products and services, and the competitive environment. Before joining Boeing in April 2007, she worked for Northrop Grumman Corporation in various engineering and process improvement roles.

Active in SWE since joining the Purdue section in 1998, McGinnis has held several positions with the Los Angeles Section and Region B, as well as national positions within the Society. She is a life member and has served on the board of directors since July 2008. McGinnis received her B.S. in industrial engineering from Purdue University, and has certifications in systems engineering, lean, Six Sigma, and project management. She is a candidate for a M.B.A. and M.S. in systems engineering from Loyola Marymount University.

McGinnis enjoys designing jewelry, reading, cycling, kickboxing, and yoga.

Lana Fountain Flakes, Director of Education

Lana Fountain Flakes’ career spans a 13-year service period with the NASA/Johnson Space Center community, where she worked in various capacities in the reliability/quality/test engineering arena. She is currently employed as a senior reliability engineer for ABS Consulting.

Fountain Flakes developed an interest in and passion for engineering and science during her childhood. As a high school student, she was selected as a National Science Foundation Young Scholar, which gave her the opportunity to learn about chemical and biological sciences, computer sciences, and engineering. After high school, she entered Louisiana Tech University, graduating with a B.S. in biomedical engineering in 1997.

Fountain Flakes joined SWE in 1993 as a charter member of her collegiate section at Louisiana Tech University. Since then, she has served the Society in various capacities in the local Houston Area Section, Region C, and in national positions.

In addition to her commitment to propelling women in STEM, Fountain Flakes is committed to furthering opportunities for women personally and professionally. She dedicates many hours of community service to recovery/reentry programs for domestic
violence victims and incarcerated women, and she also serves as an adult literacy volunteer in the greater Houston area.

In her leisure time, Fountain Flakes studies Portuguese; and enjoys reading; international travel with her husband, Kenneth; spending time with family and friends; and working with rescue dogs.

Melissa Tata, Director of External Affairs

Melissa Tata is a senior life member of SWE, most recently serving as speaker of the Council of Representatives for FY07-08. She also has been Gulf Coast Region governor and deputy director; vice-president and president of the Southwest Texas Section; and Corporate Partnership Council representative for Dell Inc. She received the Distinguished New Engineer Award in 2006.

In 1999, Tata joined Dell Inc., where she currently is a senior project strategy manager. She manages the consumer in-home value-added services business, generating substantial revenue by defining new processes and retail warranty partnerships. While leading a cross-functional program team, Tata is responsible for developing proposals, creating business cases, and initiating operating procedures. She has managed multiple site teams, led numerous Six Sigma Black Belt cost-savings projects, and published three papers. She was instrumental in driving the Dell engineering rotation program and currently is a co-lead for the Women in Search of Excellence program. Previously she worked for Monsanto Plastics.

Tata studied mechanical engineering, earning a M.S. from the Massachusetts Institute of Technology and a B.S. from Rensselaer Polytechnic Institute. She is the president of the RPI Austin Alumni Chapter and vice president of communication for the MIT Austin Alumni Chapter. Tata enjoys swimming, biking, rollerblading, reading, and dancing.

Linette Patterson, Director, Professional Development

Linette Patterson serves as senior manager of inventory control and quality assurance (ICQA) for Amazon.com. In this capacity, she leads teams across Amazon’s worldwide facilities to align ICQA processes, to establish appropriate standards and tools, and to ensure quality is at the forefront of inventory activities around the globe.

Prior to joining Amazon, Patterson held management, engineering, and consulting positions with Dell, McLeod USA, Williams Communications, and Accenture. Her areas of expertise include driving change across geographic and functional areas, continuous process improvement, and customer focus. She is a member of the American Society for Quality, a Six Sigma Green Belt, a lean change agent, and a licensed engineering intern. She holds a B.S. in mechanical engineering from Oklahoma State University.

A senior life member of SWE, with 15 years of service since joining as a student in 1994, Patterson has held a variety of positions at the local, regional, and national levels. This is her fourth year on the board of directors, serving previously as speaker of the Council of Representatives and treasurer. In 2004, Patterson received the SWE Distinguished New Engineer Award.

In her free time, she enjoys reading, traveling, and spending time with her husband, Stephen, and daughter, Elizabeth.

Alyse Stofer, Director of Regions

Alyse Stofer has served SWE at the local, regional, and national levels, most recently as Heartland Region governor and collegiate upgrade coordinator on the membership committee for fiscal years 2007 and 2008. She also has served as Region H lieutenant governor; Region H secretary; and in a variety of positions for the Minnesota Section, including section president, vice president, secretary, and representative.

In 2003 Stofer was SWE’s New Face of Engineering, and in 2006, she received the SWE Distinguished New Engineer Award. Also in 2006, she was the recipient of the Minnesota Federation of Engineering, Science, and Technology Societies Young Engineer of the Year Award.

Stofer has been an employee of Transoma Medical, a leader in designing, manufacturing, and marketing implantable wireless diagnostic systems, for more than 10 years. During much of her career, she has worked on technical design teams and, as a result, is a co-inventor on several pending patents and on one patent. Currently, she is a program manager leading the product improvement engineering team for Transoma’s Patient Management Device division.

She received her bachelor’s degree in biomedical engineering from the University of Iowa, her master’s in biomaterials from the University of Minnesota, and a medical device certificate from the University of St. Thomas. She and her husband, Kevin, have a son and daughter. Stofer enjoys spending time outside with her children, as well as reading and baking, and is involved with the welcome ministry at her church.

Bernice E. Brody, Speaker of the Senate

Bernice E. Brody has served as director of professional development, chair of the public policy/government relations task force, and director of Region F. A SWE member since 1990, she has held various section positions, including president, treasurer, and representative for the Mid-Hudson Section.

Brody is an executive project manager with
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IBM Global Services, centrally supporting World Wide Web hosting programs and services for all of the IBM divisions. She has more than 26 years of experience in manufacturing and development engineering, engineering management, and IT project management. As a PMI- and IBM-certified executive project manager, she provides leadership in Web hosting program management, Web on demand transformation services strategy for IBM divisions, complex financial investment and planning, and works with the chief information officers to expand current services for the various divisions at competitive costs.

Brody holds a bachelor’s degree in chemistry from Saint Joseph’s University.

Mary Anderson-Rowland, Ph.D., Special Director, Women in Academia

Mary Anderson-Rowland, Ph.D., is an associate professor of engineering at Arizona State University. In 1974 she became the first woman engineering faculty member at ASU. For 11 years, she was the associate dean of student affairs for the university’s Ira A. Fulton School of Engineering. During her administration, she was the inspiration behind the women in engineering program, and she created the minority engineering program.

In 1975, Dr. Anderson-Rowland helped establish the SWE student section at ASU, which was named the national Top Mid-Sized Student Section in 2004, and she has remained the section’s advisor ever since. She was honored with the Society’s Distinguished Engineering Educator Award in 2002, and became a SWE Fellow in 2006.

In 1982, Dr. Anderson-Rowland began a graduate career change program that enabled 80 women to earn master’s degrees in industrial engineering, increasing the percentage of women IE graduate students from 5 percent to more than 30 percent.

For the past seven years, Dr. Anderson-Rowland has directed two upper-division academic scholarship programs with an emphasis on women and underrepresented minority students with unmet financial need.

In addition to her SWE honors, Dr. Anderson-Rowland has been recognized with numerous awards, including the American Society for Engineering Education National Minorities in Engineering Award.

She earned her B.A. in mathematics from Hope College in 1961, and her M.S. and Ph.D. in mathematics from the University of Iowa in 1963 and 1966, respectively.

An advocate for work/life balance, Dr. Anderson-Rowland enjoys spending time with her husband, two sons and their wives, and her grandchildren.

Betty A. Shanahan, CAE, F. SWE, SWE Executive Director and CEO

Betty Shanahan, CAE, F. SWE, has been the executive director and CEO for the Society of Women Engineers since September 2002. She is the first engineer to hold this position.

Before joining SWE, Shanahan spent 24 years in development, engineering management, and marketing for the electronics and software industries. She began her career at Data General as the “one woman engineer” on the “Eagle” mini-computer design project captured in Tracy Kidder’s Soul of a New Machine. She moved on to Alliant Computer Systems and transitioned to marketing management in 1990. She has been responsible for computer-aided software engineering and signal processing products, and file viewing and conversion technologies. She was the vice president of product management and marketing for the Software Components Division of Stellent Inc. before moving from industry to the non-profit sector.

Shanahan earned a B.S. in electrical engineering from Michigan State University, a Master of Software Engineering from the Wang Institute of Graduate Studies, and a M.B.A. in strategic management from the University of Chicago Graduate School of Business.

A Fellow life member of SWE, Shanahan has held numerous section and national volunteer positions, including the 1995 national conference co-chair and chair of the conference management committee. She is a member of IEEE, the Association for Computing Machinery, the American Society of Association Executives, and serves on the incoming board of the Council of Engineering and Scientific Society Executives.

Martha Addison, Collegiate Board Representative

Martha Addison was born in South Carolina. After high school, she pursued her childhood passion for space and obtained an aerospace engineering degree from the University of Alabama.

Throughout her collegiate career, Addison served in a variety of leadership roles, including president of the university’s SWE section, ambassador for the UA College of Engineering, flag football captain, and captain of the American Institute of Aeronautics and Astronautics Student Design/Build/Fly team. Addison also served SWE as regional collegiate representative for Region D.

Addison accepted a position as design engineer on the F-35 program with Northrop Grumman in El Segundo, Calif. Northrop Grumman Corporation is a leading global security company whose 120,000 employees provide innovative systems, products, and solutions in aerospace, electronics, information systems, shipbuilding, and technical services to government and commercial customers worldwide.

In her leisure time, Addison enjoys Alabama football, traveling, and scrapbooking.
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Recent developments include SWE testimony on Capitol Hill and a White House roundtable commemorating Title IX’s 37th anniversary, but even with positive indicators, vigilance is needed.

The Society’s role in public policy discourse was advanced this summer when SWE member Barbara Bogue testified before the House Committee on Science and Technology and the Subcommittee on Research and Science Education. Bogue spoke on behalf of the Society’s AWE Project, which she co-founded and co-directs, and as a researcher specializing in the application of research to practice, assessment, and the development and progression of girls and women in engineering. Bogue was one of five witnesses at the July 21 hearing, titled “Encouraging the Participation of Women in STEM Fields.”

Other panelists included Alan Leshner, Ph.D., chief executive officer, American Association for the Advancement of Science; Marcia Brumit Kropf, Ph.D., chief operating officer, Girls Inc.; Sandra Hanson, Ph.D., professor of sociology, Catholic University; and Cherryl Thomas, president, Ardmore Associates LLC, a Chicago-based engineering and construction firm. According to committee rules, each witness spoke for approximately five minutes, submitting more lengthy written testimony for the committee’s review.

With more than 25 years in the field, Bogue conveyed substantial knowledge and insight — insight that fueled the formation of the AWE program. The strength of the AWE program and SWE’s decades of outreach efforts were apparent during the testimony and subsequent question and answer period.

Defining the discussion

Committee chairman Daniel Lipinski, Ph.D. (D-Ill.), opened the hearing. “Today we look back to the beginning of the pipeline, and examine what factors impact women in STEM fields, from kindergarten through the end of college,” he said, noting that during the previous Congress, the committee examined the issues facing women in academic science and engineering.

Dr. Lipinski received a degree in mechanical engineering from Northwestern University 20 years ago, making him one of the few technically trained members of Congress. Citing National Science Foundation data, he pointed out that in 2006 women earned more than half of all science and engineering bachelor’s degrees, but in engineering, computer science, and physics, women earned only about 20 percent of the degrees. “Although this is an improvement from the time I was earning my mechanical engineering degree … more can be done to encourage women in these fields,” he said.

“We know that women can face unique challenges throughout the STEM pipeline, and we invited today’s witnesses to help us understand what those barriers are and how we can break them down,” he continued. “It is important for the federal government to do its part in supporting research and programs that encourage best practices to attract and retain women in STEM.”

The testimony

Dr. Leshner went first, followed by Dr. Kropf. Both addressed the current involvement of girls and young women in STEM, the biggest challenges to attracting and retaining them, and the most promising solutions. Dr. Leshner spoke to these from the vantage point of scientific organizations, while Dr. Kropf spoke from the perspective of her organization, Girls Inc., and similar girl-serving organizations.

Sociologist Sandra Hanson, Ph.D., cited examples of research conducted over the course of her career. She provided broader context to the experiences noted by the other witnesses, as well as data. Perhaps most telling was her description of a study in which students were asked to draw a picture of a scien-
Intel is proud to support the Society of Women Engineers and its efforts to empower women to achieve their full potential in careers as engineers and leaders.

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tive of her career journey. Thomas was
provided a personal narrative,” Bogue noted.

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surveys offered by SWE AWE have
outcomes.”

and implementation of STEM pro-
ing tool ... It advocates assessment as
looking at assessment as an organiz-
atists,” Bogue stated.

We integrated these two key con-
cepts — effective assessment and in-
tegration of research findings into
programming — to develop universal
tools that could be used by STEM
educational and outreach programs
to measure the success of different
activities and approaches, compare
them with other programs, and con-
tinuously improve programs and ac-
tivities,” Bogue stated.

“The SWE AWE Project addresses
the barriers to improving assessment
and developing better metrics by
looking at assessment as an organiz-
ing tool ... It advocates assessment as
a method to guide the development
and implementation of STEM pro-
grams as well as the measurement of
outcomes.”

The benefit of such assessment is
not just for girls. “The more than 50
surveys offered by SWE AWE have
been tested and proven effective for
both male and female students, and
help us to confirm that our efforts on
behalf of women are also benefiting
men,” Bogue noted.

The fifth and final witness, Cherryl
Thomas, provided a personal narra-
tive of her career journey. Thomas was
steered toward scientific research,
which was “more acceptable,” rather
than engineering. Years later, work-
place opportunities and a supervisor
who supported the notion of women
in nontraditional jobs led to a second
degree in engineering and made her
the first woman in the City of Chicago
to hold the position of commissioner
of the Department of Buildings.

The question and answer session
provided an opportunity to clarify
and further inform the committee.
Near the close of the hearing, Dr.
Lupinski noted that he remembered
SWE from his college days. “My
friends in SWE found it so helpful,”
he said. “Support groups are impor-
tant and SWE certainly fills that role
for engineering majors.”

An archived webcast of the hear-
ing, which lasted just under two
hours, can be found at: (http://sci-
cence.house.gov/publications/hearings_m-

Commemorating Title IX

Earlier in the summer, SWE was
invited to the White House for a
roundtable marking the 37th an-
niversary of Title IX. White House
Senior Advisor Valerie Jarrett, J.D.,
chaired the discussion, which also
featured U.S. Education Secretary
Betty Shanahan, CAE, F. SWE,
and Cherryl Thomas, Ardmore Assoc.

Next steps

The Society’s voice and positions
are being heard, and there appears to
be a receptive climate. However, it is
precisely because we have a support-
ive climate that SWE needs to be
even more vigilant.

Cathy Pieronek, J.D., Title IX ex-
pert and FY09 government relations
and public policy committee chair,
points to another development that
took place in June — the release of a
study by the National Academies,
Gender Differences at Critical Transi-
tions in the Careers of Science, Engi-
neering, and Mathematics Faculty.

The study, and particularly the ex-
ecutive summary, has generated some
controversy for the conclusions
drawn and the questions left unan-
swered. In her written testimony, Bar-
bara Bogue referred to the problems
inherent in treating all STEM disci-
plines as one. She noted that this
study “examined only select STEM
fields to conclude that there is rela-
tively no problem at critical transition
points for women in academic ca-
reers. This study is an example of the
way that treating all disciplines col-
lectively conceals problems in individ-
ual STEM fields.”

Pieronek said, “It is important to
understand that, although meaning-
ful change takes time, today we have
a great opportunity through SWE to
have an impact on policies that will
improve conditions for women in
STEM fields.” She added that, “In-
fomed constituents communicating
SWE’s views to their representatives
is one of the most effective ways we
can ensure the climate improves for
women in STEM.”

For SWE members, the fall brings
opportunity to become engaged in a
variety of ways. The upcoming con-
ference in Long Beach will include
sessions where members can receive
training and learn more about effect-
ing change through public policy.
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In April 2009, Yvonne Brill, a pioneering rocket propulsion engineer, won engineering’s most prestigious award, the John Fritz Medal. She is only the second woman to receive this award since it was established in 1902.

Brill earned her B.Sc. in mathematics from the University of Manitoba, Canada, and her M.S. in chemistry from the University of Southern California. She began her career in the aircraft industry in 1945, and when her employer, Douglas Aircraft, was awarded the Project RAND contract, Brill became a research analyst in the missiles division.

Of this post-war era, she said, “Rockets and space were new, relatively unknown fields when I joined Project Rand in 1946.” Brill was the only woman engineer working in rocket propulsion systems at the time. She was on a team of five scientists who defined rocket propellant performance, derived high-temperature thermodynamics properties for rocket exhaust, and published one of the earliest reports on the subject.

“Our first task in performance calculations at RAND was to extend the thermodynamic tables for exhaust gas species to 5,000 kelvin. The National Bureau of Standards [NBS] tables only went to 3,000 kelvin then. These calculations were very labor-intensive in the days before computers and somewhat boring after a while,” she said. “I dealt with this by changing jobs.” Later, when the NBS officially extended its thermodynamic tables, the results did not differ from the calculations done by Brill’s team.

In 1949, Brill went to Marquardt, a small engineering company, to work on advanced ramjet fuels. Brill was the first woman the company had ever hired for a technical job, and the first with a chemistry, rather than an engineering, background. Again, Brill arrived just as the company was entering new scientific territory. “Compressible flow theory and high-speed flows were only coming into vogue then ....,” Brill said. “I was on equal footing with the engineers, because they hadn’t taken these courses as undergraduates, either.” Brill found she enjoyed engineering. “I designed the igniter for a supersonic ramjet missile known as Project Rigel, and got to pack the propellant charge for the igniter. The missile flight test was successful!”

In 1966, Brill joined RCA Astro Electronics as a senior engineer in propulsion systems. She was the only propulsion engineer on the staff. She had never worked on satellites before this, but had a dozen years of experimen-
tal and analytical experience on rocket engines, both liquid and solid rockets. She collaborated with colleagues from previous jobs and in rocket science. “They gave me great support when I needed someone with detailed propulsion knowledge to test my new ideas,” she said.

While at RCA, Brill invented and patented the electrothermal hydrazine thruster (EHT). This propulsion system keeps a satellite in a fixed, geosynchronous orbit longer than other systems and with a larger payload, an innovation that has saved commercial satellite owners millions of dollars. Brill also found management at RCA to be supportive. “The EHT did not exist when I proposed it. I wrote a patent disclosure in 1967, and RCA pursued the disclosure to a U.S. patent, which was granted in 1972. The patent is in my name, assigned to the RCA Corporation.” To date, more than 200 of these thrusters have been flown on spacecraft built by RCA, GE, Lockheed Martin, and Motorola (Iridium).

Brill has always been active in encouraging women to become engineers, and especially to enter the aeronautical, aerospace, and biomedical fields. She established the Brill Family Scholarship, which, through SWE, awards $1,000 to a woman engineering student every year.

Brill is candid about work/life balance for women engineers, observing, “To say the least, if you have a career and children, it is hard to achieve a good work/life balance.” Brill and her husband, a research chemist, have three children. Brill returned to work when the youngest was 2 years old. She said, “The most important support came from my husband’s understanding of the challenges of a career. He had no objections to my working late or sometimes on weekends to do the jobs I was assigned. He approached his job in the same way.”

Brill consults on satellite technology and space propulsion systems and has provided technical support on commercial communications satellites to many companies in the United States and abroad. She is a member of the National Research Council Space Studies Board, the National Academy of Engineering, the Women in Technology International Hall of Fame, and an Honorary Fellow of the American Institute of Aeronautics and Astronautics. Brill has received many awards and honors, including the SWE Resnik Challenger Medal, the IEEE Judith A. Resnik Award, and the NASA Distinguished Public Service Medal.

Mildred Dresselhaus, Ph.D., a leading expert in carbon science and an MIT Institute Professor, is the 2009 recipient of the National Science Board’s Vannevar Bush Award. She was honored for “public service in science and engineering, advocacy for increasing opportunities for women in science,” and for “extraordinary contributions in the field of condensed-matter physics and nanoscience.” Her studies of carbon science, thermoelectricity, and physics at the nanometer scale have led to many other scientific discoveries.

Dr. Dresselhaus has spent her entire professional academic career at MIT, teaching and doing research, always working in emerging areas of science and engineering. While an undergraduate at Hunter College, she received a Fulbright Fellowship (1951-52) to attend the Cavendish Laboratory at Cambridge University. She received her M.S. from Radcliffe College in 1953 and her Ph.D. from the University of Chicago in 1958, then spent two years working on superconductivity at Cornell as an NSF post-doctoral fellow.

For seven years, Dr. Dresselhaus was on the staff of the MIT Lincoln Laboratory in the Solid State Physics Division, where she did research in magneto-optics that led to a new understanding of the electronic structure of semimetals. “My first job was great; I could do almost anything I wanted — except for anything I knew about,” she said. “They weren’t interested in superconductivity, so I began to learn about magneto-optics, about which I knew nothing.” Dr. Dresselhaus thrives on working at the edge of the familiar, pointing out that when fields mature, all the interesting discoveries have been made, and discoveries.

The John Fritz Medal and Vannevar Bush Award

The John Fritz Medal is widely regarded as the highest honor one can receive in the engineering profession. Established in 1902 by the American Association of Engineering Societies, the annual award recognizes “scientific or industrial achievement in any field of pure or applied science.” Visit www.aaes.org for more information.

Each year since 1980, the National Science Board has presented the Vannevar Bush Award to an individual who has made “substantial contributions to the welfare of the nation through public service activities in science, technology, and public policy.” For more details, please visit www.nsf.gov/nsb.
It’s appropriate that Dr. Kristina Johnson’s speech, on the occasion of receiving SWE’s Achievement Award, contains references to light. She is an electrical engineer with expertise in liquid crystal, electro-optics, and smart pixel arrays. As with so many other Achievement Award recipients, SWE’s recognition in 2004 was a harbinger of other accolades in engineering, academy, business, and public life. Dr. Johnson holds 129 U.S. and foreign patents, co-founded several start-up companies, and has published more than 140 articles. In 2008, she won the John Fritz Medal, engineering’s most prestigious award, the first woman to join scientific luminaries like Alexander Graham Bell (1907), Thomas Edison (1908), Alfred Nobel (1910), and Guglielmo Marconi (1923).

Dr. Johnson was nominated in March by President Obama and confirmed in May by the U.S. Senate as Under Secretary for Energy in the U.S. Department of Energy. She oversees energy efficiency and coordinates clean and renewable energy research and commercialization — one of the Obama administration’s top priorities.

Although Dr. Johnson’s father and grandfather were both engineers, it didn’t occur to her to pursue engineering until she won first prize from the Society of Women Engineers at a Colorado state high school science fair. Pursue it she did, earning her B.S., M.S., and Ph.D. in electrical engineering at Stanford.

In 1985, Dr. Johnson joined the electrical engineering faculty at the University of Colorado, Boulder, rising quickly from assistant professor to director of a National Science Foundation Engineering Center. In 1999 Dr. Johnson went to Duke University, to be dean of the Pratt School of Engineering. Long an advocate of cross-disciplinary research, she helped set up the Fitzpatrick Center for Interdisciplinary Engineering, Medicine, and Applied Sciences at Duke. Under her leadership, the school’s endowment, student body, faculty, and research expenditures grew significantly.

In 2007, Dr. Johnson was appointed provost of Johns Hopkins University, the largest research university in the country. She was the first woman to hold that position.

Dr. Johnson’s path through education and leadership was influenced by her father’s views. “It’s important to pursue your interests,” he taught her. “If you pursue something you’re passionate about, it will all work out.” His words have proved true.

Dr. Johnson told the audience that women are underrepresented in higher education, and that it is her passion to change that. “We’ve been strongly influenced by service,” she said. “It’s what you do that counts.”

She pointed out, service is part of the ethos of academic life at MIT. “... Ever since I’ve been here ... we’ve been strongly influenced by service, not only to MIT, but to the whole country ... .” She was president of the American Physical Society and of the American Association for the Advancement of Science, and treasurer of the National Academy of Sciences. She directed the Office of Science at the U.S. Department of Energy from 2000 to 2001 and chaired the Governing Board of the American Institute of Physics from 2003 to 2008.

Dr. Dresselhaus’ career has been varied. She has followed her interests and her desire to make discoveries. But she acknowledges that the political climate or the availability of funding also influence the course of a career. She advised, “If there is something you really want to do, and at first you don’t succeed, wait a few years and try again. Things change. Just think how attitudes about global warming have changed in 10 years.”

Dr. Dresselhaus was at the leading edge of women’s entry into academic science and engineering. When she got her Ph.D., very few women in the United States held doctorates, and when she joined the MIT faculty in 1968, women made up just 4 percent of the undergraduate student body, and women faculty numbered about 10. Dr. Dresselhaus took a practical view of her pioneer status: “A lot of people weren’t ready for a woman with a Ph.D. I didn’t impose myself on people who weren’t ready for me,” she said. Attitudes that might have stopped some, never interfered with her plans. “I just kept on working on what interested me. If I had a good idea, I pursued it, and then people were eager to work with me. In the end, it’s what you do that counts.”

Dr. Dresselhaus was the first tenured woman professor in MIT’s School of Engineering. She is currently professor of physics and electrical engineering, and since 1985, has been Institute Professor at MIT, the highest academic position at the university.

In the early 1960s, when women students were a tiny minority in MIT classrooms, Dr. Dresselhaus held mentoring sessions in her office and coached women students in networking to combat both social and academic isolation. In 1973 she received a Carnegie Foundation grant to encourage women to study traditionally male-dominated disciplines. That same year she was appointed to MIT’s Abby Rockefeller Mauze chair, which promoted scientific scholarship by women.

Marc Kastner, Ph.D., dean of MIT’s School of Science, described Dr. Dresselhaus as an “exceptional physicist, classroom teacher, and mentor of young scientists ... now being recognized for her great public service.” As Dr. Dresselhaus pointed out, service is part of the ethos of academic life at MIT. “... Ever since I’ve been here ... we’ve been strongly influenced by service, not only to MIT, but to the whole country ... .” She was president of the American Physical Society and of the American Association for the Advancement of Science, and treasurer of the National Academy of Sciences. She directed the Office of Science at the U.S. Department of Energy from 2000 to 2001 and chaired the Governing Board of the American Institute of Physics from 2003 to 2008.

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PROACTIVE STRATEGIES

The Society of Women Engineers National Survey about Engineering

SWE Retention Study and Work/Life Balance

Extensive analysis of the SWE Retention Study and emerging research on work/life balance yields valuable insights and practical policymaking tools.

BY LISA M. FREHILL, PH.D., COMMISSION ON PROFESSIONALS IN SCIENCE AND ENGINEERING

Is it really true that women are more likely than men to leave engineering once they get out of college and into the workforce? To what extent can work/life policies increase retention of valuable employees? The SWE Retention Study went far in helping us to see the complex answers to the first question. In this article we will review some of the key findings from the SWE Magazine series about the retention study; show the family status for engineers at different career stages; and provide some information related to the work/life balance question.

Over the past year, the Commission on Professionals in Science and Technology (CPST) analyzed data from two sources: the SWE Retention Study, with data collected in 2005 by Harris Interactive, funded by SWE’s Corporate Partnership Council; and data managed by the National Science Foundation (NSF) on U.S. scientists and engineers. The 2005 questionnaire was modeled on one that had been completed by SWE in partnership with other professional engineering societies in 1991-1992. While the earlier survey used professional society membership lists to draw the sample, the new study sought to better understand why people left engineering. Thus a different sampling strategy was used in which engineering bachelor’s and master’s graduates of 25 engineering schools (24 U.S. and one Canadian) were surveyed, with more than 6,000 respondents. A series of six articles based on CPST’s analysis of these data appeared in SWE Magazine in 2007-2008.

Because they were based on a survey of graduates of specific colleges and universities, the SWE data were limited in scope. Therefore, in order to validate the findings, NSF data from the 2003 Scientists and Engineers Statistical Analysis System (SESTAT) were used to examine engineering retention. These NSF data, though not perfect, are considered some of the best data about engineers and scientists in the U.S. labor force. With its focus on engineering retention, however, the SWE Retention Study involved many questions that were not asked in the SESTAT surveys. So the SESTAT data provided us with a benchmark to determine the extent to which the limited-sample SWE data might vary in comparison to the more general SESTAT population.

As shown in Figure 1, both sources provided the same answer: Yes, women do leave engineering at a faster pace than men. Indeed, the SWE data actually seemed to show a slightly higher rate of retention than did the national-level SESTAT data. That is, the SWE data provide more conservative estimates of attrition. Even upon graduation, there is a gap in women’s and men’s participation in engineering: Less than three-fourths of men but only about 60 percent of women who responded to the SWE retention survey indicated that they were employed as engineers within the first three years of finishing college. By the time we look at people who graduated 18-20 years prior to the survey, only about one-third of women but about half of the men were still in engineering jobs.

Further analysis revealed that 48 percent of women were still in engineering jobs, with men a little more likely to be employed as work/life balance policies and work/life work arrangements help workers to combine employment with caring responsibilities and family, personal, or social life outside the workplace.
engineers (58 percent). One in 10 men but 22 percent of women were not in the labor force or employed outside engineering. Men and women were equally likely to report being unemployed (1 percent of women and men). Finally, 29 percent of women and 31 percent of men indicated they were in jobs for which their engineering training was helpful.

How important were family-care issues in women’s higher rate of attrition from engineering? A number of analyses showed that they were only somewhat important. First, Table 1 shows the marital status and percentage of respondents who indicated they had no children under 18 living in their home, separately by gender and degree cohort. There are few statistically significant sex differences when we split the data on marital status by degree cohort. Among those who completed their engineering degrees in 1990-94, women were slightly less likely to be married than were men (and more likely to have never been married or divorced or separated). And, among those in the 1995-99 degree cohorts, women were slightly less likely to be married and more likely to be separated or divorced than their male counterparts.

Second, within most cohorts, women were less likely than men to report having children under 18 living in their homes. But this merely begs the question of whether engineering has a specific impact on childbearing. That is, in recent years much attention has been given to the generally lower rate of childbearing among professional women. So, we ran an analysis to determine whether women who reported that they were still engineers were less likely than other women in their same graduation cohort who were no longer in engineering to indicate they had children. Put simply, it made no difference whatsoever for women, although for some men, engineers were less likely to have children than those who said they were in jobs where their engineering was helpful. Furthermore, the difference between the likelihood of women and men engineers having children narrowed over the course of the degree cohorts. This finding indicates that engineering women, like other professional women, may be delaying childbirth but there is no evidence that the presence of children in the household causes them to leave engineering.

The SWE Retention Study asked respondents why they were no longer in an engineering position, with responses differing for men and women, as shown in Figure 2. The majority of people who left engineering did so to pursue some other career interest. Men were more likely to leave the field for advancement opportunities or “other career issues” (which included salary), but women were more likely than men to indicate they left a negative work climate. Women were also much more likely to cite time and family-related issues (18 percent) than were men (3 percent) for leaving the field. Although not shown here, the issues affecting women’s exits from engineering vary for different age cohorts. For example, “negative work climate issues” were less important for those who graduated 1993-2000 than they were for those who graduated 1980-93. The gender difference in the importance of time and family-related issues was also less pronounced for those who graduated after 1993.

Table 1. Marital and Family Status by Gender and Degree Cohort.

<table>
<thead>
<tr>
<th>Year Graduated, BSE</th>
<th>Female, SWE</th>
<th>Male, SWE</th>
<th>Female, SESTAT</th>
<th>Male, SESTAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-2005</td>
<td>75%</td>
<td>75%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>2006-2007</td>
<td>70%</td>
<td>70%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>2008-2009</td>
<td>65%</td>
<td>65%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>2010-2011</td>
<td>60%</td>
<td>60%</td>
<td>40%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Sources: National Science Foundation SESTAT 2003 data (weighted) and Society of Women Engineers’ National Survey of Engineering, 2005.
who entered the engineering work force prior to 1993 or after 2000. The salience of family and time issues in leaving engineering also varied: 26 percent of women in the 1985-1992 degree cohorts indicated this reason, but only 13 percent of those in the 1993-2000 and just 7 percent of the most recent graduates cited this issue as a basis for leaving the profession.

Over the past several years, there has been quite a bit of attention paid to making jobs more work/life friendly. But it should be remembered that engineers are people with “means.” That is, engineering salaries are routinely higher than those of the general labor force; therefore, engineers are quite likely to have the means to afford accommodations and may work for companies that provide these. In the 2003 SESTAT data, for example, median salaries among those whose highest academic degree was a bachelor’s were $58,000 for women in engineering and $62,000 for men.

In addition, a common complaint in the natural sciences has to do with the timing associated with the completion of one’s education and entry into the labor force. Some analysts fail to draw the important distinction between engineers’ and scientists’ career trajectories. Engineering careers are quite different compared to those in the natural sciences because most engineers possess a bachelor’s degree rather than an advanced graduate degree. Hence, young women who leave engineering school in their early 20s have a number of years to become established at their workplaces, to develop a good working relationship with their peers and their supervisors. As a result, by the time engineering women begin to have children, they have reached even higher salary levels and have developed the interpersonal skills to configure their jobs as they might need. At the same time, however, they may have strong attachments to their team and a strong team ethic, which needs to be considered when implementing accommodations, as discussed in the next section.

Some issues associated with making work/life accommodations were discussed during a meeting of SWE’s Corporate Partnership Council. Several attendees spoke of women at their workplaces who felt guilty because they could not work longer hours or had to be away from the office. Many of these companies have implemented the same strategies as other employers who are attempting to retain women during the childbearing years. Such arrangements include flexible work hours and days, day care assistance, phased part-time work after the birth or adoption of a child or as an employee moves toward retirement, and extended family leave (Working Mother 2008). While these accommodations may be present, the low number of women in the engineering workplace continues to cause them to feel greater general scrutiny of their work — especially in workplaces where there are few other women — so they may be quite self-conscious about making use of these accommodations. As members of work teams, when they take time off, team members know that others on the team will have to work harder.

**Work/life balance**

Family-friendly policies are no longer a rare luxury. Work/life balance has come to mean more than just the provision of unpaid leave for new parents. Many employers have developed a suite of policies designed to accommodate the increasingly complex lives of employees. Many observers have commented that the priorities that appear to operate for the current generation of new workers (i.e., those between 18-30 years of age) sometimes seem different from those for past generations. The “millennials” expect to maintain a complex web of personal relationships as a priority, with work occupying a more subordinate role than for past generations of new workers. In addition, the large cohort of baby boomers — and the smaller cohort of their children — are likely to experience increased demands to provide elder care.

And, as with engineers in the past, the need to maintain one’s skills to compete in the 21st century with constant and rapid technological change, means engineers will continue to need to take time to go back to school or gain additional skills. So work/life balance has come to encompass a number of employer policies to accommodate a very large number of potentially variable sets of circumstances — while being fair to everyone.

*Working Mother* magazine compiles an annual list of the 100 “best companies” with an emphasis on those that provide strong
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support for family life. All of these companies, according to the company representative who completed the voluntary questionnaire, indicated that they provided:

- A prenatal program
- Flextime
- Telecommuting (either ad hoc or on a part-time basis)
- On-site lactation/mothers' room
- Financial planning services
- Elder care referral service

Further, almost all (95-99 percent) indicated they also provided health insurance for part-timers, job-sharing, and a compressed workweek.

Of course, the Working Mother list is skewed to represent large, for-profit employers, so how do their results square up with employers in general? In 2008, the Families and Work Institute, with funding from the Alfred P. Sloan Foundation, completed a “National Study of Employers,” somewhat replicating an earlier survey by the institute. Their results are less rosy than those in the Working Mother article, largely because they use a more scientifically drawn sample with less response bias and represent both large and small employers in the for-profit and non-profit sectors. Some key findings from the Families and Work Institute study:

- 79 percent of employers now allow some employees to periodically change arrival/departure times (up from 68 percent in 1998).
- 47 percent of employers allow some employees to move from full time to part time and back again (down from 57 percent in 1998).
- Even some large employers appear to not comply with the Family and Medical Leave Act, but most employers do so.
- 65 percent of employers offer employee assistance plans to help employees deal with various pressures. These were especially important for parents of teenagers.
- More employers (60 percent) offered wellness programs in 2008 versus 1998 (51 percent).
- 39 percent of employers in 2008, up from 23 percent in 1998, offered referral to elder care services.
- Half of employers allow some employees to work some regular paid hours at home occasionally.
- 76 percent of employers with 1,000 or more employees provided “some pay” as replacement pay during maternity leave. Only 17 percent of employers, regardless of size, provided replacement pay during paternity leave. Other major flexibility and care elements that were reported by more than two-thirds of the respondents as applicable to at least “some” employees:

- Have control over when to take breaks (84 percent).
- Return to work gradually after childbirth or adoption (77 percent).
- Take time off during the workday to attend to important family or personal needs without loss of pay (73 percent).
- Take paid or unpaid time away from work for education or training to improve job skills (74 percent).

Child care assistance was quite rare at the employers in the Families and Work Institute survey. Most commonly, employers provided information to help employees locate child care (35 percent) or set up dependent care assistance plans that allowed employees to pay for child care with pre-tax dollars. In stark contrast with the glowing picture in the Working Mother article, only 9 percent offered on-site child care; only 6 percent provided assistance related to back-up care; and only 6 percent provided reimbursement for child care costs when employees traveled on business.

Why such differences in the survey findings? The Families and Work Institute implemented a scientific sampling scheme with a broader range of employees and identified an official respondent for each company. The Working Mother survey, on the other hand, relied upon self-report by an indeterminate company member and included only for-profit firms. The smallest company included in the Working Mother list had 771 employees.

Managers’ role in work/life balance

Managers are a critical aspect of any work/life balance program. “People join companies, but leave supervisors,” said Debbie Soon, a vice president at Catalyst. “In high-tech organizations people who have great technical skill often advance into managerial roles, and while these folks may be stellar technicians, they are often not given the support and training to enable them to be equally good managers,” she said.

The main complaint of women about their supervisors was that they weren’t available when needed, didn’t give regular feedback and weren’t responsive to suggestions. Yet few companies really attend to management training for work/life balance accommodations. On the Working Mother Web site, for example, negative comments about the top 100 companies revealed potential problems with the implementation phase of work/life policies. Further, in the Families and Work Institute study, only 20 percent of the employers said it was “very true” that “Management rewards those within the organization who support effective flexible work arrangements.” Only 21 percent said that it was very true that “The organization makes a real and ongoing effort to inform employees of available assistance for managing work

“One cannot overstate the importance of supervisory relationships to the retention of employees. … employees don’t leave companies—they leave supervisors. If companies are to retain highly qualified women, they must recognize that addressing and improving supervisory relationships is a critically important issue.”

and family responsibilities.” While 68 percent of the employers surveyed said that they provide training to supervisors in managing diversity and 59 percent in managing employees of different ages, just half provided training to supervisors in responding to employees’ work/family needs.

Another study, conducted jointly by the Michelle R. Clayman Institute for Gender Research at Stanford University and the Anita Borg Institute for Women and Technology, echoed the findings that supervisors are a key component to women’s career success. Their study, titled “Climbing the Technical Ladder: Obstacles and Solutions for Mid-Level Women in Technology,” surveyed employees in companies in Silicon Valley in California to compare and contrast how women and men experienced career advancement at the critical mid-career stage. The study called attention to the importance of recognizing that most women — but proportionately fewer men — are involved in dual-career couples, so that the family environment differs for the average woman versus the average man. In addition, work cultures — and supervisors are a vital part of these cultures — are critical to whether employees think their contributions are valued or whether they are treated fairly within the workplace. Supervisor training and rewards need to align with flexibility goals if work/family accommodations are to be a successful tool in retaining high-quality employees.

Without training, and relatively little information about available assistance, it is no wonder that employees and their supervisors often struggle with work/life accommodations and that there are numerous anecdotes that focus on the frustration of these accommodations. It is clear: If managers work carefully with an employee, develop a fair set of performance guidelines and goals, and manage team member relations effectively, then a true win-win situation can occur. The company will have retained a valuable, skilled, and already-trained employee, and the employee will have a stronger commitment to a company that truly took the effort to care about their personal situation. Company loyalty is an important side effect of good work/life policy implementation in which an employee feels that he or she has been treated fairly. On the other hand, if any piece of the work/life network is lacking, then a disgruntled employee may give up altogether, leaving the labor force entirely or seeking an alternative employer that seems to care more for the complexity of employees’ lives.

**Key sticking points** — barriers that can negatively impact the implementation of even the most well-meaning policies — are as follows:

**Goals and timeline:** Develop an effective plan with achievable goals, timelines, specifications about time boundaries, etc. How long will the accommodation last? Will there be a short-term review period to determine how things are going? How will the employee’s work be reviewed?

**Amount of work:** In many cases, there can be a temptation to assign as much work as the employee completed without the accommodation and to assume that he or she will manage somehow. The employee may even wish to maintain the same amount of work, concerned that in doing otherwise, he or she is letting the group down. It is important to determine a fair amount of work that the employee can complete within the agreed-upon working hours. If the employee will be working 20 hours per week, therefore, they should be assigned half their previous load.

**Assistance:** The employee’s previous position may involve work elements that can be “off-loaded” to an intern, co-op student, or another member of the team. By providing some assistance, the employee may be able to retain a larger level of responsibility than simply cutting responsibilities to adjust workload. In other words, they receive an assistant for some of the constituent tasks while retaining full responsibility for completion of the project.

**Co-workers:** An employee who works with a team can feel guilty about “letting the team down.” At the same time, co-workers can enhance these feelings, even by a seemingly harmless joke about the employee’s reduced load and their own increased load.

In the social sciences, we refer to one of the issues at play here as the “free rider problem.” That is, whenever there is a social good, such as a set of work/life balance policies to permit accommodations, some people may view these in a narrow way so that they imagine they would never benefit from such things. So

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**Why work/life balance?**

According to the 2002 National Study of the Changing Workforce, “employees in more effective and flexible workplaces are more likely than other workers to have:

- Greater engagement in their jobs
- Higher levels of job satisfaction
- Stronger intentions to remain with their employers
- Less negative and stressful spillover from job to home
- Less negative spillover from home to job
- Better mental health.”

*(Families and Work Institute, 2008: 3)*
Conducting a Survey — a Proactive Approach
To discover the status of work/life balance issues in a company or organization, a valid survey must be conducted using appropriate methodology. Surveys are not merely asking questions of passive respondents. Surveys can convey information, provide training, and get people thinking about key issues they may have previously taken for granted.

The first step is to establish a group that represents the interests of employees. While members of human resources may be part of this group, it is important to identify employees from various levels of the organization who can get their peers “on board” with the survey, and ensure that the questionnaire captures the variations in how work is accomplished across the spectrum of departments and functions, and how these variations might impact the application of work/life balance policies.

The following is a brief outline of the survey process:
1. Setting the stage: committee formation
2. Committee decides on the survey questions
3. Committee decides how to implement the survey, including all logistics, such as:
   • Who should send the initial notification of a survey?
   • What should this notification convey? (i.e., Why is the survey being completed?)
   • When will the survey be administered? What kinds of incentives will be offered? When should reminders be sent and who should send them? When will the results be available?
   • Where will the survey be located and where will people be allowed to access the results? Will they be allowed to comment on the results and, if so, what will happen with those comments?
   • How will a high response rate be encouraged?
4. Survey is administered.
5. Preliminary survey results are developed and some group(s)/individuals are invited to comment and ask for subsequent analysis.
6. A final report is generated and distributed as per step 3.
7. New policies, procedures, or trainings are implemented consistent with the report findings.
8. Periodically review the effectiveness of the new policies and procedures.

why should they “help” someone else? In this framework, there is a tendency to see life as “everyone for him/herself.”

There are many strategies a manager might employ to head off these sentiments and defuse a situation:

■ Involve the team members in crafting the work plan for the employee who needs the accommodation.

■ Emphasize all the other ways that accommodations may have been made in the past: “Remember when Ted broke his leg skiing and we all had to work double-time to finish the project.” In this way, employees will see that accommodations made now for one set of circumstances could well be made in the future — or may have been made in the past — when they had a moment of need.

■ Make it clear that you will use your managerial acumen to ensure that these accommodations won’t increase someone else’s workload — unless someone may be willing to accept additional work. Anyone willing to take on more duties should receive clear rewards when he or she completes the extra work. In the former situation, though, in which people may be reluctant to take on more work, you will need to determine another way to complete the work of the group.

In closing, women in engineering deal with the same pressures associated with modern work/life balance as all working women. They differ from the average working woman in that they are often one of only a few women within a given work environment and so are more sensitive to how they interact with their peers and supervisors. Often they are married to professional men, so the financial resources that engineering women have often is far in excess of the average working woman in the United States. These resources give women engineers a range of choices so that if work/life accommodations are not effectively made, they might step out of the work force altogether rather than feel like they are not making a contribution or that they are a burden to their work teams. If companies wish to retain these women, then in addition to having progressive policies on the books, they also need to train supervisors in the proper implementation of these policies to the mutual benefit of the employee and the company.

Funding for this study was generously provided by SWE’s Corporate Partnership Council.

References


Lisa M. Frehill, Ph.D., is the executive director of the Commission on Professionals in Science and Technology. Prior to joining CPST, she was an associate professor of sociology at New Mexico State University where she was the principal investigator and program director of that institution’s ADVANCE program. In a prior life, she was an industrial engineer at General Motors.
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Three women illustrate the eclectic, emerging, and new-wave thinking behind wearable computing, which ranges from heart-rate monitors to sleep-apnea breathing stimulators, to an experimental mind-controlled handheld device.

Ariel Garten is a neuroscientist and a psychotherapist who designed avant-garde fashions before deciding to run her own company, creating wearable and thought-controlled computing devices. Susan Ashdown, a Ph.D. in apparel design who teaches at Cornell University, turned her initial fascination with the way clothes fit into research into how smart clothes move and interact with the body.

And Lucy Dunne, Ph.D., an assistant professor at the University of Minnesota and a student of Dr. Ashdown’s, abandoned her teenage dreams of becoming a fashion designer to work toward making more efficient and wearable biomonitoring systems.

These three women illustrate the eclectic, emerging, and new-wave thinking behind wearable computing, which ranges from heart-rate monitors to sleep-apnea breathing stimulators, to an experimental mind-controlled handheld device.

Garten, a 29-year-old Toronto native and daughter of noted New York-born Canadian artist Vivian Reiss, is working on the most far-out ideas: enabling people to control objects with their thoughts, including allowing the elderly, paraplegics, and others who are physically challenged to use their thoughts to dim lights or to turn lights on and off when they start to fall asleep. The mind-controlled devices contain electroencephalograph sensors that pick up electronic pulses that show brain activity.

“We are coming up with better ways of creating programming algorithms and collecting information from the brain,” said Garten, who holds an honors Bachelor of Science degree in psychology/neuroscience, and therapist certifications in Gestalt, linguistic programming, and cognitive behavior therapy.

Garten, who directs thought-controlled computing at her firm, InteraXon, in Toronto, considers such breakthroughs “wearable computing” because they represent the future of computing that is a part of our person, not just worn on our person.

“To me, wearable computing is something we engage in every day,” she said. “We are making greater and greater demands to interact with our computers in easier ways. I have a touch screen on my cell phone, for example.
“Thought control is [at a level] where voice-activated technology was 10 years ago,” Garten said. “The first [mind-controlled] wearable computers are already in the gaming world. Gamers wear headsets that allow them to affect the emotional qualities of their characters in the game. By changing brain state or by focusing, the gamers can turn their characters left or right or up or down.”

The Toronto Star described Garten’s company, InteraXon, as “a little piece of techno Neverland” where “Tinkerbell-worthy gadgets are taking flight.” In fact, thought-controlled computing overcomes one of the drawbacks of requiring people to control and manage their computers, researchers say.

**Not as easy as it looks**

Dr. Ashdown, a 20-year veteran of college teaching, serves as the Helen G. Canoyer Professor in the department of fiber science and apparel design at Cornell University’s College of Human Ecology. Her experiences have shown her how difficult it is to incorporate sensors and computing applications into fabric.

“Merging the function of a computer with a wearable garment is quite a challenging activity,” said Dr. Ashdown, who designed a course that focuses on the functionality of textiles, apparel, and innovative materials.

“Even in the most functional garment, we expect and want to look a certain way, particularly for workers’ functional design,” she said. “[The garment] needs to have the right appearance and an aesthetic that functions well.

“The design of even the most geeky eyewear — safety glasses — is an example of how a clunky, unappealing design could be redone so that now, safety glasses have a sleeker look, like designer sunglasses, that are much more appealing on the face,” Dr. Ashdown said.

Another challenge is seamlessly incorporating computing into apparel that is expected to sit well on the body, move easily, provide warmth and comfort, and be easily washable.

“Would the computing component be something we unsnap [from the clothing]?” she said. “That becomes a hassle.” To overcome such problems, Dr. Ashdown’s students have researched ways to make the garment itself “smart.”

Raymond Lo and Eric Tran, students of wearable-computing guru Steve Mann, Ph.D., at the University of Toronto, echo Dr. Ashdown’s concern. If wearable computing takes extra effort, people may not have the time or inclination to bother with it. Lo and Tran said their studies have proven that the burden is a turnoff, or, as they put it, “Perhaps Joe doesn’t want to recharge his shoe every night.”

As a student, Dr. Dunne led research into producing a bicycle jacket that lights up when the ambient light goes below a certain level, providing night visibility for the cyclist, and that heats up when the outdoor temperature reaches a certain level. However, Dr. Ashdown said, “We did not address washability.”

Yet Dr. Ashdown believes clothes are fundamentally functional, and that’s why she teaches students that fashion design is more than E! Entertainment television and the reality show Project Runway.

**Intergenerational teamwork**

Dr. Ashdown was perplexed by students’ celebrity focus, so she designed coursework concentrating on how garments interact with a person’s body. The study is for undergraduates, apparel design students, and fiber science and apparel textile management majors. The curriculum informs Cornell’s related studies such as intergenerational courses sponsored by the Living Environments Aging Partnership and funded by the Foundation for Long Term Care and the Corporation for National and Community Service.

Elder collaborators come to class about once every two weeks, to put forward their life experiences and ideas, so students can incorporate them into the designs. Students have designed projects in the classroom ranging from a fashionable shoe suitable for an older person to a bicycle jacket that lights up and heats up based on the environment.

“I’ve come to the conclusion that predicting is a fruitless gesture. We as humans envision what we think might be a good, useful development, produce it and put it out there, and see how people use it. That’s the key.”

Susan Ashdown, Ph.D., Helen G. Canoyer Professor, Cornell University
woman’s taste that can also regulate temperature, to a lightweight, collapsible walker made of textiles that can convert to a chair.

Stories written in the Cornell Chronicle quote students praising the course and appreciating their new friends’ insights into life. Mayra Alatoree, ’09, a fiber science and apparel design major, said the collaboration with the community senior citizens “was very gratifying,” the Chronicle noted.

Other smart textiles-based products designed in the course include head-protection gear with thickening fluids, a portable machine that lets seniors put on pants without bending over, a winter coat that provides protection from a fall, and a garment that notifies a doctor if a person’s vital signs indicate a medical emergency.

Understanding the space between body and clothing

Despite such high-minded idealism, Dr. Ashdown’s research has its edgy side too. She started using three-dimensional imaging machines designed to take quick and exact measurements of a person’s body to better understand how clothes fit. “This technology was developed as a fancy tape measure because it can take a full hour [with a regular tape measure] to get a handful of accurate [body] measurements,” she said.

With 3D body scanning, the subject strips to her underwear, steps into a booth, stands for 12 seconds while lights play over her body, and watches as a 3D model appears on a computer screen. “I immediately got bored with taking body measurements, so I asked, ‘What else can this do?’” Dr. Ashdown said.

She now uses the machine to scan people first in their underwear and then clothed. “When I merge those two, I can understand the space between the body and the clothing,” she said. She has also started scanning people in “active” positions such as sitting or bending rather than standing with arms down.

Dr. Ashdown laughs at herself for being a “somewhat reluctant” technology adopter and carrying a cell phone with no camera. “I’m not the tech geek, but I love the way people interact with their world,” she said. “The way people interact today is through technology.”

Fusing fashion and function

Lucy Dunne, Ph.D., a 28-year-old native of Albany, N.Y., and Dr. Ashdown’s protégé, took a path as unexpected as InteraXon’s Garten. Dr. Dunne wanted to be a fashion designer at age 17 but instead found herself at Cornell, fascinated by functional clothing design as seemingly mundane as a firefighter’s uniform.

“I was attracted to a more engineering-based design,” Dr. Dunne said. Yet she realized she couldn’t build the kind of functional computing wear she wanted unless she picked up new skills. So she stayed at Cornell to complete a master’s degree and, at the same time, earn an associate’s degree in electronic technology from Tompkins Cortland Community College.

Dr. Dunne loved the community-college experience. “The students were so careful, dedi-
The Navy landed us here.

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“Thought control is [at a level] where voice-activated technology was 10 years ago.”

Ariel Garten, Neuroscientist and Psychotherapist, InteraXon

cated, and willing to help each other,” she said. “Everyone was there for a specific reason. They were very motivated.” Her education took another unexpected turn when she decided to spend time in Ireland, where her family originated, and found it difficult to get a job in something as obscure as smart clothing.

So she got her Ph.D. in computer science from University College Dublin. The experience gave Dr. Dunne insight into the limitations of the rigid disciplinary walls in standard education, which don’t allow students to pursue courses of study with emerging, interdisciplinary topics in mind.

“In order to build smart clothing, you need to know about apparel, about electronics, and about how to program electronics,” she said. “It takes some depth of understanding and the ability to work on one’s own and with others from very different backgrounds.”

Dr. Dunne has shown off her skills on the runway by designing a dress that flashes with the model’s heartbeat and showing off another dress in which suspended balls glow brighter when the model becomes excited or scared. Dr. Dunne faults purely technically educated people for developing wearable computing that “looks like cyborgs or big boxes strapped to you.”

“A focus on optimizing a sensor’s signal inside a piece of clothing and getting the best signal possible can directly contradict human values of comfort and wearability. It’s very uncomfortable, awkward, and intrusive,” Dr. Dunne said. Yet ignoring the sensor leaves the researcher with noise that completely obscures the sensor. What to do?

While in Ireland, Dr. Dunne dedicated her research to figuring out how to get usable signals from sensors that are completely unobtrusive. The university there is pursuing a patent resulting from her work. She is now working on a shirt that would monitor the breathing of a person suffering sleep apnea, and send a little jolt when the person stops breathing. People with sleep apnea stop breathing repeatedly during their sleep, sometimes hundreds of times and often for a minute or longer.

Dr. Dunne sees the future in turning tactile display into something akin to touch. She is trying to figure out what it takes to make an impression that’s not a vibration, that activates nerves and can even jolt the wearer into action.

Human issues behind the computing

With technological advances, people are coming to accept still-controversial tracking systems such as global positioning system sensors built into smartphones, or the idea that such Internet giants as IBM, Google, and Microsoft are vying to generate online health records that would store people’s heart-rate, glucose, and other intimate health data. In fact, such monitoring technology now abounds in everything from municipal cameras that shoot photos of cars that run red lights, to department stores that run surveillance systems in nearly every part of the store, to online grocery coupons personalized to each shopper based on the purchases the shopper has bought with his or her loyalty card.

Student researchers Raymond Lo and Eric Tran turned the invasion-of-privacy concept on its head by setting up what they call “cyborglogging,” or “the art of sousveillance.” The art calls for people to wear devices, such as a camera phone, as a necklace and constantly take photos of those they encounter.

“The system can be used to capture everyday life without the conscious thought or effort of the user,” the students’ research states. “If the user wishes to manually override the automated cyborglogging system, he or she can make deliberate narratives, complete with annotations.”

Garten said young people interested in the field should “do whatever they can to expand how they think creatively about the world.”

“Ask yourself to think in new ways, wonder what happens when you put everyday objects in new combinations,” she said. “Be open to possibilities.”

What does it mean?

Dr. Ashdown concedes she is captivated by the technology of wearable computing, but she refuses to predict its future course. “We use computing today so differently than we thought we would in the 1970s,” she said.

“I’ve come to the conclusion that predicting is a fruitless gesture. We as humans envision what we think might be a good, useful development, produce it and put it out there, and see how people use it. That’s the key.”
See things from a different angle?

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University Labs:

What propels women to head university labs, especially when tenure and biological calendars collide? Three SWE members who direct engineering labs offer keen and encouraging insights.

University engineering research labs and centers encompass a remarkable fusion of elements. Amidst the jumble of equipment, wires, and computers, seasoned faculty members to undergraduate students work on diverse projects in various stages of development.

Heading this medley is the lab or center director, often described as an entrepreneurial CEO, whose list of responsibilities is stunning in its complexity. Starting with feeding the funding pipeline with well-written proposals that procure grants, they mentor and train the next generation of researchers and professors. While keeping abreast of their own research, getting published, and teaching, they must interact with industry to move fundamental research to prototype and products — all this while maintaining lab safety and managing staff and technicians. In some cases, they also determine salaries.

Though funding, research, and teaching are the primary responsibilities of running a lab, according to three SWE members who currently head university labs, idealism, passion, and fostering environments in which others can succeed are also major components. According to Patricia Davies, Ph.D., director of Purdue University’s Ray W. Herrick Labs and professor of mechanical engineering, a successful lab director facilitates success in others. Her function is to discern how best to serve the grad students and faculty members in her lab.

Likewise, “working with brilliant, fun, motivated students on their way to change the world” is how Beth Pruitt, Ph.D., describes her position as principal investigator at Stanford University’s Microsystems Laboratory.
and assistant professor of mechanical engineering.

Leading entails “transferring one’s vision and knowledge to future generations by creating an environment where ideas progress from theory to prototype,” noted SWE Achievement Award recipient (1995) and life member, Manijeh Razeghi, Ph.D., Walter P. Murphy Professor and director of the Center for Quantum Devices in Northwestern University’s Department of Electrical Engineering and Computer Science.

An array of lab environments

Though these women share similar ideals as directors, each of their labs exemplifies different facets of university research. They run the gamut from a formal university center comprising many faculty members, visiting experts, and graduate students, with annual operating costs in the millions, to individual professors’ research labs with several graduate students working on the professors’ projects. Speaking of the tremendous differences, Lisa Frehill, Ph.D., execu-
“Between my research and handling the business of the lab, I still get to play, which could be anything from teaching a student how to wire a circuit... to discussing the next step in a research project.”

Beth Pruitt, Ph.D., Assistant Professor, Mechanical Engineering and Principal Investigator, Stanford University Microsystems Laboratory

Dr. Razeghi is at the multimillion-dollar end of the spectrum. Coming from an extensive background as a pioneer in semiconductors and optoelectronic devices, she directs Northwestern University’s Center for Quantum Devices, a world-class laboratory that, since its inception in 1992, has garnered more than $50 million and generated 55 patents awarded or pending, 75 significant awards, 450 publications, 12 books, 21 chapters, and 550 conference presentations.

Her accomplishments extend even further. She was asked to design and build the center from the ground up in 1992. Northwestern recruited her from a position as head of the Exploratory Materials Lab at Thomson-CSF in Orsay, France, by offering her an empty space in which to create a facility according to her vision. “The goal was to set up a facility where research and development could be carried out from theory, through growth and characterization of materials to fabrication and testing of devices, and finally back to simulation for the next step,” Dr. Razeghi recalled.

The center focuses on high-level research in compound semiconductor science and nanotechnology. To achieve this, the researchers combine their experience in solid-state physics; quantum mechanics; electrical, mechanical, and chemical engineering; and materials science.

When Dr. Davies became director of Purdue University’s 51-year-old Herrick Labs in 2005, she stepped into the shoes of three male predecessors. She noted that she was selected to head the lab because she would continue its well-established “mode of operation.” As she described it, this meant “giving people ownership of the lab so the research is collectively owned.” Currently, the lab has slightly more than 70 grad students, a number of visiting international scholars, and undergraduates.

Dr. Davies brought her research background in vibrations and acoustics to the lab. She initially came to Purdue University’s mechanical engineering department from the Institute of Sound Research at the University of South Hampton in England. Her experience at Purdue prepared her to contribute to the focus of the lab, which encompasses thermal systems and air quality, noise and vibration control, electromechanical systems, and modeling of human response for machine and systems optimization. Industry sponsors many of the projects, such as applications for smart buildings, environmental noise, and tactile communications interfaces. There is also an emphasis on multidisciplinary projects. Researchers from the School of Mechanical Engineering collaborate with professors from the colleges of science and liberal arts. She observed, “We look for broader ways of attacking problems, and the lab environment allows us to do that.”

Having received her Ph.D. from Stanford University in 2002, Dr. Pruitt balances a full
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schedule of teaching with research in its earlier stages. “It’s more exciting to be involved with ideas before they are ready to roll out as products and make money,” she explained. She brought five years of Navy experience, plus several years in industry before and during her Ph.D. and a post-doc in Switzerland. Now she works with two post-doctoral students and 12 graduate and three undergraduate students on projects focused on microfabricated devices and bio applications.

As a principal investigator, she enjoys the variety of a university lab and the freedom to define what she can do. Her academic career is right where it should be, according to Dr. Frehill, who explained that in the bench sciences and engineering, your career is about leading a lab. “That’s how you advance,” she said. “Any professor is expected to set up and run that sort of enterprise.”

More than technical skills needed

Obviously, superior technical skills are taken for granted, but as these three women demonstrate, running labs demands excellent people skills. Bossing people is not one of them. “It never works,” commented Dr. Davies, noting that the success of the lab depends on getting a group of people to work well together. “A picture of me as a great leader is not accurate,” she noted.

People skills facilitate one of the main purposes of academic laboratories, which is to mentor and train the next generation of researchers and teachers. Dr. Razeghi started that process by creating a 12-course curriculum in solid-state engineering for the graduate and undergraduate programs at Northwestern. She explained that by starting from zero and teaching the topics herself, “I could select the most passionate and skilled students to join my group.”

To her, students are like family. She trains them; teaches them discipline; educates them; and transmits her knowledge, experience, and values to them. Students must write a weekly report, which she reads faithfully, as well as punctually attend weekly meetings. Dr. Razeghi equates discipline with success. One of her doctoral students compared her lab to a steel factory and stated, “She can take iron and mix it with other materials and make it stronger.” He was equating making steel to how his professor, Dr. Razeghi, makes students into people of strength and capability who contribute to society. She sees her purpose as ensuring that knowledge is shared and transferred from generation to generation while keeping the most gifted and hardest-working students within the center. “This unique formula guarantees an ongoing world-leading position for the center,” she noted.

Dr. Davies also sees the transfer of knowledge as paramount in her job. Sitting with a grad student talking about research is one of the joys of her life, especially when she sees the student’s progress. “We start off teaching grad students, and at the end of the project they, hopefully, end up teaching us,” she commented. According to Dr. Davies, the proclivity to educate the next generation is not just about producing results but “learning about a system or machine and being able to find out how to measure things, how to analyze and
model them, and use that knowledge to solve problems.” To her and the faculty members she works with, “the outcome is understanding how to solve problems.”

While student research is serious and hard work, Dr. Pruitt said that between her research and handling the business of the lab, she “still gets to play,” which could be anything from teaching a student how to wire a circuit, to taking a class with other faculty members in cell culture, to discussing the next step in a research project and massaging the data to figure out the next experiment. “I get to step in at the most fun parts,” she explained. She thoroughly enjoys troubleshooting in the lab culture, which she described as the culture of questions. “Generating new ideas, new programs, and fundraising for those ideas is what enables the students to be able to do the great work they do,” she said.

**A Principal Investigator’s Responsibilities to Her Grad Students**

Grad students expect a lot from those who are in positions to mentor and guide them to the next steps in their careers. Beth Pruitt, Ph.D., principal investigator at Stanford University's Microsystems Laboratory and assistant professor in mechanical engineering, decided she would write a document telling the grad students in her lab what they could expect from her as a principal investigator. The excerpt below demonstrates the degree of responsibility inherent in heading a lab of any size, as well as the enormous scope of duties involved in leadership:

*As principal investigator, my responsibility to the group is to manage research projects and the laboratory and to provide mentoring and career preparation for lab members. You should manage your own time/projects and are ultimately responsible for your Ph.D. research and your goals. As your mentor, I aim to do the following:

• Help you develop the skills necessary to evolve into an experienced, independent, and effective researcher
• Refine your writing abilities with the goal of clear and concise communication through publications, presentations, and grant writing
• Develop your mentorship and team-leading skills through opportunities to supervise and train other students
• Guide you in “asking the right questions,” i.e., choosing experiments and controlling variables
• Enable you to develop interpersonal skills for a successful research career, including mentoring, teamwork, and collaboration
• Provide access to world-class facilities and the necessary training to conduct your research
• Give guidance in publishing results in the archival literature to bolster research standing for you and the group
• Provide opportunities to present work in collaborative settings as well as conferences related to your research field*
This year’s installment of SWE Magazine’s series on female deans of engineering focuses on leaders at two decidedly different engineering institutions. Deirdre Meldrum, Ph.D., leads Arizona State University’s Ira A. Fulton School of Engineering in Tempe, Ariz., with 210 faculty and 6,500 students. Arizona State was established in 1885 and today is a comprehensive public research university with more than 60,000 students at four campuses. The engineering program at ASU dates to 1954 and offers 10 baccalaureate degree programs, 14 master’s degree programs, and 10 doctoral degree programs. Cherrice Traver, Ph.D., leads the engineering program at Union College in Schenectady, N.Y., an independent liberal arts college founded in 1795. In 1845, Union became the first liberal arts college in the United States to offer engineering, and it currently confers undergraduate degrees in electrical, computer, mechanical, and biomedical engineering.

Deans Meldrum and Traver both earned their doctoral degrees in electrical engineering after starting out in other fields — Dr. Meldrum in civil engineering and Dr. Traver in physics. Both cite mentors, formal and informal, as influential in their careers. Dr. Meldrum noted, “My parents have been very influential in that they have always given me many opportunities and allowed me to pursue my own interests. Both of my parents are English professors. My husband has provided the flexibility and support that is needed so I can balance family and demanding professional positions. In high school I thought I wanted to be an architect but was then admitted to two summer programs — the Junior Engineering Technical Society and Women in Engineering — at the University of Idaho right after my junior year to learn about engineering. From that point on I wanted to be an engineer.”

A chance conversation got Dr. Traver thinking about her career: “I doubt he even remembers me, but a graduate student during my undergraduate studies asked me a lot of questions during a slow time in a lab session that made me realize I should raise my career expectations. I ended up in graduate school for engineering a few years later because of that short conversation.”

Neither Dr. Traver nor Dr. Meldrum started out with the goal of becoming a dean. Dr. Meldrum moved to a new institution to take on the role of dean, while Dr. Traver moved into the deanship at the institution where she has spent most of her academic career. “I honestly never aspired to be a professor, let alone a dean!” said Dr. Meldrum. “I came to ASU in January 2007, knowing that being a leading researcher does not mean I am a leader on the administrative side. The last thing I wanted to be was a dean. But President Crow is a great salesman who made me an offer I couldn’t refuse, so here I am.

“There have been important decisions throughout my career, but there are several major ones that led me to my current position. As a Ph.D. student in electrical engineering at Stanford University,” Dr. Meldrum continued, “I learned that I love research and academia. I was also introduced by a student colleague to genomics and the Human Genome Project.

Varied paths from electrical engineering to deanship

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Those events led to my going on to be an assistant professor at the University of Washington. I became the founder and director of the Microscale Life Sciences Center in 2001, one of the first National Institutes of Health Centers of Excellence in Genomic Science in the U.S.; there are now 10 total. I was recognized as a good leader and was recruited by President Crow of ASU to lead the Ira A. Fulton School of Engineering as dean and as a role model for interdisciplinary, large-scale research.

Dr. Traver noted that “One thing that junior faculty members have to decide is how much time they want to spend on ‘service’ activities — either for their department, or the college. In retrospect, I probably devoted more time and energy to tasks such as starting student clubs and other activities than is normal for a junior faculty member. I had not thought about administration earlier in my career, but I have always been interested in initiatives to improve things. When this position became open, I already had some ideas about how this leadership post could be influential in making things better.”

Both women have collaborative leadership styles. Dr. Meldrum observed that “Initially, I had to be more forceful. Given the small number of women engineering deans in the country I am kind of a rare bird in an industry dominated by men. But my team is getting to know me now and I’m getting to know them, so I can do things my way, which is often nontraditional. I’m extremely lucky; I have a great leadership team that is very supportive and is helping me to increase the number of women faculty and students in our engineering school. I’ve been told that my groups and teams are more collaborative because I am a woman and because of my leadership style. I don’t have any data on that, but it feels right.”

Dr. Traver also is an inclusive leader: “When working on initiatives and making decisions, I try to get stakeholders involved, and to give credit to others when there are major accomplishments.”

Involvement in professional societies has played an important role in the careers of Dean Deirdre Meldrum leads Arizona State University’s Ira A. Fulton School of Engineering and is a role model for interdisciplinary, large-scale research.

The Best and Worst of Being a Dean

Dr. Meldrum, Arizona State University: “Being able to influence the environment where young minds can be impacted in positive ways is a very rewarding position to be in. Watching young people prepare themselves for the workplace is one of the best experiences I have as a dean. Another thing that is great about being a dean is that every day is different, there is a lot of variety, and I get to meet a lot of different people from nearly all sectors of life. The realization that education is not affordable to everyone is one of the worst things about being a dean.”

Dr. Traver, Union College: “The best is learning about the creative projects that our alumni are engaged in; collaborating with administrators, faculty, and staff from many sectors of the college; and providing support for faculty and students with innovative ideas. The worst is dealing with space shortages and difficult people.”
Dr. Meldrum has been an active member of SWE for about 30 years. She said, “As an undergraduate student at UW [University of Washington], I held several offices, including president of the student chapter. It was invaluable in providing leadership experience, training to be a professional, and networks of other female engineers. It gave me a very positive feeling about women in engineering, so I knew that I was not alone and that it was great to be an engineer.

“While working full time as a member of the technical staff at Jet Propulsion Laboratory, I was a member of the JPL SWE corporate board and participated in events in the Los Angeles basin,” Dr. Meldrum continued. “I was the SWE faculty advisor to the SWE student chapter at the University of Washington for the 14 years I served on the faculty and think of that experience as a very rewarding and strong connection to the engineering students. Now, as dean of engineering at ASU, I participate in SWE events and promote SWE to all students as a great society for professional preparation and networking.

“The other major associations I am active in are the IEEE Robotics and Automation Society and the IEEE Engineering in Medicine and Biology Society. They provide key technical forums to present my research, journals to publish in, and people in my field to network with,” Dr. Meldrum said.

Dr. Traver also noted the importance of professional society participation: “Being from a small institution, professional societies have been a key resource for networking and professional development. Union was the host of the 2008 Frontiers in Education conference, and working with IEEE and ASEE [American Society for Engineering Education] to plan the conference was a very rewarding experience.”

Managing career, family, and accomplishments

Both Dr. Traver and Dr. Meldrum have been able to combine high-powered engineering careers with family life. When asked how their careers have influenced their personal lives and vice versa, Dr. Meldrum observed that “Being a leader in engineering education influences nearly everything I do, from how I work with students to how I interact with my children. I am always thinking about how I can provide the best environment and opportunities for them to develop critical thinking skills that will lead to their success and happiness in ways that are fun and exciting. My children give me close relationships and insights into how children learn and how early influence can make huge impacts on who they are as people and how they approach life.”

Dr. Traver also noted that children have influenced her perspective, while the time demands of being a dean have caused her to cut back on other activities: “I love to cook, but because I must attend a number of evening events, I’ve had to scale back on that. On the positive side, having two daughters around college age has given me a lot of insights into the views of this generation.”

SWE Magazine asked both women what they have accomplished or hope to accomplish as dean. Dr. Meldrum is in the midst of a major reorganization of the engineering programs at ASU. “We have taken the very first step to align our engineering school toward solving societies’ grand challenges,” she said. “What I hope to accomplish is not to just change the structure of our engineering school, but to cluster our talented faculty to collaborate, establish communities, and create discoveries that will result in accomplishing our vision, which is: leading engineering discovery and innovative education for global impact on quality of life. We reorganized from

“Being a leader in engineering education influences nearly everything I do, from how I work with students to how I interact with my children.”  Deirdre Meldrum, Ph.D.
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10 traditional, discipline-based departments to five schools focused on broad grand challenge themes. This is a revolutionary change in engineering that has not happened in other engineering schools around the country.

“My institution, Arizona State University, is moving away from conventional and traditional ways of doing things,” Dr. Meldrum continued. “President Crow has a powerful vision of a New American University where we are measured not by whom we exclude, but rather by whom we include; pursuing research and discovery that benefits the public good; assuming major responsibility for the economic, social, and cultural vitality and health and well-being of the community.”

Dr. Traver is also involved in creating new programs that build on Union College’s interdisciplinary tradition. “I have been dean for about four years now. In that time I have led the engineering departments in a planning process that was integrated with the first strategic plan of the college. We have implemented several components of the plan, including starting a new bioengineering program, hosting an annual national symposium on engineering and liberal education, and developing interdisciplinary academic minors that integrate engineering and the liberal arts. I also helped coordinate a number of renovations to our facilities and developed a college-wide program for assessing student learning.

“I can’t take all the credit, but the idea of taking advantage of the presence of engineering in a liberal arts college by considering the human-made world in science, humanities, and social science disciplines is starting to take hold. We have not figured out all the ways that it can be done, but there are some excellent examples that I want to build on in the future.”

The importance of flexibility

In closing, both deans emphasized the importance of flexibility in careers. Dr. Meldrum said, “I think it is important to learn early in your life what is your happiness path and your career path. If you have chosen a career that you feel is also your happiness path, this is fantastic, but make sure you attain balance because I have seen people who are so happy at work that they destroyed their home life. Find a happy career path and engage your loved ones about your work.

“Some of you at some point in your lives will make a change. If it’s for the sake of balance and happiness, do it! I started as a civil engineer, became an electrical engineer, and found my passion in the work I’m currently doing. I was not afraid to change because I was chasing my happiness,” Dr. Meldrum continued.

Dr. Traver observed that “We live in challenging times, and it is important to be prepared and to remain flexible. Seek opportunities to work with others on interesting and complex problems — in the classroom, the college, and the community. This is what an engineering education is preparing you for, and the more experience you can get now, the better.”

Recommended Reading:

Dr. Meldrum: What Got You Here Won’t Get You There, by Marshall Goldsmith, and What Makes a Leader?, by Daniel Goleman. “It is amazing what techies like me will learn about how to work effectively with people. It is all about emotional intelligence — something we rarely learn in our engineering training.”

Dr. Traver: Strategic Change in Colleges and Universities: Planning to Survive and Prosper, by Daniel James Rowley, Herman D. Lujan, and Michael G. Dolence. “This book is more about strategic planning than leadership, but it is helpful for providing both context and practical advice for those who find themselves in this process.”

Peggy Layne, P.E., F. SWE, is the ADVANCE program coordinator at Virginia Tech. She is a former chair of the SWE Magazine editorial board and a past national president of SWE. Layne became a SWE Fellow in 2001.
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As of July 1, 2006, people of Hispanic origin make up the largest ethnic or race minority in the United States. The estimated 44.3 million Hispanics constitute 15 percent of the nation’s total population. In addition, Puerto Rico is home to 3.9 million residents not included in the estimate. The U.S. Census Bureau defines Hispanic Americans as U.S. residents — of any race — who trace their ancestries to Spain, Mexico, and the Spanish-speaking countries of Central America, South America, and the Caribbean. President Lyndon B. Johnson proclaimed the first National Hispanic Awareness Week in September 1968. In 1998, President Ronald Reagan signed a bill to turn the occasion into a month-long celebration to honor the culture and heritage of Hispanic Americans and to acknowledge their contributions to the United States in every aspect of our lives.

Hispanic Heritage Month lends itself to educators who want to teach children to respect and rejoice in the diversity of the United States. A number of Web sites provide a rich selection of recommended reading by and about Hispanics. Additionally, teachers have access to online games and music to introduce their students to Hispanic traditions in fun ways, all while helping to develop the children’s intellectual curiosity.

Recognition through stamps

One means by which Hispanics have been recognized is through the release of Hispanic-related postage stamps. In 1869, the U.S. Postal Service issued a stamp commemorating the landing of Christopher Columbus in the New World. The stamp is regarded as the first to acknowledge Hispanics. Since then, the agency has produced more than 50 stamps dedicated to Hispanic people, history, and culture. Offerings have included tributes to explorers, artists, pioneers, statesmen, athletes, entertainers, and educators, as well as events and traditions.

The Latin Jazz stamp, which made its appearance in 2008, portrays musicians playing the piano, bass, and conga drums. Designed by artist Michael Bartalos, the colorful image salutes Latin jazz, a blending of African and Latin American rhythms with jazz and classical elements from Latin America, the Caribbean, Europe, and the United States.

Also issued in 2008 was a stamp depicting...
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Mexican-American journalist Ruben Salazar. A columnist for the *Los Angeles Times* and news director for a Spanish-language television station, Salazar was killed while covering the National Chicano Moratorium March against the Vietnam War in 1970 in East Los Angeles, Calif. His trailblazing efforts inspired other Hispanics to pursue careers in journalism.

Hispanic contributions in arts and entertainment have been illustrated on stamps with tributes to such notable figures as composer and conductor John Philip Sousa; poet, journalist, and politician Luis Muñoz Marín; musician Ritchie Valens; and actor and musician Desi Arnaz. An image of Chacón’s Madonna and Child graces a holiday stamp issued in 2006. The painting is attributed to 18th century Peruvian artist Ignacio Chacón.

In 2001, Mexican painter Frida Kahlo (1907-1954) became the first Hispanic woman to be revered with a U.S. postage stamp. Seriously injured in a bus accident as a teenager, Kahlo based her works on the hardships of her life, as well as those of women as a gender. She was influenced by pre-Columbian art and Mexican folk art, and her more than 140 paintings include 55 self-portraits.

César Chavez, civil rights and labor activist, made his most famous mark on history by co-founding the United Farm Workers of America with Dolores C. Huerta. Born in Yuma, Ariz., as a second-generation American, Chavez spent many of his formative years toiling in farm fields and vineyards, where he experienced firsthand the hardships and unfair treatment suffered by farm workers. The Postal Service recognized the accomplishments of Chavez with a stamp in 2003.

Among the stamps devoted to socially significant events in Hispanic-American history is a 2007 issuance that commemorates *Mendez v. Westminster*, a 1946 federal court case that challenged the segregation of Mexican children in Orange County, Calif., schools. The court rendered a decision declaring such segregation unconstitutional, setting a precedent for Brown v. Board of Education in 1954.

Postage stamps have long provided a means for recognizing people, cultures, places, events, history, and other facets of society. Despite a decline in “snail mail,” brought about by the ease and instant gratification of electronic communication, the U.S. Postal Service continues to offer commemorative stamps, and philately, or stamp collecting, remains an engaging passion enjoyed by aficionados of all ages. To learn more about stamp collecting and to explore the agency’s vast collections, visit [www.usps.gov](http://www.usps.gov).

**Hispanic-related Postage Stamps**

The U.S. Postal Service has a long history of paying homage to Hispanic people and events. From its first Hispanic-related stamp, issued in 1869, to the most-recent releases honoring journalist Ruben Salazar and Latin jazz, the agency offers a selection of stamps that recognizes the achievements and contributions of Hispanics in all aspects of life. The collection includes, among other offerings:

<table>
<thead>
<tr>
<th>Stamp</th>
<th>Year</th>
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<tbody>
<tr>
<td>Landing of Columbus</td>
<td>1869</td>
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<tr>
<td>Columbian Series</td>
<td>1893</td>
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<tr>
<td>David Farragut</td>
<td>1903</td>
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<tr>
<td>Panama Pacific Exposition</td>
<td>1913</td>
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<tr>
<td>John Philip Sousa</td>
<td>1940</td>
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<td>Pan-American Union</td>
<td>1940</td>
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<td>Puerto Rico Election</td>
<td>1949</td>
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<td>Simón Bolívar</td>
<td>1958</td>
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<td>José de San Martín</td>
<td>1959</td>
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<td>Palace of the Governors</td>
<td>1960</td>
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<td>Mexican Independence</td>
<td>1960</td>
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<td>Alliance for Progress</td>
<td>1963</td>
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<tr>
<td>Juan Ponce de León</td>
<td>1982</td>
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<tr>
<td>Roberto Clemente</td>
<td>1984</td>
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<td>Hispanic Americans</td>
<td>1984</td>
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<td>Padre Junípero Serra</td>
<td>1985</td>
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<td>Luis Muñoz Marín</td>
<td>1990</td>
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<td>Dennis Chavez</td>
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<td>Juan Rodríguez Cabrillo</td>
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<td>Ritchie Valens</td>
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<td>Padre Félix Varela</td>
<td>1997</td>
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<td>Cinco de Mayo</td>
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<td>Desi Arnaz</td>
<td>1999</td>
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<td>César Chavez</td>
<td>2003</td>
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<td>Let’s Dance/Bailemos</td>
<td>2005</td>
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<tr>
<td>Chacón’s Madonna &amp; Child</td>
<td>2006</td>
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<tr>
<td>Mendez v. Westminster</td>
<td>2007</td>
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<tr>
<td>Ruben Salazar</td>
<td>2008</td>
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<tr>
<td>Latin Jazz</td>
<td>2008</td>
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**ALL STAMPS COURTESY OF THE UNITED STATES POSTAL SERVICE**
At its fourth annual Women of Vision Awards, the Anita Borg Institute honored three leaders in technology and highlighted the winners’ accomplishments and contributions in three areas: leadership, innovation, and social impact.

Leadership: Mitchell Baker, J.D., chairperson, Mozilla Corp., was recognized for her work as the leader of the Mozilla Foundation, a nonprofit organization dedicated to openness and innovation on the Internet. Her work with the Mozilla Foundation and the Firefox Web Browser has evolved the technology around Web browsing with more than 200 million users worldwide.

Innovation: Yuqing Gao, Ph.D., senior manager, IBM T.J. Watson Research Center, headed the Laboratory for Speech-to-Speech Translation systems at IBM. She was also the principal investigator of DARPA CAST and TransTac Programs at IBM and led the research and development of IBM’s Multilingual Automatic Speech-to-Speech Translator system, which is leading the industry in automated speech translation.

Social Impact: Jan Cuny, Ph.D., program director, National Science Foundation, has been a passionate voice for women and underrepresented minorities in her work with the National Science Foundation’s Broadening Participation in Computing program. Her work went beyond funding programs to building an inclusive community for underrepresented groups in technology, allowing them to use and create technology and ensuring they will be qualified for roles in a technology-driven world.

Honoring an Engineering Educator

Alice Parker, Ph.D., professor, University of Southern California’s Viterbi School’s Ming Hsieh Department of Electrical Engineering, is the 2009 recipient of the American Society of Engineering Education Sharon Keillor Award for Women in Engineering Education. This award recognizes and honors outstanding women engineering educators who have an exceptional record in teaching engineering students, as well as strong records of research and service. Dr. Parker is a former division director for computer engineering, a former dean of graduate studies, and a former vice provost for research at USC. She currently leads a research effort examining the use of nanocarbon modeling in emulating human brain function.

Renowned Researcher, Educator Heads UC Davis

Linda Katehi, Ph.D., provost and vice chancellor of the University of Illinois at Urbana-Champaign and a renowned researcher and educator in the fields of electrical and computer engineering, was named chancellor of the University of California, Davis. In addition to serving as provost at the University...
sity of Illinois at Urbana-Champaign, Dr. Katehi held a joint appointment with the Gender and Women’s Studies program. Previously, she served as dean of engineering and professor of electrical and computer engineering at Purdue University and as associate dean for academic affairs and graduate education in the College of Engineering. In addition, she was professor of electrical engineering and computer science at the University of Michigan.

**Young Investigator of the Year**

Leila Parsa, Ph.D., Rensselaer Polytechnic Institute assistant professor, won the Office of Naval Research 2009 Young Investigator Program. Dr. Parsa will receive a three-year, $500,000 research grant for applying her investigations into the design and control of energy and power electronics converters toward the development of new shipboard power systems. “Dr. Parsa’s work represents the leading edge in the development of future energy sources and systems, which is of obvious importance to society at large and one of the department’s strategic objectives in research and education,” said Kim Boyer, Ph.D., head of Rensselaer’s department of electrical, computer, and systems engineering. For the Navy, Dr. Parsa will help to develop a monitoring, fault detection, and reporting system to identify the faults in the shipboard electromechanical energy converters and power electronics converters. The end result will be safer, more reliable ships.

**From Summer Engineering Intern to CEO**

Ursula M. Burns, former president of Xerox Corp., is now the company’s new CEO. Burns joined Xerox in 1980 as a mechanical engineering summer intern and later assumed roles in product development and planning. From 1992 through 2000, Burns led several business teams, including the office color and fax business and office network printing business. In 2000, she became senior vice president of Corporate Strategic Services, heading up manufacturing and supply chain opera-
tions. She then took on the broader role of leading Xerox’s global research as well as product development, marketing, and delivery. In April 2007, Burns became president of Xerox, expanding her leadership to include the company’s IT organization, corporate strategy, human resources, corporate marketing, and global accounts.

In the Top 2 Percent of Technological Development
Mary Leigh Wolfe, Ph.D., professor of biological systems engineering in Virginia Tech’s College of Agriculture and Life Sciences, was elected into the American Institute for Medical and Biological Engineering’s College of Fellows. The College of Fellows represents the top 2 percent of medical and biological engineers in the field. Fellows are at the leading edge of technological development, helping to revolutionize medicine, engineering, and related fields that enhance and extend the lives of people all over the world. Dr. Wolfe’s research focuses on hydrology, nonpoint source pollution control, geographic information systems, and water quality management.

Significant Barriers to Advancement for Underrepresented Minorities in Technology
Leading high-technology companies need employee diversity to remain globally competitive and innovative, but new research indicates that underrepresented minorities make up a very small proportion of high-technology work forces, especially at the senior level. According to Obstacles and Solutions for Underrepresented Mi-

The Whiting School of Engineering will be conducting searches in several disciplines for full-time tenured, tenure-track and non-tenure-track faculty positions. The School has nine departments (Applied Mathematics and Statistics, Biomedical Engineering, Chemical and Biomolecular Engineering, Civil Engineering, Computer Science, Electrical and Computer Engineering, Geography and Environmental Engineering, Materials Science and Engineering, and Mechanical Engineering) and is seeking candidates who strengthen or complement the School’s faculty, especially in areas that transcend traditional disciplinary boundaries. For information on specific positions, please see all listings on our website: http://engineering.jhu.edu/faculty-employment.

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norities in Technology, 6.1 percent of technical men and 8.2 percent of technical women in Silicon Valley high-tech companies are underrepresented minorities. Representation at the highest levels of the technical ladder is especially poor for women of color. The study, conducted by the Anita Borg Institute for Women and Technology, found that the impact of this underrepresentation includes:

- High-tech companies are now at a clear risk of losing underrepresented minority technical talent.
- Companies are losing on the benefits of gender and ethnic diversity in decision making, as diverse teams tend to make better decisions and generate more innovation.
- Minority job candidates look for companies that model diversity at the top.
- A lack of role models is a critical factor in the career choice of young girls and early career women.

U.S. prominence in science and technology has been seriously undermined in recent years due to the decreasing enrollment of students in STEM disciplines.

I’m Busy; Talk to My Avatar

Perhaps you have had the desire to create a copy of yourself that could stand in for you at a meeting, freeing you to work on more pressing matters. Thanks to a research project called LifeLike, that fantasy might be a little closer to reality. Project LifeLike is a collaboration between the Intelligent Systems Laboratory (ISL) at the University of Central Florida and the Electronic Visualization Laboratory at the University of Illinois at Chicago that aims to create visualizations of people or avatars that are as realistic as possible.

While their current results are far from perfect replications of a specific person, their work has advanced the field and opens up a host of possible applications in the not-too-distant future. The ISL team focuses on applying artificial intelligence capabilities to the avatars. This includes technologies that allow computers to recognize and correctly understand natural language as it is being spoken. It also allows for
automated knowledge update and refinement, a process that enables the computer to “learn” information and data it receives and apply it independently. The end goal is for a person conversing with the avatar to experience the same level of comfort and interaction they would have with an actual person.

**Cracking Cyber Crime**

A New Jersey Institute of Technology electrical engineer has cracked the code that will enable researchers around the world to detect tampering with electronic images. “Using our program, we can usually inspect a photograph on a computer screen and know that someone has changed it,” said Yun-Qing Shi, Ph.D., professor of electrical and computer engineering. “We still cannot say, nor can anyone else, where in the media the image has been changed. But we will get there.” Earlier this year, System and Method of Steganalysis, developed by Dr. Shi and his collaborator, Guorong Xuan, received a U.S. patent. The research has already been licensed. Image tampering came to the world’s attention following changes to two widely recognized images: a *Los Angeles Times* photo of the Iraqi War in 2003 and a BBC News image of the Israeli air strike against Beirut in 2006. Since then, Dr. Shi, an expert in information assurance and digital data forensics who lectures worldwide, has made it his business to highlight new and better ways to detect tampering with electronic images.

**Will Service-based Learning Bring More Women into Engineering?**

The key to improving engineering programs while also boosting the number of women interested in the male-dominated field may be curricula that emphasize hands-on, service-based learning as well as traditional academic and technical knowledge. With a $500,000 grant from the National Science Foundation, Chris Swan, Ph.D., associate professor of civil and environmental engineering at Tufts School of Engineering, and a team of researchers are taking a hard look at this theory. The goal of their three-year study is to determine the extent to which service learning might help engineering programs attract and retain students, particularly women. The findings could help educators nationwide adapt or retool their teaching methods.

**Admit It, You Use Your Cell Phone while Driving**

Most drivers who own cell phones use them while driving, even though almost all of them believe it is a dangerous practice. A quarter of drivers with cell phones send or receive text messages while driving. Most drivers with cell phones use handheld rather than hands-free phones, although they believe that hands-free phones are safer. Even in states where it is illegal for drivers to use handheld phones, half of cell phone users do so. These are some of the findings of a nationwide online survey of 2,681 U.S. adults between May 11 and 18, 2009, by Harris Interactive:

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Applicants must establish dialogue with Advisers at the lab prior to application deadline. Questions should be directed to the NRC at: 202-334-2760 (tel) or rap@nas.edu.

Qualified applicants will be reviewed with regard to race, religion, color, age, sex or national origin.
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• 72 percent of those who drive and own cell phones say they use them to talk while driving.
• Most of these people (66 percent) say they usually use handheld rather than hands-free telephones to talk.

Even in states that have banned the use of handheld cell phones while driving, half of cell phone users (49 percent) use handheld rather than hands-free phones.

Only 2 percent of those who use cell phones while driving believe this is not dangerous at all. Most believe it is very dangerous (26 percent), dangerous (24 percent), or somewhat dangerous (33 percent).

**The Ultimate in Recycling**

Stanford researchers have developed biodegradable substitutes for wood, plastic bottles, and other common materials that may one day save trees, reduce greenhouse gas emissions, and shrink landfills. The faux lumber is made from a new biodegradable plastic that could be used in a variety of building materials and perhaps replace the petrochemical plastics now used in billions of disposable water bottles. “This is a great opportunity to make products that serve a societal need and respect and protect the natural environment,” said lead researcher Sarah Billington, Ph.D., associate professor of civil engineering.
and environmental engineering. In 2004, Dr. Billington and her colleagues received a two-year Environmental Venture Projects grant from Stanford’s Woods Institute for the Environment to develop artificial wood that is both durable and recyclable. The research team focused on a new class of construction material called biodegradable composites, or biocomposites — glue-like resins reinforced with natural fibers that are made from plants and recyclable polymers.

**Real Rose-colored Glasses**

A University of Toronto study provides the first direct evidence that our moods literally change the way our visual systems filter our perceptual experiences, suggesting that “seeing the world through rose-colored glasses” is more biological reality than metaphor.

“Good and bad moods literally change the way our visual cortex operates and how we see,” noted Adam Anderson, Ph.D., professor of psychology. “Specifically, our study shows that when in a positive mood, our visual cortex takes in more information, while negative moods result in tunnel vision.” The study appears in the *Journal of Neuroscience*.

The research team used functional magnetic resonance imaging to examine how our visual cortices process sensory information when in good, bad, and neutral moods. They found that donning the rose-colored glasses of a good mood is less about the color and more about the expansiveness of the view.

**One-stop Info about Women Engineers**

The WEPAN Knowledge Center provides a publicly accessible tool for getting information related to women in engineering and a professional networking platform for registered users. The center will give users access to cataloged and fully cited information resources, including research reports, data and statistics, agenda papers, bibliographies, best practices, key programs, and more:

- Direct access to resources housed in the Knowledge Center
- Links to resources housed on other sites
- Advanced search capabilities
- Easy uploading procedures for additional resources users contribute

An online professional community for networking, collaborating, identifying subject matter experts, and sharing information:

- Build and maintain your own profile
- Join or establish professional interest groups
- Monitor and post calendar events
- Communicate via blogs, discussion boards, online chat, or e-mail messages
- Special online events, webcasts, and webinars:
  - Panel discussions and interviews

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Often without our realizing it, daily life provides teachable moments — the chance to make a difference, and through our actions, pave the way for future engineers.

BY SANDRA A. WOOD, SWE EDITORIAL BOARD

I have a small statue in my office that I purchased in Chicago at a local artisan shop as I neared the end of my term on the SWE board of directors in 2004. The figure depicts three women with their arms around one another in an open embrace. From their dress lengths and body language, one can conclude that they are three generations of the same family with a cause for celebration. I call it my SWE statue. To me it represents three SWE generations eagerly awaiting the birth of the fourth.

Often unaware of our influence

We go about our routines every day — we get out of bed, get the kids to school, go grocery shopping, attend birthday parties and other family get-togethers, attend engineering classes, go to work, go to bed, then get up and do it all over again — balancing life, college, work, and family. We focus on our personal agendas, dreams, and ambitions, often oblivious to the impacts we make on others.

Then one day you are in the local shopping mall and a woman approaches you. “Excuse me,” she says, “You don’t know me, but I remember you well. You’re one of the engineers who hosted that mother and daughter engineering day several years ago. My daughter and I came that Saturday afternoon. I just wanted to say thank you. Because of you, she is now an engineer.” It’s a real stretch, but you vaguely remember that afternoon 10 years ago. You spent just two hours of your time helping with a SWE event, but it impacted a young woman for a lifetime. You are now a role model.

A few years later, you’ve finally taken that leap and made a career transition to another firm in order to obtain a management position. One day, the branch manager calls you into his office and asks you to review the resume of a young engineering graduate they want to hire. The applicant is well qualified, has leadership activities, is well rounded, and female. Your boss says, “She reminds us of you.” This company had hired you as its first female engineer and you paved the way for another. You are a role model. Of course, this wasn’t your intention in taking the job. You were just looking for a management position and they offered the best salary and opportunity for growth.

And then there was the time you worked for a major company, once again the first female engineer hired into that particular division. There were few women in technical positions in the company, and none in management. Through SWE you worked to sponsor a glass ceiling seminar for local engineering firms. This initiative has helped female engineers in the community over the years as you see them being mentored and earning upper-level management positions. Again, you are a role model.

When you decided to take some personal time off in between engineering jobs to refocus on family, you signed up to be a volunteer for PTA, band, and football activities for your sons’ school. You teamed with a math teacher to coach the high school’s two teams in an engineering-related design challenge competition. Both teams went on to win the regional and state competitions but couldn’t afford to attend the world competition. By reaching out to the local engineering community, the $10,000 needed was raised. Most of the students had never been on an airplane and more than half of them were minority or female. They placed in the bottom five in their events, but gained knowledge of engineering design, teamwork, and communication. They met young men and women from all over the world in a weeklong experience that will last a lifetime. You are, once again, a role model.

And now you are a faculty member working with 250 new first year engineering students every semester. Although it is your full-time job, you are a role model. A young female enters your classroom — a minority student who was in the eighth grade the summer SWE ran a math, science, and engineering program for Girls Incorporated. She has joined SWE and now does...
outreach activities through the university’s student chapter as well as through her cooperative education program company. She is now a role model.

Pay it forward

All of these experiences are mine, but many SWE members have encountered similar instances. While you were just living your life, pursuing your dreams and passions, searching for role models of your own, you also became a role model and probably did not realize it. With the exception of a female high school science teacher and one male university professor, over the last 25 years all of my role models have been SWE members at the local, regional, or national level. I know the majority of their names, but they might not know mine. Some inspired me on a visit to a student SWE meeting in my college days, during a chance meeting on an elevator, in a hotel lobby at a conference, through an article in SWE Magazine, or by a book they wrote. Their successes, passion, words, and actions have motivated me to continue to pursue the path of being a role model.

I have come to the conclusion that because there is no mold for being a role model, it suits me well. You are never too young (thank you, collegiate students) or too old (we will miss you, Betty Preece) to be a role model. The hours are sporadic; you never know when you will be called into action. And at times, an experience may have been ordinary and uneventful to you to the point that you aren’t sure when it even took place, yet you made an impact. Being a role model can also be a lonely path; you may never know of all the people you influenced or to what extent, but rest assured, they will remember you.

Pay it forward for SWE generation four. ■

Sandra A. Wood is a member of the SWE Magazine editorial board and the faculty of the University of Alabama College of Engineering in Tuscaloosa, Ala. Wood has an M.S. in engineering from the University of Alabama at Birmingham and more than 20 years’ experience in industry as an engineer and scientist prior to joining the university staff. She has served as Region D director and in numerous positions on the region and section levels of SWE. Based upon her own experience as an undergraduate majoring in biology and chemistry, Wood is passionate about outreach and believes her first degree would have been in engineering had she been aware of the opportunities.

Never Too Old to Be a Role Model

SWE pioneer Betty Preece remained active at all levels of the organization for more than 50 years. Her passion for outreach and career development was well known and respected internationally, both in SWE and other organizations, and especially in Region D, her home region. She endeared herself to successive generations of collegiates and young professionals. A resident of Indialantic, Fla., she died in May, a role model for all of us. A Fellow, Distinguished Service Award recipient, and member of the SWE Magazine editorial board, her obituary appears on page 78.

SWE Smiles - Crossword Answers

Solution:

- PUNCH
- O
- PHILATELY
- A
- COPY
- B
- STAMPA
- F
- POSTAGE
- DUE
- COMMEMORATIVE
- S
- STICKER
- C
- POSTCARD
- O
- AN
- LICK
- EXTINGUISH
- F
- CLASS
- O
- PEN
- FORENSIC
- RUBBER
- TIL
- CH
- FILED
Transforming Obstacles into Opportunities

BY JILL S. TIEJEN, P.E., F.SWE AND MARY D. PETRYSZYN, SWE

Obstacles and setbacks can ultimately become steppingstones to greater growth and fulfillment.

You’ve been laid off. Your spouse has asked you for a divorce. You didn’t get a long-sought promotion. Each of us will experience obstacles, both personally and professionally, in our lives. One key to our life success is how we deal with those obstacles. A more empowering response is what is often referred to as “making lemonade out of lemons” or “seeing the silver lining.” These old maxims do contain a truthful perspective. When you look at a negative event in your life as an occasion for learning and growing, you can transform an obstacle into an opportunity. What can you learn from an obstacle? It is important to ask: What happened? How did it happen? Why did it happen? How did you contribute? What message is there for you? How do you move forward? Through the process of answering these questions, a great deal can be learned, and the setback that undermined your sense of control and well-being can become more manageable.

Examine the obstacle

So, here you are. You had a great career plan — or did you? You showed up at the office, put in your time, did what you thought was reasonable work. You received a couple of promotions after what seemed to be appropriate periods of time, and believed you were comfortably on course to run the company someday. Then you noticed others moving up the ladder more rapidly. This is discouraging. You begin to wonder why this is happening. What is stopping your progress? What has changed since you started on your path?

Or maybe you think you have it all — a great relationship, wonderful friends, and a job you truly enjoy. Then it happens: Your spouse asks for a divorce. How could that be? When you got married you were so in love! You started a family and everything was perfect. This couldn’t be happening, could it? You find yourself crushed and defeated. Now what?

Time to assess … examine … evaluate. When you encounter an obstacle, you must seek to understand. Take stock of what has happened by stepping back and examining where you are and how you got there. It’s tough to keep your objectivity in the face of a derailment. Take time to seriously consider the situation and course of events. Ask yourself tough questions: Am I sure I really want that next-level position and the accompanying responsibilities? Do I have the right skills, aptitude, and attitude? Do I actually have a career plan that leads me to the role of running the company someday? What changed in the relationship and how did I miss it … or did I?

Evaluate your role

Understanding yourself is critical, making introspection an important tool. Ask yourself such questions as: What was my role in the derailment? How could I/should I have re-acted or behaved differently?

Another helpful approach is to conduct a personal SWOT assessment — that is, identify your strengths, weaknesses, opportunities, and threats. Such an evaluation can work in both personal and professional settings and allows you to decide whether your existing skill set is compatible in a given situation. Further, you should also examine your passions — not just what is important to you, but what deeply moves and motivates you.

This self-inventory will help evaluate your role in and accountabilities for the obstacles you encounter. It will also aid in charting the way ahead, by aligning your strengths and passions, and then determine the gaps (education or skill development, for example) you may desire to close. Prioritizing will be valuable; most of us can’t do everything at the same time.

You don’t have to go it alone. It makes sense to engage in career counseling or to seek other outside resources for help identifying and asking the questions, and plotting a course once you’ve answered them. It might even be helpful to receive personal counseling from a psychotherapist or psychologist. No one is perfect and, as engineers, it can be helpful for us to understand the psychology underlying our actions and behaviors — and how to act and react differently, and potentially more effectively, going forward.

Consider the possibilities

While obstacles may trip us up or slow us down for a while, they can also provide a wake-up call, forcing us to think about our life’s mission. When we clean out our emotional closets, we can approach life in a more deliberate manner. We can more easily see and be open to the possibilities around us and pursue our true interests. This means recognizing the messages that are there for you. Be receptive to and learn from these messages, which
A Strong Return on Leadership

The SWE Corporate Partnership Council (CPC)—founded by the Society’s most prominent supporters—is a mutually beneficial relationship for its members and the Society. The CPC is vital in keeping SWE in touch with industry trends and developments and providing generous financial contributions to support innovative projects, ongoing operations and the overall SWE infrastructure. In turn, Council members reap many valuable benefits such as prime access to SWE programs and services that help them achieve their recruiting, retention and advancement goals for women in engineering. Together SWE and its CPC are working to diversify and advance the field of engineering.

For more information visit SWE.org/Partner

Society of Women Engineers Corporate Partnership Council (CPC)

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can in turn guide you to develop ways to move forward.

Encountering a career obstacle, examining it, and evaluating your role may result in developing a plan to change jobs or return to school — possibilities you hadn’t thought of previously — leading you to new opportunities. A personal obstacle may cause pain for a time, but the introspection and the understanding gained through examining, assessing, and evaluating provide the opportunity to adjust your life balance, become stronger, more resilient, and in the long run, more fulfilled.

You have an amazing array of possibilities in your life, both personally and professionally, but as the old saying goes, “into every life some rain will fall.” Your success in your career and personal life will depend to a significant extent on how you deal with those negative events. We hope you can gain some insight from the steps outlined above and transform the obstacles in your life into meaningful opportunities for growth and well-being.

Jill S. Tietjen, P.E., is a Fellow life member of the Rocky Mountain Section. The president and CEO of Technically Speaking Inc., she served as the 1991-1992 national president of SWE.

Mary D. Petryszyn is a life member of the Rocky Mountain Section. She serves as vice president of Civil Security and Response Programs at Raytheon and was the 2005 recipient of SWE’s Upward Mobility Award.
Affirmative Reaction
By Aileen Schumacher, P.E.
Books in Motion; unabridged edition (April 2000)
ISBN-10: 1556869940

Aileen Schumacher, P.E., has owned and managed Blum, Schumacher, and Associates in Newberry, Fla., with her husband since 1982. She holds a master’s degree in civil engineering, and is a licensed professional engineer and a certified hazardous materials manager. From 1991-2002, she ran a technical supply company that provided equipment and materials to domestic and foreign markets.

Like many engineers, Schumacher is also an author, with the well-regarded A Guide to Hazardous Materials (Quorum/Greenwood, 1988) to her credit. But, in an alluring twist, Schumacher has woven her engineering expertise with her passion for writing fiction and created a name for herself as a formidable murder-mystery writer.

Her first book, Engineered for Murder (Write Way Publishing, 1996), introduces Tory Travers, a young, widowed structural engineer who becomes enmeshed in a murder investigation. As the story unfolds, Travers forms an alliance with David Alvarez, a detective assigned to the case. In Schumacher’s follow-up novel, Framework for Death (Write Way Publishing, 1998), the protagonists come together again, blending Alvarez’s sleuthing skills with Travers’ engineering acumen to solve another mystery. Both books were reviewed by Jan Williams in the May/June 1998 issue of SWE Magazine. The cover story of the July/August 1999 issue was about Schumacher’s “two careers.”

Schumacher continues the series with Affirmative Reaction. This time, Travers visits an abandoned housing project to examine its storm sewer system, where she discovers the body of a city worker who was responsible for the condemnation of the property years earlier.

In the fourth installment of the series, Rosewood’s Ashes, the engineer-turned-heroine returns to her hometown after her father is critically injured in a hit-and-run accident. After several murders occur, Travers and Alvarez get involved in the investigation. The evidence they uncover continually leads them back to the violent, racially motivated Rosewood, Fla., massacre of 1923.

Supergirls Speak Out
Inside the Secret Crisis of Overachieving Girls
By Liz Funk
Touchstone (March 2009)
ISBN-10: 141656263X

In Supergirls Speak Out: Inside the Secret Crisis of Overachieving Girls, first-time author Liz Funk examines the pressures many girls and young women feel to meet self-imposed, impossible-to-reach standards of success.

To these “supergirls” (approximately ages 13-30), happiness and real accomplishment come from nothing less than having and being the best in everything, and they pursue this standard of perfection at virtually any cost. They strive to attain top grades in school, get into the best colleges and universities, sport the most stylish clothes, be pretty and maintain perfect bodies, and reach the pinnacle of social finesse.

But, according to Funk, 21, who wrote Supergirls as an undergrad at Pace University, this insatiable need for constant self-improvement often covers a hidden lack of self-esteem. As these young women push themselves to reach higher levels of achievement and social acceptance, the consequences can be staggering, manifesting in the form of anxiety attacks, mental breakdowns, and debilitating physical problems.

Supergirls Speak Out follows the lives of five young women, ranging from high school and college students to a New York investment banker. Drawing from investigative research, interviews with nearly 100 other young women and experts, and personal experience, Funk explores the causes and dire effects of the phenomenon and offers advice to aid other supergirls in overcoming their obsessive habits and living happier, more balanced lives.

A self-described “recovering supergirl” herself, Funk has been published in USA Today, the Christian Science Monitor, New York magazine, CosmoGIRL, the Huffington Post, the Baltimore Sun, the Nation, Tango magazine, Vibe Vixen magazine, the Times Union, and Girls’ Life. ■

“When we meet a ‘perfect’ girl, we often wonder, ‘What’s her secret?’ But we should really be looking for different kinds of secrets: not what hair products she uses to get such shiny tresses or how she balances all her activities without ever seeming spent, but what she’s trying to make up for or what she’s trying to hide.”

Supergirls Speak Out: Inside the Secret Crisis of Overachieving Girls, by Liz Funk
Betty Preece
SWE Pioneer, Advocate, and Trailblazer

SWE pioneer member, Fellow, and Distinguished Service Award recipient Betty Preece died May 17, 2009. The first woman to receive a degree in electrical engineering from the University of Kentucky, she was also an organizing member of the Society of Women Engineers. Her six decades of service to SWE were recognized with the Distinguished Service Award, which she received at the 2007 conference in Nashville. A more than 11-year member of the SWE Magazine Editorial Board, her contributions were far ranging.

After graduating in 1947, Preece went to work for General Electric in Long Island as a service shop engineer. She had a difficult time finding pants in her petite size, necessary for work in an environment where she provided technical direction for the 10-man repair shop.

Preece moved to Florida in 1951 as the project engineer in the surveillance systems section of Air Force Missile Test Center, now Patrick Air Force Base. She was the first woman engineer for the Eastern Test Range, responsible for design, development, procurement, installation, test, evaluation, and modification for all land, shipborne, and airborne surveillance systems to meet the changing requirements for Atlantic missile safety.

The “firsts” that Preece accomplished were done simply as a matter of course, not to be a trailblazer. But she did blaze new trails. Through her efforts and example, significant programs and changes have been made not only in SWE, but also in the local and regional, and national communities of schools, industry, and other associations.

Shortly after beginning to teach at Melbourne High School and at the Florida Institute of Technology, Preece started the first SWE student section at FIT and was its counselor from 1976 until recently. Passionate about working with young women and encouraging them to find careers in engineering and science, she volunteered in numerous positions, and was a charter member for two of Florida’s sections.

Preece was actively involved in many engineering and science societies and received numerous awards and honors for her contributions. She was a senior life member of SWE and a SWE Fellow; a life member of IEEE; senior member of American Institute of Aeronautics and Astronautics; and a member of Women in Engineering ProActive Network; Women’s Engineering Society of Great Britain; Third World Organization for Women in Science; Missile, Space and Range Pioneers; American Association of Physics Teachers; and Science Education for Students with Disabilities.

A few of her many awards include: Distinguished Service Citation from American Association of Physics Teachers; Sigma Xi Brevard County Science Teacher of the Year; United States Air Force Chief of Staff Volunteer Excellence Award for Lifetime Volunteer Service; and WEPAN President’s Award for Distinguished Service.

In addition to her degree from the University of Kentucky, Preece had an M.S. in science education from Florida Institute of Technology. She presented more than 100 technical papers and posters to professional organizations, as well as dozens of workshops for teachers and students of all ages, across the world, affirming that science is fun.

She was preceded in death by her husband, Ray, who was well known for accompanying her to SWE meetings over the years. She is survived by two sons, Eric and George. Services were in Indialantic, Fla., her home for more than 50 years.
Employers in bold are SWE Magazine Heritage Club Members

### Stanford University

**Department of Chemical Engineering**

The Department of Chemical Engineering at Stanford University is seeking applicants for a tenure-track faculty position at the junior level (Assistant or untenured Associate Professor). Applicants are expected to have earned a Ph.D. degree in chemical engineering or related disciplines.

We will consider applicants knowledgeable in the general area of chemical engineering science. There are several broad areas of interest, including hydrocarbon chemistry, surface reactivity and catalysis, fuel cells, environmental or atmospheric studies, molecular transport processes and mechanics, soft materials physics and chemistry, computation and simulation, biochemical and biomolecular engineering, and nanomaterials processing. In general, we give higher priority to the overall originality and promise of the candidate's work rather than to the sub-area of specialization. Researchers with programs that emphasize the production and storage of energy are particularly encouraged to apply.

The successful candidate will be expected to teach at the graduate and undergraduate level, to develop advanced graduate courses in a research specialty, as well as to develop a world-class research program with an emphasis on the fundamental physical, chemical, and engineering aspects of chemical engineering science. Applicants should be seeking a stimulating interdisciplinary environment in which to pursue teaching and research. We anticipate that the faculty members will contribute to and develop leadership roles and interactions among faculty not only in Chemical Engineering, but also Electrical, Mechanical, Civil and Environmental, and Material Science and Engineering in the School of Engineering; in Physics, Chemistry, and Biology in the School of Humanities and Sciences; in the departments and programs in the School of Medicine, as well as Bioengineering located in the Schools of Engineering and Medicine, and at the Stanford Synchrotron Radiation Laboratory.

Applicants should send curriculum vitae (including research accomplishments, teaching experience, and publications) a transcript of doctoral graduate study, a detailed research and teaching plan, and supporting letters from three references to Professor Gerald G. Fuller, Chair, Search Committee, Department of Chemical Engineering, Stanford University, Stanford, CA 94305-5025. Applications are due by December 1, 2009, but we will continue to accept applications until the position is filled.

Stanford University is an equal opportunity employer and is committed to increasing the diversity of its faculty. It welcomes nominations of and applications from women and members of minority groups, as well as others who would bring additional dimensions to the university's research and teaching missions.
Tinkering with Success

Long before SWE and career counselors found them, some girls were first introduced to engineering in their toy boxes. “My closet as a kid looked like a construction site,” Diane Peters remembered during a StoryCorps® interview recorded at the WE07 national conference. “[My parents] had to tell me to please move the skyscraper so that we could have dinner.”

Early hands-on experience with building and science toys provides girls with a chance to explore engineering; however, due to traditional gender roles and product marketing, girls are not always encouraged to play with such toys. To ensure that young girls receive the same exposure to engineering as young boys do, SWE sections now open the toy box during outreach activities for young girls, teaching them that, as Peters puts it, “You get to basically build the world’s largest Erector Set®, play with it, and get paid for it.”

– Troy Eller, SWE Archivist

Clips from Diane Peters’ StoryCorps interview with Anne Lucietto, as well as other interviews, can be accessed at: http://www.reuther.wayne.edu/audio/by/album/2007_storycorps_interviews

Advice to Other Women Engineering Students

From the November, 1962, issue of the Ohio State Engineering comes this personal report from Kay Nestleroad.

“I look back with mixed feelings on my first two years as a woman engineering student. Some happy; some sad, and some funny experiences came to my mind: happy because my courses were easy; happy because I was in a minority; and because harder work would have brought better results, and funny because of my position as a woman in engineering.

“The reason I think many women are discouraged from entering engineering is lack of experience. I have found this to be the worst problem I have encountered. It is a struggle to accumulate the knowledge which the males have acquired over two years of shop and a lifetime of tinkering with cars, clocks, etc., which most girls have been discouraged from even considering.

SWE Newsletter reprinted an article from the November 1962 issue of Ohio State Engineering, in which engineering student Kay Nestleroad noted, “The reason I think many women are discouraged from entering engineering is lack of experience ... It is a struggle to accumulate the knowledge which the males have acquired over two years of shop and a lifetime of tinkering with cars, clocks, etc., which most girls have been discouraged from even considering.”
The National Security Agency (NSA) gathers and analyzes millions of foreign signals every day and is responsible for protecting U.S. Government information systems. It takes a team of incredibly talented professionals to capture the information, protect it, and identify the one signal that could be a threat to our world.

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