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The growing number of women in leadership roles

Women make up a dishearteningly small percentage of leadership roles in the medical device industry, but the trend toward gender parity is gaining steam.

omen are less likely to be in leadership positions at bigger medical device companies, but the disparity is slowly shrinking. That's the takeaway from this year's **Women in Medtech** issue.

Just 18% of executive roles at the top 100 publicly traded medical device are held by women, and only three companies have a female CEO, according to an analysis of **Medical Design & Outsourcing's** annual **Big 100**. Of the 969 leadership positions at the world's biggest medtech companies, only 172 are held by women. Nearly a quarter of the companies have no women in leadership roles and another 24 companies have a single female executive.

Medical device companies also doled out \$2.7 million in research payments to 195 physicians in 2018. Only 16 of the recipients were women, who received a collective \$322,000.

Though women in leadership roles is still not what it could be, the number of women in executive ranks is on the rise.

Diversity in medtech is trending toward parity, however. Medtech lobbying group AdvaMed said at its recent MedTech Conference that it would be focusing on diversity initiatives in the next fiscal year, including driving initiatives for more women in medtech. Many companies like Medtronic, Stryker and Johnson & Johnson have also outlined their own plans and initiatives online for diversity and inclusion in its workforce.

Stryker, McKesson, Cardinal Health, 3M, Johnson & Johnson, Medtronic, Siemens, Baxter, Cook Medical, Danaher and Abbott were recently named some of the best companies for women to work for by Forbes, ranking out of 300. Women at those 11 companies hold 25% of C-suite roles, higher than the industry average.

Medtech diversity isn't an outlier in corporate America. The gender leadership gap is apparent in most industries, with just 20% of high-tech executive, senior officers and management being female, according to the Equal Employment Opportunity Commission. The divide is even more stark if we break it down to race and ethnic diversity. The American Association of University Women reports that white men make up 63% of all leadership roles while white women hold 24%, Black women hold 2%, Hispanic women hold 1%, Asian American women hold 1% and other racial and ethnic groups hold less than 1% of executive roles.

Though women in leadership roles is still not what it could be, the number of women in executive ranks is on the rise. The Center for American Progress reports that women held no executive ranks in the Fortune 100 companies in 1980. By 2001, 11% of executives were female, and in 2017, 6% of Fortune 500 CEOs were women.

Danielle Kirk

Danielle Kirsh | Senior Editor | Medical Design & | Outsourcing | dkirsh@wtwhmedia.com |

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The 2018 List of 100 Women in Medtech

NAME	TITLE	COMPANY
Deborah Andrews	CFO	Staar Surgical
Elizabeth Barrett	CEO	UroGen Pharma
Michelle Basil	EVP, GC	Haemonetics
Amy Baxter	Founder & CEO	PainCareLabs
Jeanne Berg	VP Global Surgical OEM	Ecolab
Juliana Blum	Co-founder & VP	Humacyte
Megan Brandt	SVP	Metavention
Allison Byers	Co-president	Digital Cognition Technologies
Victoria Carr-Brendel	GVP and president, Cochlear implants	Sonova
Elsa Chi Abruzzo	VP regulatory, clinical & quality	Anuncia
Lori Chmura	CEO	Dune Medical Devices
Dorothy Clarke	VP R&D, innovation & business development compliance	J&J
Lori Cohen	Chair, pharmaceutical, medical device & healthcare litigation practice	Greenberg Traurig
Diane Côté	CEO	Medteq
Laura Dietch	CEO	BioTrace Medical
Janet Dillione	CEO	Bernoulli
Sheri Dodd	VP/GM, Medtronic Care Management Services	Medtronic
Jennifer Doyle	VP, medical affairs, respiratory, gastrointestinal & informatics	Medtronic
Elaine Duncan	Founder & president	Paladin Medical
Lisa Earnhardt	EVP	Abbott
Meg Eckenroad	VP, women's health	Hologic
Rachel Ellingson	SVP, strategy	Zimmer Biomet
Karen Erickson	EVP & chief quality officer	Optum, UnitedHealth Group
Bettina Experton	President & CEO	Humetrix
Judith Faulkner	Founder & CEO	Epic Systems
Marissa Fayer	CEO	HERHealthEQ
Sherry Fox	President & co-founder	BioCare Systems
Jenny Freeman	Co-founder & CEO	Respiratory Motion
Ginger Glaser	СТО	Monteris Medical
Betsy Gross	Head global market access, indirect markets	Intuitive Surgical
Jessica Grossman	CEO	Medicines360
Jeri Hilleman	CFO	Intersect ENT
Antonia Holoway	President	Digital Cognition Technologies
Marlou Janssen	GM/business leader	EPD Solutions, a Philips company
Marie Johnson,	CEO	AUM Cardiovascular
Lee Jones	CEO	Rebiotix
Elli Kaplan	Co-founder & CEO	Neurotrack
Stephanie Kaplan	COO	Madorra



The 2018 List of 100 Women in Medtech (continued)

NAME	TITLE	COMPANY
Katie Karloff	CEO	INVO Bioscience
Francine Kaufman	CMO, Medtronic Diabetes	Medtronic
Janet Kay	Retired from VP, regulatory affairs	Integra Lifesciences
Julia Kensick	VP, quality	Tandem Diabetes Care
Deborah Kilpatrick	CEO	Evidation Health
Lynn Kirkpatrick	CEO	Ensysce Biosciences
Kim Labow	CEO	Medfusion
Paula Lank	VP, regulatory and clinical affairs, Physio-Control	Stryker
Sandra Lesenfants	VP & GM, endovenous franchise, aortic peripheral vascular	Medtronic
Brooke LeVasseur	CEO	AristaMD
Kelly Londy	CEO	Lumicell
Michelle Longmire	CEO	Medable
Nancy Lurker	President & CEO	EyePoint Pharmaceuticals
Trang Ly	SVP & medical director	Insulet
Carolyn Magill	CEO	Aetion
Louise Makin	CEO	BTG
Kathy McElligott	EVP, CIO & CTO	McKesson Corp.
Ashley McEvoy	EVP, worldwide chairwoman, medical devices	Johnson & Johnson
Chrissa McFarlane	CEO & founder	Patientory
Sinead Miller	CEO & co-founder	Path Ex
Anne Morrissey	CEO	Alydia Health
Stephanie Muir	СТО	Midmark Corporation
Anne Mullally	VP/GM, Physio-Control	Stryker
Heather Nigro	SVP, regulatory, quality & clinical affairs	CSA Medical
Laura Niklason	Founder	Humacyte
Lisa Olson	President	Regulatory and Clinical Research Institute
Marie O'Malley	Sr. Director, supplier outreach	Medtronic
Sharon O'Reilly	President & CEO	SmartTRAK/BioMedGPS
Maria Palasis	President & CEO	Lyra Therapeutics
Jennifer Palinchik	President	Jalex Medical
Azin Parhizgar	President & CEO, Claret Medical	Boston Scientific
Karen Parkhill	EVP & CFO	Medtronic
Luann Pendy	SVP, chief quality and regulatory affairs officer	Medtronic
Shacey Petrovic	President & CEO	Insulet
Ruth Poliakine Baruchi	Co-founder & CEO	MyndYou
Stacey Pugh	VP & GM, Medtronic Neurovascular	Medtronic
Amy Belt Raimundo	Managing director	Kaiser Permanente Ventures
Holly Rockweiler	Co-founder & CEO	Madorra



The 2018 List of 100 Women in Medtech (continued)

NAME	TITLE	COMPANY
Kim Rodriguez	President & CEO	Acessa Procedure
Erica Rogers	President & CEO	Silk Road Medical
Eileen Rose	VP, global project management	Boston Scientific
Bridget Ross	President, global medical group	Henry Schein
Kate Rumrill	President & CEO	Ablative Solutions
Renee Ryan	CEO	Cala Health
Katherine Ryder	Founder & CEO	Maven
Maria Sainz	President & CEO	Aegea Medical
Surbhi Sarna	Founder & CEO, NVision Medical	Boston Scientific
Lisa Sasso	President & CEO	Medical Development Partners (MedDevCoach)
Lori Schechter	EVP, GC & chief compliance officer	McKesson Corp.
Martha Shadan	President & CEO	Miach Orthopedics
Amy Siegel	Co-founder	S2N Health
Carla Smith	EVP	HIMSS
Elizabeth Staub	VP, regulatory affairs and quality assurance	Stryker
Mary Szela	President & CEO	TriSalus Life Sciences (formerly Surefire Medical)
Leslie Trigg	CEO	Outset Medical
Leigh Vosseller	EVP & CFO	Tandem Diabetes Care
Judy Wagner	VP & CFO	Bayer Medical Care
Kathy Wengel	EVP & chief global supply chain officer	Johnson & Johnson
Sue Willman	VP, Global Diabetes Integrated Care Services and Solutions	Medtronic Diabetes Care
Tiffany Wilson	CEO	Global Center for Medical Innovation
Amy Winslow	President	BioPorto Diagnostics A/S
Sharon Wolfington	President & CEO	Acumed

2019 WOMEN IN MEDTECH



Our editorial team at **Medical Design & Outsourcing, MassDevice** and **DeviceTalks** drew on its resources to produce an alphabetical list of 100 women executives in the medtech industry. The list is a who's who of women founders, CEOs, presidents, VPs and more who are breaking down barriers in a maledominated industry.

Milena Adamian Managing partner Azimuth Ventures

yne (

Lisa Anderson Co-founder, president, COO Paragonix Technologies

Laura Angelini GM, renal care *Baxter*

Jeannette Bankes President & GM, global surgical Alcon

Tina Barrett Chief regulatory officer *Eastman*

Sophie Bechu EVP, COO *Philips*

Yin Becker VP, communications, public affairs, marketing *Stryker* **Laura Boll** VP, regulatory affairs & quality *Diversatek*

Michelle Bonn President Guideline Medical

Karine Brand CEO Laird Thermal Systems

Anna Maria Braun CEO, chief HR officer, director, labor relations, Asia Pacific B. Braun

Terri Bresenham Chief innovation officer *GE Healthcare*

Jenna Carl VP clinical development & medical affairs Big Health **Wendy Carruthers** SVP, HR Boston Scientific

Jane Chen Co-founder, CEO *Embrace*

Emily Cook Chief clinical operations officer Aspire Health

Marcia Coulson President Eldon James

Chandra Devam Founder, CEO *Aris MD*

Kate Dobbs SVP, marketing & communications *Fresenius*

Robyn Docherty

VP, finance First Stop Health

Lisa Anderson, president, co-founder and COO of Paragonix Technologies Image courtesy Paragon

Is this the way to improve organ transportation?

Paragonix co-founder **Lisa** Anderson on the importance of respect when it comes to organ transportation.

DANIELLE KIRSH SENIOR EDITOR

rgan transplants are performed annually to remove diseased organs and replace them with healthy ones to extend the lifespan of patients. Potential transplant recipients are placed on a waiting list by a doctor who has determined that a transplant is the best course of action. Once a donor organ is available, the organ transportation system becomes one of the most critical medical devices of the transplantation process, according to Lisa Anderson, president, co-founder and COO of Paragonix Technologies.

Before Anderson helped found Braintree, Mass.based Paragonix, she was working in the lab at Harvard Medical School and discovered that two important things were missing in the way organs were being transported: preservation and respect.

"I was at Harvard Medical School doing research in Type 1 diabetes and one of the aspects of my research was to dissect the human pancreas. This was a revelation to me that when I first saw the human pancreas coming into the lab, I called my colleague and I said, 'Oh my god, they messed up the packaging here. I can't believe that organs are transported like that. Is this just for research?'" Anderson told Medical Design & Outsourcing in an interview. "I was really upset about it. I still remember it. We called the lab and the clinical staff and they said, 'No, this is how organs are transported - even for transplantation.'"

Anderson's memory of that experience followed her from the research world into her role at a venture capital firm, where she was sourcing a variety of medical technologies. Anderson discovered a number of concepts that addressed organ storage and technology meant to improve the transport from donor to recipient.

"When I saw the various technologies out there, it was a very natural move for me to say that I'm going to drop everything else," Anderson said. "If this is an area where I can make an impact, this is where I want to be. That's how Paragonix was founded back in 2010."

Technologies



SherpaLung lung transportation device, currently unavailable in the U.S. *Image courtesy Paragonix Technologies*

Paragonix Technologies is marketing organ transportation devices meant to transport organs safely between donors and recipients. The company's Paragonix SherpaPak CTS is designed for human hearts. The company is also developing transportation devices for lungs and kidneys.

"It was only within two years of the company founding that I had finally brought in the right expertise to direct me into what is now our current fields, the cardiac field and the lung field. Direction was important." said Anderson.

There are more than 113,000 people on the national transplant waiting list in the U.S., according to the U.S. Health & Human Services Dept. Last year, there were 36,528 transplantation procedures, including 3,408 heart, 2,530 lung and 21,167 kidney transplants.

Each organ can only survive for a certain amount of time once it's outside of the body. Hearts and lungs can survive four to six hours and kidneys can survive 24 to 36 hours. That means that regulating their environment between extraction from the donor and implantation into the recipient needs to be managed precisely.

"We perfectly control the temperature of that organ. The perfect organ preservation temperature is between 4°C and 8°C. In combination with preservation solutions used in combination with our device, we maintain the organ in stasis. We ensure that the organs aren't damaged during transport," Anderson explained.

The Paragonix SherpaPak Cardiac Transport System is a lot different from the plastic-bag-and-ice-cooler method, she added. A cooler with crushed ice offers no temperature control and the longer the transport time is, the worse the temperature control gets. There is also no record of how the organ was transported.

"With our product, the SherpaPak Cardiac Transport System, we provide that optimal control for the organ. We provide a record of the temperature during transport and that record can be downloaded via Bluetooth after the transport and then filed with the patient's clinical file," said

Anderson. "We are all about filling that gap between donor and recipient." Paragonix Technologies last year

Faragonix recinicipality for the Lung Transplant Foundation to continue developing and commercializing its SherpaLung system.

Each organ transport system is single-use and made from three components: a shipper to provide an insulating layer; a pair of sterile, leakproof clear polycarbonate canisters; and the Sherpa cool material that helps ensure temperatures are kept at 4 °C.

"We had a recent transport performed with SherpaPak in Europe where we had a total out-of-body time of 7 hours. The surgeon called me in the middle of night to tell me, 'You know, Lisa? I wanted to tell you something. We would not have implanted that heart if it hadn't been transported in your product,'" Anderson said. "My only goal when I started Paragonix was to bring something important to patient care. That was my absolute desire, my dream. I really wanted to develop a product that could benefit patients. And I think, the past eight months since the launch of our first product have been some of the most satisfying months of my life. People are alive because of our product. People received a heart because of our product."

Moving forward, Anderson says the company will continue its R&D efforts on devices for other organs while expanding its commercial footprint. Paragonix also recently received FDA clearance to use its SherpaPak CTS to transport pediatric hearts, an underserved market.

"We just recently obtained FDA clearance for the use of [SherpaPak CTS] for the transport of pediatric hearts. This is something incredibly important for the company, and we were excited to see the first use of the product for pediatric heart transplantation," Anderson said.



Karen Drexler CEO Sandstone Diagnostics

Kathryn Duesman

VP, clinical affairs *Retractable Technologies*

Sophie Dutilloy

President, EMEA Alcon

Jodi Eddy

SVP & CIO Boston Scientific

Stacey Eisen

SVP, global communications & president, Baxter International Foundation Baxter

Lisa Estrada

Chief compliance officer, Fresenius Medical Care North America *Fresenius*

Kathryn Fink

VP, HR Stryker

Stephanie Fitts

VP of clinical, quality & regulatory affairs *Transenterix*

Karen Flynn

SVP & chief commercial officer West Pharmaceutical Services

Diana Francis

VP, global quality & compliance *BeiGene*

Amanda French

Co-founder, CEO EMME

Kathleen Frost

VP, intellectual property *Transenterix*

Pat Fuher

VP, R&D *Medtronic*



Navigating the constantly choppy waters of medical device regulation

Regulations at the FDA and in the European Union are in constant flux, and that's not even mentioning Brexit. Here's how one regulatory expert keeps ahead of the changes.

DANIELLE KIRSH Senior Editor

The regulatory space for medical devices is always evolving. Manufacturers have to keep up not only with FDA regulations, but other countries' rules not to mention keeping track of Brexit, the U.K.'s pending departure from the European Union. As product steward and regulatory representative at Eastman Chemical in Kingsport, Tenn., it's Tina Barrett's responsibility to keep up with all of those changes.

"The government agencies will send out news blasts. I get quite a few a day from the FDA," Barrett told **Medical** Design & Outsourcing. "And then there are some European newsletters. By getting those daily emails, I go through them every day to review and see what the changes are and if those are relevant to us or not. There are some really great medical device-focused consulting groups that will host webinars where they'll have subject matter experts from the industry go through the changes in regulations, as well, and what those mean. The FDA also does a really great job of putting on webinars that are informational to explain things as well. Attending those gives a good introduction to the changes."

It's hard to talk about regulatory changes these days without bringing up Brexit. In a 2016 referendum, 52% of voters approved leaving the EU. Originally slated to take effect March 29, it's been delayed twice after Parliament rejected proposed deals due to concerns about how to handle the border between Northern Ireland and the Republic of Ireland. **Tina Barrett**, product steward and regulatory representative, Eastman Chemical

A "no-deal Brexit," in which the U.K. abruptly leaves the EU with no agreements in place, severing trade relationships, could result in delays of up to six months for medical devices at the border, according to the Association for the Advancement of Medical Instrumentation.

"Brexit is still a little bit of the great unknown," Barrett said. "It's my understanding that, for the most part, they are going to continue to be aligned with a lot of the policies that the EU has right now. They have made that statement on environmental policies, which means that they will be keeping some of those European legislations and basically mirroring that."

Most of the regulatory changes that keep popping up now are EU Medical Device Regulation-related, she explained. New EU MDR rules, which regulate production and distribution of CE-marked medical devices and ensure compliance, are set to take effect in May 2020.

"The manufacturers are looking to get ahead of that," Barrett told us. "What I'm seeing is an increase in requests for detailed information that will be included as part of their technical file for submission in the EU."

That involves traceability requirements including a detailed report that tracks the manufacturing process from the raw material supplier through post-market surveillance. The EU traceability regulations were imposed after a silicone breast implant scandal in Europe. A French company's implants incurred significantly higher rupture rates than sealed implants; it was later discovered that the company was using industrial-grade silicone in the implants. EU regulators traced the problem all the way back to the raw material.

"Companies are now required to have that increased scrutiny on suppliers. They're going to have an increased scrutiny on their applications to the notified bodies and to the competent authorities," Barrett said. "And then, even after a device is put on the market in the EU, they'll have additional requirements for post-market surveillance, so that if something happens with a patient it's easy to trace that back to understand where the problem was and identify it to mitigate any additional risk."

Any change in regulation could slow medical device production as companies try to adapt their processes to the new

What I'm seeing is an increase in requests for detailed information that will be included as part of their technical file for submission in the EU.

rule. Barrett said there are two steps to tackling the changes: Figure out where you deviate from the new regulation and then communicate the new processes to the relevant groups.

"The first step is always to do a gap analysis to take a look at what we are doing currently and what are the new rules, where do we meet them and where are the big control changes that we may need to address with different policies or procedures," she said. "After that, we would roll it out to the various groups that might be affected. It could be quality assurance, it could be manufacturing, it could be marketing. It just depends on which group might have an action item that comes out of that gap analysis."





Debbie Garner CEO FemSelect

Elisabeth George

VP, global government affairs, standards & regulations *Philips Healthcare*

Katharine Giles

CEO OncoRes Medical

Helen Giza

CFO Fresenius Medical Care

Karen Gledhill

GC, Fresenius Medical Care North America *Fresenius*

Nina Goodheart

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Hilary Halper

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Stephanie Harrington

Founder, CEO Matrix Medical Devices

Michele Holcomb

EVP, strategy & corporate development *Cardinal Health*

Vicki Holt

President & CEO *Protolabs*

Katie Jaxheimer-Agarwal

VP, operations & finance *Maven*





Carla Kriwet EVP, chief business leader, connected care *Philips*

Jacqueline Kunzler SVP, CQO Baxter

Angela Lalor SVP, HR Danaher

Katy Lanz Chief clinical officer Aspire Health

Michele Larios VP & GC Retractable Technologies

Betty Larson EVP, chief HR officer *Becton, Dickinson*

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Erin Liberto Chief commercial officer Avita Medical

Grita Loebsack

Chief marketing officer *EssilorLuxottica*

Julie Logothetis President Kahle Automation

Tracy MacNeal

President & CEO Materna Medical

Karen Mahoney

Global head of human resources *Abiomed*

Diversity in medtech is up: This top West executive has seen it

Medtech isn't the male-dominated field it was decades ago and **Karen Flynn**, chief commercial officer at West Pharmaceutical Services, is here to tell you about it.

CHRIS NEWMARKER EXECUTIVE EDITOR

aren Flynn's 35-year career in healthcare saw her rise through Cardinal Health and spinoff Catalent Pharma Solutions before joining West Pharmaceutical Services in 2008. Flynn has been West's chief commercial officer since 2016, in charge of all the commercial aspects of the business.

She has a lot to oversee. West is a global manufacturer of products used to contain and deliver injectable medicines, with 27 manufacturing sites around the world. The company makes everything from syringes, to vials (made from a proprietary polymer material), to hospital administration products, to drug-delivery devices that people use on themselves.

Medical Design & Outsourcing asked Flynn for her insights on how things have changed for women in the industry:

MDO: What is it like for women working in medtech now, versus 10 or 15 years ago?

Flynn: We're fortunate in that there are many, many more women who choose to study in technical fields. ... We are seeing many more women around the table, which is very encouraging. That's one of the big changes. ... In our laboratories, I haven't done a head count lately, but I know that it's pretty even, 50/50, if not more women in the lab. In the engineering fields and even IT, we're starting to see more and more women enter those fields.

What we need to do though, I believe, is to encourage women to stay in those career paths or at least to continue to be encouraged to be challenged on those career paths because too often I think that sometimes women still are choosing to opt out. ... It's difficult, right? ... We really have to reach down and help one another out. And it's our responsibility really as managers and senior leaders to look within the organization and provide those opportunities for the young females to encourage them to continue that technical career path if that's what they choose to do.

MDO: What are the biggest lessons you've learned as a leader?

Flynn: I feel like one of the most important things as a leader — as you grow in your management roles and your span of authority becomes wider and wider — is that you could do nothing better than to surround yourself with talent because you move from being maybe a subject matter expert early in your career in a particular area to having broader and broader accountability for things that you know less and less about. So the only way to be really successful is to be sure that you have talent around you and probably even more so that you foster the growth of the people that are on your team. Encourage them to continue to learn and to develop because then as an organization you get better. And as a leader you get better as well. You continue to learn from everyone around you.

MDO: You hold one of the top leadership positions at West. How much does it help when women employees can see that there are already people like them holding top positions?

Flynn: If you can envision yourself in a position that's already filled with someone who looks like you, it seems like there's a clearer path forward. It is important that we have diversity that's visible to everyone for that reason. And of course, it's also

important to have diversity because you get better thinking, and there are many, many, many studies that show that that's the case. You get better results by having more of a diverse input of thoughts and ideas. So I think it's critically important not just for the medical device manufacturing industry, but for industry in general.

We are fortunate in our industry that it's an exciting industry, and I think that more and more people want to work for businesses where you feel like there's a connection to the work you do and contribution to society at large. There's so much good work going on in the medical device industry that you can recruit a diversity of talent into the field. It is really incumbent upon all layers of management to encourage the growth of a diverse candidate pool.

MDO: In a field such as engineering, is there still a perception problem that an engineer is a man wearing a short sleeve dress shirt with a pocket protector? Are we getting over that stereotype?

Flynn: I have to say I'm a little bit biased, but my daughter just graduated in May with a chemical engineering degree. So I've been around a lot of young female engineers in her friend circle and hearing her talk about her experience. It's just not as acute as it was once upon a time. It's not as unusual now for women to be in engineering. She works for a large pharmaceutical company, so she's fortunate in that there are a lot of resource groups that are aimed for supporting young women engineers in particular. I think that there are companies like the one she's working for — West is another one where we are trying to think about what it takes to encourage our female employees, to give them the support that they need so they don't feel isolated, no matter what role that they're in within the company. I feel like one of the most important things as a leader is that you could do nothing better than to surround yourself with talent.

How to increase diversity in medtech: This J& J VP has insights

Charolyn Mordas has risen quickly through the ranks at Johnson & Johnson to become VP of Biosurgery R&D at the company's Ethicon business. Her story hints at what needs to be done to boost diversity in medtech.

CHRIS NEWMARKER EXECUTIVE EDITOR

Providing an intellectually stimulating environment appears to be a start. Mordas during her college years had a goal of becoming a college professor, but she thinks she's gotten to teach more being at J&J.

"We get to learn from the world around us, what's happening in trends in the healthcare industry, what's happening in the competition," Mordas said. "We're constantly sharing knowledge and teaching each other – and also crosscorrelating because sometimes the facts are a little harder to find. We have to take multiple data points and teach all of us collectively and then make sense out of it, which is even better."

Mordas has also risen fast in the company in recent years. For years, she had roles of increasing responsibility from staff scientist to senior director in the company's oral care business, working on brands such as Listerine. In March 2018, she moved over to Ethicon to become senior R&D director of wound closure and repair product development. A year later, she became VP of biosurgery product R&D, where she works on next-generation hemostats to minimize surgical bleeding.

When it came to work on consumer products, it was about freshening breath and reducing gingivitis.

"While there's absolutely quality of life and health benefits that come from that, it's not saving lives. I learned [at Ethicon] about suture products literally going into people's hearts and keeping their hearts going for decades to come," Mordas said.

"This is not about me creating the suture. This is about changing the ways of working to inspire innovation," Mordas said.

Mordas' advice to people who want to move up and provide more value for a business: Don't forget to network.

"I think whether it's in my last role or any of the roles before, they come through a good amount of skill and hard work, and then a good amount of building a network of people who can see what value it is that you're bringing and where else you might be an asset," Mordas said.

Don't just collect LinkedIn contacts or business cards, either. Understand the other person and get them to understand you, Mordas advised.

"Because those are the connections that help you out, not just someone knowing your name. ... Especially for women early in their career, if you need something, ask for it. It doesn't matter what it is, someone is willing to help you."

Women occupy 27% of the top leadership roles at J&J – higher than the overall 18% figure among the world's 100 largest medical device companies, according to an **MDO** analysis. Top leaders at J&J include Ashley McEvoy, who runs one of the largest medical device businesses in the world.

Mordas suspects the percentage is even higher among lower level executives – and it matters.

"Today's junior talent is going to be tomorrow's leaders, and the more that

hen Carolyn Mordas was a PhD student at Princeton University, there were brilliant faculty members constantly reminding her that she didn't know everything. They challenged her know-how every day.

Mordas needed to make some money while preparing to defend her PhD thesis, so she got an internship at Johnson & Johnson Consumer business offices a few miles away in Skillman, N.J. What she encountered was an entirely different environment.

"These people have been working here for 20 or 30 years. They're so smart. They know everything. But they were very humble and said, 'Hey no, this is why we hired you. We need to solve a problem, and we're looking for your guidance,'" Mordas recently told to **Medical Design & Outsourcing**.

Mordas' internship turned into what is now a 15-year career at Johnson & Johnson. Her story provides some clues into what medtech companies overall need to do to boost diversity. we can attract and retain and develop, the better off we're going to be in the future," Mordas explained.

Johnson & Johnson also has a goal of getting more women involved in scientific fields. In 2015, the company launched its Women in Science, Technology, Engineering, Math, Manufacturing and Design (WiSTEM2D) initiative, which supports women from their youth through university and into their professional careers.

Moving over to Ethicon, Mordas has noticed that fields such as mechanical and electrical engineering have a higher proportion of men. But she also thinks the blending of disciplines in medtech will eventually improve the situation.

"We no longer have standalone devices," Mordas said. "We're thinking about systems of devices. That could be something that might look like a mechanical widget, but on top of it, it has a chemical coating that has antimicrobial benefits. And there may be sensors. And there may be imaging. So it's becoming so interdisciplinary. ... It's these intersections where the magic is happening."

The 100 List (continued)

Angela Main

SVP, global chief compliance officer & associate GC, Asia Pacific Zimmer Biomet

Jessica Mayer Chief legal & compliance officer Cardinal Health

Dr. Katarzyna Mazur-Hofsäss CEO, EMEA Fresenius

Angela McClure

Chief experience officer *Fresenius*

Lorelei McGlynn

SVP, chief HR officer Henry Schein

Ravyn Miller Director of U.S. marketing *Medtronic* **Donna Miller** Global GC *Olympus*

Carolyn Mordas VP, biosurgery R&D Ethicon

Mary Moreland EVP, HR Abbott

Corlis Murray SVP, quality assurance, regulatory & engineering services Abbott

Andrea Nadai Director of operations Boston Medtech Advisors

Shana Neal SVP, chief HR officer *Owens & Minor*





2019 WOMEN IN MEDTECH



How a childhood science project sparked a career

Qattie Shaw tested her diabetic father's blood sugar against her own as a sixth-grade science fair project. Her results intrigued her and sparked a career in STEM.

LISA EITEL Executive Editor *Design World*

Carrie Shaw, founder and CEO, Embodied Labs Image courtesy Carrie Shaw

> In 2016, Carrie Shaw founded Embodied Labs — a software and virtual-reality (VR) company that aims to give healthcare providers deeper understanding of what it's like to have physical and cognitive changes.

Her first interest in science and technology came during a sixth-grade science fair project.

"My dad was diabetic, and, as a 12-year-old whose favorite food group was dessert, I was always amazed he wasn't allowed to eat ice cream. I thought it especially weird he also had to be careful eating things such as rice — not understanding that sugar isn't always sweet."

So, for her science project, Shaw's plotted her father's blood sugar against her own using finger-stick blood-sugar testing every 15 minutes after eating a cup of ice cream and then (in another trial) after eating a cup of rice. "I saw how my blood sugar normalized far more quickly than his — and immediately gained a fascination with experiential science and the idea that laboratory-style projects can answer a whole host of questions."

Shaw cites University of North Carolina professor Donald Lauria as her mentor. "I met Lauria when I joined Engineers Without Borders; he had done decades of work in third-world countries designing water systems and helping communities set up business models to ensure people accessing the water could pay a small fee to sustain the system. He and I had many lunches during which we'd discuss philosophy and religion as they relate to public health and infrastructure in developing countries.

The work of medical anthropologist and physician Paul Farmer through

Mountains Beyond Mountains (and later at Partners in Health) also shaped Shaw's decision to become a technologist. Farmer built for sustainability and need while living in the communities he aimed to help.

Shaw got her own chance to help improve a public-health system after an internship in a periurban slum outside of Cusco, Peru. "Shadowing staff at an NGO Health Clinic, I saw file cabinets full of paper files. The NGO wanted grant funding but only used paper documentation — and had trouble executing data analysis on their healthcare programs. Ultimately, I gathered a small team back at UNC Chapel Hill to borrow from Paul Farmer's Medical Record System (OpenMRS) code and convert the clinic's paper system to an Electronic Medical Record (EMR) system for digitizing patient data. We also





fundraised to buy the nurses notebook computers loaded with the EMRs. Then we took these notebooks back to the clinic and spent a couple weeks training the staff on their new system.

But Shaw's biggest technology challenge came when her mother became sick with early-onset Alzheimer's disease.

"I was maddened by the fact that I could not relate to how my mom was processing the world. For example, she had a left visual-field deficit, which is fairly easy to conceptualize but very difficult to fully comprehend. So I made a pair of goggles to simulate the deficit — and these immediately helped me and my mom's caregivers understand one aspect of her disease better.

It also helped us improve her care by always approaching her from the right and protecting her left."

But Shaw wanted so much more than that.

"I spent five years being very afraid to talk to my mom because of how her brain was changing. I wanted more understanding of what she was going through. I also wanted a visual vocabulary to better connect with her. So my biggest research

question finally became: If we could step into the shoes of someone needing care, would it make us better caregivers? Ultimately that became my Master of Science thesis research question. Unfortunately, I had nothing but my taped-up goggles in hand to solve it."

Shaw tried all sorts of bad prototypes based on avatars and desktop simulators

Carrie Shaw and her mother Image courtesy Carrie Shaw

to give caretakers a better understanding of the patient experience. Then Shaw met Embodied Labs co-founder Thomas Leahy and with his help developed a solution that the company offers today — an immersive training platform using virtual reality to give care partners and healthcare professionals a new perspective on what it means to live with age-related conditions. The platform covers Alzheimer's disease, end-of-life conversations, Parkinson's disease, Lewy body dementia, macular degeneration and hearing loss. Today, Embodied Labs also has a growing enterprise SaaS business for its B2B immersive caregiver training platform.

On the topic of promoting greater participation of young women in science and technology, Shaw cites the need for more female role models and mentors.

"Women in STEM fields must be able to be their authentic selves. Young women should also be able to create and define what it means to be a woman in technology. Part of this is abolishing preconceived notions about what being in technology means. For example, I'm not a video gamer and I don't have any hobbies that involve my wearing VR headsets — and yet I run an immersive training company."

Women in STEM fields must be able to be their authentic selves. Young women should also be able to create and define what it means to be a woman in technology.

Innovation is defined by diverse experiences, Shaw continues. "Innovation can feel very uncomfortable when going against tradition and societal norms ... but innovation happens when seemingly impossible or unrelated parts come together." The unique perspectives of women are an asset here.



Sarah O'Connell Kalil CEO CoreMap

Maria Opdycke COO First Stop Health

Katherine Owen

VP, strategy & IR *Stryker*

Alison Pilgrim

Chief medical officer *Humacyte*

Teresa Prego

Senior VP, marketing & market development *Global Kinetics*

Heather Prichard

COO Humacyte

Pamela Puryear

SVP, chief HR officer Zimmer Biomet

Michelle Quinn

SVP, chief ethics & compliance officer *Becton, Dickinson*

Desiree Ralls-Morrison

SVP, GC & corporate secretary *Boston Scientific*

Rhonda Robb

COO Cardiovascular Systems

Jacqueline Scanlan

SVP, human resources *Haemonetics*

Sandi Schaible

Lead chemist WuXi Medical Device Testing

Diane Seloff COO Aspire Health

Carrie Shaw CEO Embodied Labs



The 100 List (continued)

Audrey Sherman Division scientist 3M

Ola Snow Chief HR officer *Cardinal Health*

Erica St. Angel Chief technology information officer *Access Physicians*

Stacey Stevens EVP, chief strategy officer, COO *iCAD*

Carol Surface SVP, chief HR officer Medtronic

Barbara Taylor Senior director of marketing Portal Instruments

Halle Tecco Founder Rock Health

Clare Trachtman

VP, IR *Baxter*

Margaret Vierling President & CEO

Diversatek Healthcare

Andrea Wainer EVP, rapid & molecular diagnostics Abbott

Caroline West Global chief compliance officer *Olympus*

Anne Whitaker CEO Aerami Therapeutics

Lauren Wickert Head of quality Vesco Medical

Angie Zavoral Conley

CEO Abilitech Medical

Women inventors can succeed in medtech: This 3M scientist did

Audiey Sheiman is 3M's "100-patent woman." She recently told Medical Design & Outsourcing about the lessons she's learned along the way.

DANIELLE KIRSH Senior Editor

udrey Sherman is a division scientist with 3M's Medical Solutions Division. She has been at 3M for over 30 years, working within all aspects of research and development laboratory operations. Her experience includes innovating both sides of the tape – the pressure sensitive adhesive (PSA) and release sides – covering the synthesis and characterization to large scale manufacturing polymerization processes.

Sherman has been nicknamed 3M's "100-patent woman" because of her more than 100 U.S. patents, including an issuance that gave 3M its 100,000 worldwide patent in 2014.

She has a Bachelor of Science in chemistry from Augsburg College in Minneapolis.

MDO: What first drew you to medtech? When did you first know you wanted to be in the industry?

Sherman: What I liked most about medtech was that it combines many different scientific areas. I knew I'd have freedom to create and develop solutions that make a difference.

MDO: What has been one of your biggest challenges in getting 100 patents? Sherman: Making sure that the business use was valid internally and that the USPTO saw novelty in the ideas.

MDO: What is your favorite patent that you hold? Which one took the longest, or was most challenging, to achieve? Sherman: My favorite that I hold is number 100. It was an "all gal" idea – and it was the most fun idea to work on with my technician at the time, Wendi.

This patent was based on changing a failed concept from the past to get an effect we thought would be useful today, as we added in a feature that we learned could help make the failure successful. It was titled "Temporarily Repositional Pressure Sensitive Adhesive (PSA) blends." It allows an optical PSA to be laid in place, inspected and easily removed, if inspection determines the need to remake the bond. If the bonded part is satisfactory, then the adhesive bond can remain in place and will become fixed in place like a typical optical adhesive would. But the trick was making this type of PSA blend truly optically clear since the polymer materials we used had widely differing refractive indices and were also known to be chemically incompatible. Then, we had made it allow time for inspection and factor in time for the bond to become full strength. It was super fun to play with our novel polymer along the journey.

The one that was the most challenging to achieve was based on a polymerization of a gentleto-skin silicone pressure sensitive adhesive that actually started its chemical reaction before it was in the reactor, while it was being added into the reactor and mixed.

MDO: What is the process like for patenting a technology at 3M?

Sherman: First, you need to find a very difficult problem that is also a customer pain point. Then comes the tricky part – creating a solution that actually works. Then, you document that solution and start the process of a patent application that gets filed.

2019 WOMEN IN MEDTECH



MDO: What are some of the projects you are currently working on and what do you have in the pipeline for the rest of the year?

Sherman: I am working on medical adhesive innovations to better serve patients and improve product manufacturability.

MDO: Talk about your leadership skills. What is the most important lesson you have learned that has guided you in your career?

Sherman: Never take on decisions that are not yours to make – meaning don't assume that your answer will be "no" and let it stop you from asking for what you need. The choice to provide you what is needed is not yours anyway. Be persistent and keep asking – that's really the job at hand. Then be really good at it.

MDO: Describe your biggest leadership challenge. How did you conquer it or resolve it, and what was the outcome?

Sherman: My biggest challenge was being removed from a team I could help simply because the team wanted to do it their way. I had to watch the team struggle and ultimately fail. From then on, I've known that people need to fail on their own, and I should continue to teach, but not tell them to see what I see. People need to make course corrections for themselves to learn.

MDO: What are some of the barriers women face in today's medtech industry, if any?

Sherman: For some reason, we seem to need to supply a ton more data to get to the same end goals that men reach easily. I think that it's not so much the "med" part, as it is the "tech" part that is still suffering from some kind of bias.

MDO: In your opinion, what more can be done to promote greater participation of young women in the medtech industry? Sherman: Spread the word that it is possible to reach

for this rewarding

We need more diverse views to solve the problems of the world now and in the future.

goal and succeed. We need more diverse views to solve the problems of the world now and in the future. Please take a walk on the medtech side and be wild for it!

MDO: What career advice would you give to your younger self?

Sherman: Don't get bogged down in day-to-day stuff —just work for the end goal. That baggage isn't worth dragging across the goal line anyway.

MDO: Why is it important for companies to be more inclusive and have more women in leadership roles? Sherman: First, you see it, and then

you do it. Once you see it, you can't "un" see it. Role models help us have a place to aim.

Audrey Sherman, division scientist, 3M. Image courtesy 3M



Personnel Moves

These 14 women from last year's list have moved on to other leadership positions or retired:



CEO. UroGen Pharma



Victoria Carr-Brendel

GVP & president of Cochlear implants, Sonova (was CEO of JenaValve Technology)



Elsa Chi Abruzzo VP of regulatory, clinical & guality, Anuncia (was president & CEO of Cygnus Regulatory)



Lisa Earnhardt EVP, Abbott

(was president and CEO of Intersect ENT)



Dorothy Clarke VP of R&D, innovation & business development compliance, J&J (was VP of healthcare compliance,



GM/business leader, EPD Solutions, (was president of Biotronik)

medical devices & diagnostics at J&J)



Janet Kay retired (was VP, regulatory affairs, Integra Lifesciences)



Heather Nigro SVP, regulatory, quality & clinical affairs, CSA Medical (was VP, regulatory & clinical affairs, NxStage Medical)



Kate Rumrill president & CEO, Ablative Solutions (was president & CEO of NeoSync)



Martha Shadan president & CEO, Miach

Orthopedics (was VP, global marketing, Smith & Nephew)



Stephanie Muir CTO, Midmark Corporation (was VP, R&D & strategic marketing, Ethicon)



Shacey Petrovic president & CEO, Insulet (was president & COO)



Renee Ryan CEO, Cala Health (was VP & investor, J&J Innovation)

Amy Winslow

president, BioPorto Diagnostics A/S (was president & CEO, Magellan Diagnostics)

Elizabeth Barrett (was CEO of Novartis Oncology)



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Burzik (center) was honored with AdvaMed's Lifetime Achievement Award at The Medtech Conference this year in Boston. Image courtesy of AdvaMed

SARAH FAULKNER Contributor

Moving **NOUNTAINS'** and bringing dance to the

BOARDROOM:

Inside *Guthy Burzik's* 40-year career in healthcare

From the early days of software development to personalized cell and gene therapies, **Cathy Burzik** has witnessed a lot of technological evolution over the course of her 40-year career in the healthcare industry. She sat down with DeviceTalks' former program manager Sarah Faulkner for an interview at AdvaMed's The MedTech Conference this year, where she received a Lifetime Achievement Award for her contributions to the field. hen Catherine Burzik accepted a job in 1974 at Kodak, her first assignment was to write software that would control cameras designed to keep tabs on Russia.

"This is way before software was even a field – you didn't go to school for software engineering, but they were looking for people with critical thinking skills. I got to write the software that controlled the cameras, so I had to learn how to write assembler-level language software," Burzik explained. "When I think about it, it was pretty fascinating to be on the start of a field."

Years later, she was asked to join a secret project writing software for the very first clinical chemistry instrument.

"That's what changed everything for me," she said. It was the beginning of Burzik's wide-ranging 40-year career in healthcare. She went on to oversee the vital sign monitor franchise at Johnson & Johnson, as well as that company's clinical lab and transfusion markets. She is perhaps most wellknown for her stint as president & CEO of Kinetic Concepts. Under her leadership, the company inked a \$1.7 billion deal to purchase tissue repair company LifeCell. Eventually, KCI was picked up for \$6.1 billion by private equity firm Apax Partners.

Now, after working as a general partner at a venture capital firm, she serves on the board of several companies (large and small), helping to guide organizations through the changes that she sees emerging in healthcare.

An evolving industry

A lot has changed since Burzik wrote the software for the industry's first clinical chemistry analyzer. Digitization has ushered in a new era of therapeutic technology, changing the way doctors provide care for their patients.

"I had the opportunity to work with X-ray film and turn the film into digital images and beam the images remotely. Today, you see all



Haihy Burzik

kinds of doctors and radiologists reviewing images and you hardly ever see film. They're doing it on screens, so you can manipulate the images. You're not just stuck with the way it was taken," she said.

Burzik also noted that the goal of personalized healthcare has advanced significantly over the course of her career. "The last crown I

needed for my tooth, they 3D-printed it while I was sitting in the chair," she said. While technology

has evolved dramatically in the last three decades, regulatory bodies and payers are still working to catch up, Burzik noted, but

she pointed to cell therapy as a space where regulators have enabled growth.

"I think for a while the FDA was not being as proactive as we would have liked in the gene and cell therapy market. That has all changed. They now have accelerated programs that we're able to utilize," she explained.

"I'm very worried right now — and I think the whole industry is — about all the changes that are going on in Europe. I think there's a case where the number of notified bodies, the infrastructure there is not ready to do what they would like to do. I hope that clearer minds will prevail so that we don't get into a situation. The biggest fear is that the industry is not going to be able to get their technology re-approved in time to keep it on the market," Burzik added. When I look back at my own leadership, if you can get in a position where you have both a strong team of people working for you and a strong group of supporters at the board level, you're set up for success. If one of those two isn't good, you're not going to make it.

Moving mountains takes a team

Burzik's insights extend far beyond her analysis of the technical aspects of the field. She has served in leadership roles within multiple healthcare companies for decades and learned crucial lessons during that time.

Early on, Burzik said, she had to learn that "you can't move a mountain all by yourself." It takes a team of diverse and thoughtful people to accomplish anything meaningful in this industry, she said. Going beyond a company's immediate management team, she extended this idea to the board of directors.

"I think back to my Kodak days. I wasn't ever far enough along at Kodak to interact with the board, but Kodak had 120,000 people that now is nothing because the company missed the shift to digital technology. I hold the board of directors 100% accountable," Burzik said. "When I look back at my own leadership, if you can get in a position where you have both a strong team of people working for you and a strong group of supporters at the board level, you're set up for success. If one of those two isn't good, you're not going to make it."

Other leadership lessons came from a less traditional source — ballroom dancing.

Burzik and her husband — they met when they were just 15 years old — have always loved to dance. Fifteen years ago, when the pair were dancing at the Rainbow Room in New York City, they decided they needed to expand their portfolio beyond simply foxtrots and waltzes.

"They came out with chas-chas and Rumbas and swing and salsas and all of these things. We said to each other, 'We don't know how to do this!""

They enrolled themselves in lessons and those few lessons turned into an all-out passion. Now, they train for hours every week and travel around the country to compete multiple times per year.

"At KCI, when I started dancing, it was a leveler with the CEO and I think it helped me to be a three-dimensional KCI was 15 stories high — and people wouldn't say anything to me. Once I started dancing and I would talk about it in town hall meetings, people would ask me 'What dances are you doing? Do you have a new gown?' and always, 'What do you think of Dancing With The Stars?'"

And, she said, the benefits of ballroom dancing translate directly to the boardroom, especially as it relates to communication between leaders.

"Being able to sense in a second what somebody is trying to communicate to you — I think that level of intimacy and understanding was improved by ballroom dancing," she said.

"I worked really, really hard for many years and once I started ballroom dancing, I still worked hard, but I think I was a better person. In some ways maybe I worked more efficiently," she added. "I get that not everybody wants to dance, but I tell people, 'Go find a passion outside your job.' A lot of people say, 'Oh, I'm raising my kids.' I say, 'That's good. Raise your kids, get involved with their sports, but do something.'" 🚨



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A deeper dive into the numbers behind our

BIG100

list of the largest medical device companies shows that the industry has a long way to go when it comes to gender parity.

DANIELLE KIRSH SENIOR EDITOR

ust 18% of the executives at the 100 largest medical device companies are women, and those companies average only 15% female composition in the C suite, according to an analysis of **Medical Design & Outsourcing**'s annual Big 100.

Of the 969 leadership roles at the companies on our list, only 172 are held by women. Nearly a quarter of those companies have no women in executive leadership roles at all.

And only three companies on

the list have a female CEO: B. Braun Melsungen, Insulet and Paul Hartmann.

Those three companies also employ women in more than a quarter of their executive roles – B. Braun Melsungen at 50%, Cardinal Health at 43%, Insulet at 33% and Paul Hartmann at 25%. Convatec ranks last, as only one of 16 (6%) of its executives is a woman.

Twenty companies list no women in leadership roles and another 24 show only a single woman executive. The remaining 49 firms claim at least one



woman in a leadership role, with Baxter leading that subset at eight female leaders. The following companies have no women in leadership positions:

- RTI Surgical (0/9)
- Masimo (0/8)
- Conformis (0/7)
- Bruker (0/6)
- Nihon Kohden (0/6)
- NuVasive (0/6)
- Drägerwerk (0/5)

- Steris (0/5)
- Ambu (0/4)
- Coloplast (0/4)
- Demant (0/4)
- Ra Medical Systems (0/4)
- Carl Zeiss Meditec (0/3)
- GN Hearing (0/3)
- Siemens Healthineers (0/3)
- EDAP (0/2)
- Fukuda Denshi (0/2)
- Miraca (0/2)
- Nipro (0/1)
- Utah Medical Products (0/1)

JMS Co., Omron, Terumo, Hoya, Konica Minolta, Nikkiso and Topcon were excluded from this analysis, which also does not take into account the composition of boards of directors.

The top 20 medical device companies from our list have a slightly higher number of women in leadership roles than the rest of the roster. There is an average of 21% of women in leadership roles within the Top 20, which includes giants like Medtronic, Stryker and Johnson & Johnson. Ranking the lowest was Siemens Healthineers, which employs 50,000 people; there, all three key personnel are men.

A note on our methodology: We use each company's leadership/management website pages to find the executives at each company. We do not include directors and board members in the mix.

Here is how our top 20 Big 100 companies rank in women in leadership roles:



B. Braun Melsungen \$8,163,301,770 (revenue)

50% women in leadership roles

6 key personnel; 3 women:

ANNA MARIA BRAUN, CEO, chief HR officer, director, labor relations, Asia Pacific; **ANNETTE BELLER**, board member, finance, taxes & controlling, central service departments; **CAROLL NEUBAUER**, board member, North America



43% women in leadership roles

7 key personnel; 3 women:

MICHELE HOLCOMB, EVP, strategy & corporate development; OLA SNOW, chief HR officer; JESSICA MAYER, chief legal & compliance officer




32% women in leadership roles

25 key personnel; 8 women:

LAURA ANGELINI, GM, renal care; STACEY EISEN, SVP, global communications & president, Baxter International Foundation; HEATHER KNIGHT, GM, U.S. hospital products; JACQUELINE KUNZLER, SVP, CQO; JEANNE MASON, SVP, HR; ELLEN MCINTOSH, SVP & corporate secretary; CATHY SKALA, VP, business transformation office; CLARE TRACHTMAN, VP, IR



Alcon \$7,149,000,000 (revenue)

32% women in leadership roles

19 key personnel; 6 women:

HEATHER ATTRA, SVP, head global quality; **JEANNETTE BANKES**, president & GM, global surgical; **SOPHIE DUTILLOY**, president, EMEA; **CAMILA FINZI**, president, LACAR; **KAREN KING**, SVP, IR & communications; **SUE-JEAN LIN**, SVP, CIO



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Stryker \$13,600,000,000 (revenue)

30% women in leadership roles

10 key personnel; 3 women:

YIN BECKER, VP, communications, public affairs & strategic marketing; KATHRYN FINK, VP, HR; KATHERINE OWEN, VP, strategy & IR



3M \$6,021,000,000 (revenue)

29% women in leadership roles

14 key personnel; 4 women:

JULIE BUSHMAN, EVP, international operations; KRISTEN LUDGATE, SVP, HR; MOJDEH POUL, EVP, healthcare; DENISE RUTHERFORD, SVP, corporate affairs



Johnson & Johnson \$27,000,000,000 (revenue)

27% women in leadership roles

11 key personnel; 3 women:

ASHLEY MCEVOY, EVP, chairwoman, medical devices; **JENNIFER TAUBERT**, EVP, chairwoman, pharmaceuticals; **KATHY WENGEL**, EVP & chief global supply chain officer



Becton, Dickinson \$8,616,000,000 (revenue)

22% women in leadership roles

23 key personnel; 5 women:

BETTY LARSON, EVP, chief HR officer; **LINDA THARBY**, EVP, customer experience; **MICHELLE QUINN**, SVP, chief ethics & compliance officer; **ANTOINETTE SEGRETO**, SVP, taxes; **AMI SIMUNOVICH**, SVP, chief regulatory officer



Fresenius \$19,553,589,900 (revenue)

21% women in leadership roles

24 key personnel; 5 women:

DR. KATARZYNA MAZUR-HOFSÄSS, CEO, EMEA; **KATE DOBBS,** SVP, marketing & communications; **LISA ESTRADA**, chief compliance officer, Fresenius Medical Care North America; **KAREN GLEDHILL,** GC, Fresenius Medical Care North America; **ANGELA MCCLURE,** chief experience officer, Fresenius Medical Care North America





20% women in leadership roles

15 key personnel; 3 women:

KAREŇ PARKHILL, EVP & CFO; **LUANN PENDY**, SVP, chief quality & regulatory affairs officer; **CAROL SURFACE**, SVP & chief HR officer



20% women in leadership roles

15 key personnel; 3 women:

RACHEL ELLINGSON, *SVP*, strategy; **ANGELA MAIN**, *SVP*, global chief compliance officer & associate GC, Asia Pacific; **PAMELA PURYEAR**, *SVP*, chief HR officer



19% women in leadership roles

16 key personnel; 3 women:

WENDY CARRUTHERS, SVP, HR; JODI EDDY, SVP & CIO; DESIREE RALLS-MORRISON, SVP, GC & corporate secretary

EssilorLuxottica \$12,761,178,300 (revenue)

18% women in leadership roles

11 key personnel; 2 women: HILARY HALPER, *CFO;* **GRITA LOEBSACK,** *chief marketing officer*



Abbott \$11,400,000,000 (revenue)

17% women in leadership roles

23 key personnel; 4 women:

LISA EARNHARDT, EVP, medical devices; MARY MORELAND, EVP, HR; ANDREA WAINER, EVP, rapid & molecular diagnostics; CORLIS MURRAY, SVP, quality assurance, regulatory & engineering services



15% women in leadership roles

13 key personnel; 2 women: SOPHIE BECHU, EVP, COO; CARLA KRIWET, EVP, chief business leader, connected care





10% women in leadership roles

10 key personnel; 1 woman: SHANA NEAL, *SVP, chief HR officer*



E



9% women in leadership roles

11 key personnel; 1 woman: ANGELA LALOR, *SVP, HR*



7% women in leadership roles

15 key personnel; 1 woman: LORELEI MCGLYNN, SVP, chief HR officer



7% women in leadership roles

15 key personnel; 1 woman: TERRI BRESENHAM, chief innovation officer





0% women in leadership roles

3 key personnel; 0 women:



ust 8.2% of physicians receiving research payments in 2018 from some of the top medical device companies were women, according to an analysis of **Medical Design & Outsourcing**'s annual **Big 100** and CMS Open Payments data.

Among the top 20 medical device companies that fund research by U.S. physicians are 3M, Medtronic, GE Healthcare, Royal Philips (Philips Electronics), Becton Dickinson, Stryker, Boston Scientific, Abbott and Zimmer Biomet. Collectively, those companies doled out \$2.7 million to 195 doctors last year, but only 16 were women, who received a collective \$322,000.

Women averaged 10.9% of those payments between the nine companies that reported payments on the CMS website. Here's a closer look at the funding: The top medical device companies fund tons of research, but only a fraction of that financing goes to women-led projects.

DANIELLE KIRSH SENIOR EDITOR

EDTECH ONLY A FRACTION OF RESEARCH FUNDING GOES TO WOMEN

- **3M** paid **\$191,255** in research payments to nine physicians in 2018. *Two* physicians (22.2%) were women and received *\$68,000* (35.6%).
- None of the 34 researchers backed by \$412,000 from Zimmer Biomet were women.
- Of the seven doctors funded by \$128,000 from Medtronic, only one was a woman (14.3%), who received \$2,025 (1.6%).
- **GE Healthcare** also backed a *single* female physician out of *seven* total physicians (14.3%), putting up \$825, or 9.3%, of its total \$8,900 spend.

- **Royal Philips** (dba Philips Electronics) made **\$208,000** in research payments to *22* physicians in 2018, but just *\$26,000 (12.5%)* to *three* women (*13.6%*).
- Becton, Dickinson's \$400,000 in research payments to 25 doctors included three women (12%), who received a total of \$75,000 (18.8%).
- Three of 31 physicians (9.7%) funded by Stryker were women, who divvied up \$133,700 (16.7%).

- Boston Scientific backed one woman physician of 13 total (7.7%), paying \$11,200 (30.1%) of the total \$37,000.
- Of the 47 physicians funded by \$656,000 from Abbott, two (4.3%) were women who received a total of \$4,900, or 0.7%.
- Johnson & Johnson, Fresenius, Siemens Healthineers, Cardinal Health, Danaher, EssilorLuxottica, Baxter, Owens & Minor, Henry Schein, B. Braun Melsungen and Alcon were excluded from this analysis.



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How Medtronic could help change healthcare for the better



Medtronic officials want the world's largest medtech company to do more than just make medical devices: They want to help manage chronic diseases. Here are thoughts from the VP helping to lead the shift.

Chris Newmarker | Executive Editor |

edtronic executive Sheri Dodd had a cousin — one of only four - die from Type 2 diabetes complications at the age of 47. Lainie Dominguez was already high risk because her dad had diabetes. and she was obese. She became pre-diabetic, Dodd said during our DeviceTalks Minnesota event in September. Diagnosed as a Type 2 diabetic. Dodd said her cousin watched her carbohydrates, took oral medication, did finger sticks, became insulindependent and developed end-stage renal failure. She went in for orthopedic surgery and died of diabetes-related complications.

"I think about this all the time, and I think, 'What did she need in her journey so that she could have avoided getting Type 2 in the first place?'" Dodd said in September at DeviceTalks Minnesota.

Dodd is in a unique place to help answer the question, as VP of two Medtronic businesses at the forefront of the company's shift toward helping people manage their chronic diseases: Medtronic Care Management Services and Non-Intensive Diabetes Therapies. Medtronic and medical device companies in general can't make the transformation alone, Dodd said. "You can't think that you're going to come in alone and solve the problem."

If Medtronic is going to move beyond selling insulin pumps and glucose monitors, for example, it needs to help people with diabetes monitor their nutrition. The result is that Medtronic in November 2018 announced it was acquiring Tel Aviv, Israel-based Nutrino Health and its nutrition-related data services and artificialintelligence-based analytics.

Partnerships with health payers and providers are important, too. Dodd mentioned Medtronic's five-year value-based healthcare partnership with the Lehigh Valley Health Network. The company is using its technological know-how and data-crunching skills to tackle up to 70 major medical conditions, with the goal of helping the Northeastern Pennsylvania health system improve the lives of as many as 500,000 people, create efficiencies, and reduce healthcare costs to patients, payers, and the health system by \$100 million over five years.

"There's a technology play, but there is a behavioral play that Medtronic is

DEVICETALKS •

not uniquely expert at, and that's why partnerships and building out solutions is going to have to happen in that area of chronic management," Dodd said.

Here are five additional things that Dodd thinks Medtronic and other device companies need to accomplish if disease management is going to become a major focus of the business:

1. Access to data

Data on day one can be very different from data on day two, three or four.

"With longitudinal data, you start to understand trends," Dodd said. "When you understand that, you can get to predictive."

2. Process is very important

A medtech company can gather discreet pieces of data, but how are they going to come together?

"Call it what you like, but there's an element of getting into care delivery, care management, and chronic disease management that has to be around process. It's handing pieces of data off to somebody else, and something meaningful has to be done with that information," Dodd said.

3. Waiting for value-based healthcare

Medtronic and other medical device companies are transforming because both public and private healthcare payers have a goal of transitioning health providers toward more valuebased arrangements. Unlike the dominant fee-for-service models, valuebased healthcare rewards based on how efficiently and effectively certain patient populations are managed.

For Dodd, value-based healthcare reminds her of how her father-in-law had a sign that said, "Free beer tomorrow." "I'm building business models for this 'free beer tomorrow' day. ... It is coming. It's just in a very awkward stage right now between fee-for-service and value-based healthcare," Dodd said.

For now, medtech developers need to realistically look at whether they can demonstrate to health payers that their offerings will have a significant impact in terms of dollars and/or impact large numbers of members, according to Dodd.

"If you fall somewhere in between, then I would re-look at your channel and think about who else can you get to pay for it or bridge the discussion between a payer and a provider," Dodd said.

4. Combining clinical and economic data

Medtronic leadership put Dodd into a position in which she was in charge of both clinical and economic studies. What happens when clinical trial data combines with payer claims data is enlightening, she found.

"You can actually look populations who receive a clinical intervention and then look at claims data and see, all things being equal ..., 'Did that patient population have a decrease in healthcare utilization, if you will, in terms of avoidable cost?' and create a really good story," Dodd said.

5. It's still about people

Healthcare is about people — people concerned about their health and people helping those people get better.

"I can't envision a day when there is not a person involved in the delivery of healthcare, and I'm a big medtech fan," Dodd said.

"How do you use technology and data and process and people? I think when all that can come together, we're going to be in a good place." I can't envision a day when there is not a person involved in the delivery of healthcare, and I'm a big medtech fan. How do you use technology and data and process and people? I think when all that can come together, we're going to be in a good place.

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Women in MedTech 2019



Cheryl **McWhite**

Vice President, Corporate Compliance & Associate General Counsel **B. Braun Medical Inc.**

The Pennsylvania State University, Bachelor of Arts, Psychology, Minor in Spanish

Villanova University School of Law, Juris Doctor



I feel it is important to treat others with courtesy and respect, regardless of their role in the company. It is imperative to train and give people the knowledge and tools they need to succeed.

Cheryl McWhite is Vice President, Corporate Compliance & Associate General Counsel for B. Braun Medical Inc. Cheryl received a Bachelor of Arts degree in Psychology and a minor in Spanish from The Pennsylvania State University and subsequently attained her J.D. from Villanova University School of Law. Cheryl joined B. Braun in 2007 as a corporate attorney in the Legal Department. Prior to joining B. Braun, she worked as an associate in the Corporate Department of Schnader, Harrison, Segal & Lewis, LLP, a law firm in Philadelphia.



Q&A: with Cheryl McWhite

Vice President, Corporate Compliance & Associate General Counsel for B. Braun Medical Inc.

MDO: What first drew you to medtech? When did you first know you wanted to be in the industry?

McWhite: I always had an interest in science and the healthcare industry generally. Several of my immediate family members have a healthcare background. In addition, prior to starting law school, I contemplated going to medical school. Working in the medtech industry seemed to be the perfect way for me to utilize my legal skills in an industry that has always interested me. Moreover, it is rewarding to work in an industry that helps save and improve lives each and every day.

MDO: Describe your biggest leadership challenge. How did you conquer it or resolve it, or what was the outcome?

McWhite: I think my biggest leadership challenge was getting comfortable with feeling uncomfortable. It is important to make wise and informed decisions based on the facts and circumstances that exist at the time the decision is made. It is also necessary to delegate and trust your team.

MDO: Talk about your leadership skills. What is the most important lesson you have learned that has guided you in your career?

McWhite: I try to lead by example. I feel it is important to treat others with courtesy and respect, regardless of their role in the company. It is imperative to train and give people the knowledge and tools they need to succeed. Everyone makes mistakes, and as with many things in life, there is not always a clear right or wrong answer. Accordingly, people need the support, guidance and confidence to make informed and reasoned decisions and to learn from their choices. It is also important to recognize successes and achievements and understand what motivates people. Everyone is different, and as such, it is important to understand each person's strengths and weaknesses so you can help them grow and develop professionally. If the team is not successful, that is a reflection on the leader. A successful team is a sign of a good leader.

MDO: In your opinion, what more can be done to promote greater participation of young women in the medtech industry today?

McWhite: I believe that greater flexibility is key. Things are different than they were decades ago. It is more common for households to have both parents working full-time. It is often difficult to juggle full-time employment with kids, activities and school work. If companies can be flexible with their employees, I feel that may promote greater participation of young women in the industry.

MDO: What career advice would you give to your younger self?

McWhite: I would tell myself to trust your instincts and be confident. Be willing to adapt and always listen carefully. It is important to listen before you form an opinion or try to resolve an issue. It is good to question things. What was done in the past may not necessarily be the best or right way to do things now based on current circumstances. Collaboration and excellent communication skills are key.

MDO: Why is it important for companies to be more inclusive and have more women in charge? McWhite: I feel it is important for companies to choose the right leaders based on knowledge, experience, skill and ability regardless of whether the person is male or female. The right people need to be chosen for the right reasons. Diversity is important. Different views can give companies a broader perspective, which can in turn, enable the company to grow.

Women in MedTech 2019



Connie Magnuson

VP, Administration Minneapolis (formerly Co-Owner of Caribou Technologies) **Resonetics**

> University of North Dakota BSBA in Accounting



I don't see the barriers [women face in today's medtech industry] – only opportunities for talented motivated professionals to succeed. I am grateful for the opportunities I have been given.

Connie Magnuson has been a leader in the MedTech field for the past 20 years. After several years as CFO for Synovis Life Technologies, she made the leap to entrepreneur by co-founding Caribou Technologies, in Blaine, Minnesota. She helped lead Caribou Technologies to become an industry leading metal fabrication partner for key medical device OEMs. Her dedication to building a strong culture and developing deep customer relationships, enabled Caribou Technologies to grow to 100 employees and increase revenue solidly year over year. In 2019, Caribou Technologies was acquired by Resonetics as their flagship metal fabrication group. Connie continues to be a leader at Resonetics through her dedication to the growth of the Resonetics Minneapolis site.



Q&A: with Connie Magnuson

Vice President, Administration Minneapolis for Resonetics

MDO: What first drew you to medtech? When did you first know you wanted to be in the industry?

Magnuson: I started my career in public accounting and had clients in many industries but there was one medical device client I loved. Several years later, I had the opportunity to join the organization that became Synovis Life Technologies as its CFO. I have now spent over 2 decades in this field, including the last 14 as a co-founder and owner of Caribou Technologies, providing manufacturing solutions for the medical device field. We recently became part of Resonetics, a larger organization providing industry leading laser processing and metal fabrication services. Resonetics is a larger platform for customer driven solutions. This field is dynamic and the opportunity to make an impact has been very rewarding.

MDO: What are some of the barriers women face in today's medtech industry, if any?

Magnuson: I don't see the barriers – only opportunities for talented motivated professionals to succeed. I am grateful for the opportunities I have been given – and far more rewarding, the ability to positively impact our employees career potential – all irrespective of gender.

MDO: Describe your biggest leadership challenge. How did you conquer it or resolve it, or what was the outcome?

Magnuson: Building a team of talented, motivated leaders that are committed to our core values. When we got better at articulating our values and why they were important to us, we elevated the focus on linking our core values to hiring the right people. We had to make some difficult people moves to get the outcomes we desired, and it has been transformative.

MDO: Talk about your leadership skills. What is the most important lesson you have learned that has guided you in your career?

Magnuson: I am unafraid to do what needs to be done – and will provide a place for others to develop and experience success, all while having fun. One of my greatest joys is witnessing the development and success of the people I have been honored to influence.

MDO: What career advice would you give to your younger self?

Magnuson: Work smarter not harder All the steps on the journey will bring you to a fantastic, if unplanned place in your professional career.

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Define engineering SUCCESS by your Values

The decision to become an engineer can be an inspired choice. But it can also be a pragmatic decision. For Elyse Cocco, PE, Associate at Henderson Engineers, it was more of a pragmatic choice. "Initially, I wasn't drawn to anything when it came time to pick a career direction, which was really challenging," she says. "I chose engineering because I was strong in math and science, and nearly everyone says you should go into engineering with those qualities, right? Seriously, though, I went to a Women in Engineering talk at Purdue University where I heard that an engineering degree would open a myriad of doors for me. Since I didn't know what I wanted to do yet, that seemed like the best place to start."

Strength in math and science are usually listed as reasons for going into engineering. Often, though, family and friends influence the decision as well. In Cocco's case, a major influencer was her father.

"I seem to have been influenced without really realizing it," she says. "My dad taught drafting and industrial arts to high schoolers. There were a number of drafting tables around, and my dad can build all types of things. I didn't plan to follow in his footsteps, but it turned out my career would take a similar direction. I missed the hand drafting era. CAD and Revit have been my tools, and learning software is one of my strengths."

For those women who aren't sure if engineering is something they want to pursue, Cocco offers this observation. "As a mechanical engineer in the building industry, the design process is like putting together a jigsaw puzzle where you create the pieces. There are an endless amount of details and coordination to be considered along the way, so you'll always have something new to learn, which is usually the fun part."

The importance of community for women engineers

For many women engineers, a community is a great place to learn new skills. Cocco has been involved in the creation of Lean In circles, which offer support and community to members, and in other forums for women engineers.

"The Lean In circles in my area initially took place in the architecture, engineering, and construction (AEC) industry in Phoenix with women from various local companies," she says. "A Lean In circle is a small group of peers who meet regularly to support each other and learn new skills."

One of the key benefits is that these circles are often places where members can be unapologetically ambitious. "This concept also transferred to the company I work for and continues to take place today," she continues.

One can say that engineers are natural problem solvers and often enjoy taking on a challenge. Sometimes, though, the challenge is more worklife balance than technical. For Cocco, her biggest challenge was finding that work-life balance. "I

ELUSE COCCO, PE Associate at Henderson Engineers

needed to learn how to manage my time and stress after becoming a mother," she notes. "Before the birth of my first child, I knew I could solve problems by staying late and putting in additional hours to meet deadlines. But once I had a child at home my responsibilities shifted and I needed to think differently. Initially, my approach was to resume work after the baby went to bed. But that didn't work out. Out of necessity I started trying different approaches to Empow[her]. The mission statement the tasks I had on my plate and gave myself a firm deadline every day. I learned to delegate better, prioritize better, and fit tasks into my day according to how I tend to naturally get things done. Now I'm able to get more done in less time."

But Cocco also learned a lot at the AIA Women's Leadership Conference in 2015. One program was Equity by Design. "Here, I learned more about the statistics for women in the industry and what is behind them," she notes. "A few of the big takeaways for me were the importance of being your authentic self, owning your privilege, and correcting for your own socialization as women are all raised in a world under the vestiges of sexism and it takes work to recognize and undo them."

Encouraging more women to enter engineering

Even though many women are interested in math and science, the engineering field is dominated by men.

"Entering a field that is still such a high percentage of men can be daunting, but it doesn't have to be a road block," she says. "The barriers today are less obvious and less visible, but still impactful. Things like unconscious bias, which is difficult to identify and difficult to change."

Those barriers often lead women who enter engineering to leave it after a few years. Cocco's heard this referred to as the "leaky pipeline."

"The reasons women don't stay in the field are systemic, cultural, and personal," she says. "More women in leadership is a good start to improving this."

Women, organizations, and companies can do much to help overcome those biases and promote greater participation of women in engineering. For example, the company Cocco works for built an internal women's network called is to propel professional women through connections, collaborations, and continuous development.

"This group has allowed me to build valuable connections and champion policy changes that have impacted me personally, such as parental leave.

The issue of work-life balance for women continues to be a tricky one, especially if a woman engineer also wants a family, not just a career. But the concerns some young potential women engineers have about this issue may unnecessarily affect their engineering career choice.

"One of my favorite stories to share, because I think it says good things about where the engineering industry is going, is how I got promoted to Associate in 2017. I was home on maternity leave with my first child. My supervisor came over with a gift for the baby and news that I was being promoted. That really proved to me that becoming a mother was not going to hold me back from becoming successful, which really meant a lot to me."

The female touch

What can women bring to the table that benefits the engineering field as a whole and that is different from what men bring?

"Women have unique strengths and tendencies in comparison to men that can benefit the industry in a big way," says Cocco. "In my

experience, diversity is enriching and important to developing success on a team. We can generalize strengths that women tend to have, but I think it's better to operate under the guise that everyone's unique strengths add value, and the more diversity in those strengths the better off the team will be."

For Cocco, diversity is imperative. Without it, the profession suffers.

Building individual strengths

Even if a women's strengths and technical skill are accepted, a lack of confidence can undermine any skill set. In such situations, communities for women engineers can be guite helpful. But Cocco also offers the following advice.

"Learn how you operate, don't force yourself to be something you're not. Work to get better in the areas that matter for the long haul; things like time/attention management, emotional intelligence, knowing your strengths and how to leverage them. Mistakes are unavoidable, but if you know what you don't know and continue developing your knowledge in those areas the mistakes you make start to have value in the form of your growth. At Henderson, we have a team of Quality Evaluation Veterans to help everyone through these inevitable mistakes and ensure we provide the highest quality product to our clients."

Cocco continues, "Redefine success according to your values and strive for balance in your life. Know your worth and talk about the value you add to a team."

And if she were looking back at herself on the verge of going into engineering? "I'd tell myself to figure out what I like to do, not just what everyone wants me to do. I would learn to better leverage my strengths. You enjoy what you're doing more if it's what comes naturally."



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Women in Engineering

Inspiration + work = Success in engineering

During the first Black History Month she recalls as a little girl, Camille Eddy got to learn of NASA astronaut (and engineer and physician) Mae Jemison. Inspired by Jemison's story as the first black female astronaut and work in space during NASA's 1992 STS-47 mission, Eddy decided she wanted to be an astronaut as well. So Eddy's mother assigned her a small research assignment to determine what it takes: "I found out that astronaut candidates must first be scientists, doctors, or engineers ... and I wanted to go into engineering. It was then that my mother and I began thinking of the classes and coursework to get me ready for that path."

Eddy continues: "In my high school freshman year, we moved to Boise, Idaho. Within two months, my mom had connected us with the Engineering College at Boise State University. During one special event at the school, my sister and I got to meet former astronaut Barbara Morgan who had just arrived at Boise State as a distinguished educator in residence. At that same event, presenters from the Engineering College explained to us high schoolers the different fields of engineering."

At the close of the event, Eddy, her mother, and her sister stayed to get Barbara Morgan's autograph. "But my mom lingered to ask Barbara a lot of pointed questions such as, 'Can my daughter really be an astronaut?' and that sort of thing. Ultimately Barbara Morgan stayed with us for three or so hours after the event — I swear a very long time," Eddy laughs recalling the evening. "We even went to her office that night, and she showed us some plant seeds that had been to space — and it was incredible."

Barbara Morgan would go on to mentor Camille Eddy for the next six years, making both the young woman and her family increasingly comfortable with her career choice. Eddy benefitted greatly

Camille Eddy Robotics and software engineer · TIMBER IT Consulting

- Women in Engineering



from the instrumental relationship. She regularly saw Morgan at events around town, and her exposure to Morgan continued through various day and residential camps at Boise State.

After completion of high school, Eddy started at Boise State as a mechanical engineering student. There, Morgan invited Eddy to serve on a panel to help facilitate educational exchanges between astronauts in space and Boise State students. That program ultimately included a BSU Space Symposium coordinated with the International Space Station. This is where the mentorship really took flight so to speak — as Morgan served as a liaison between the students and NASA.

"We had to have meetings with the NASA educational team; we had to learn how to write proposals. Morgan worked with me with me to write an education and public outreach (EPO) plan. These are educational scripts that astronauts present as videos from space - to provide engaging technical sessions to students and the public. Our EPO presentation was on Newton's third law." On the day of the BSU Space Symposium, all of the students got coaching ... but Eddy was brand new to public speaking. Here, Morgan coached Eddy on how to present on stage and speak clearly — which ultimately served as yet more meaningful mentoring.

The next year, Eddy became team leader for a research project called the Microgravity Undergraduate Research Experience, coordinated with NASA to teach undergraduate students how to write business proposals to NASA standards and then execute a research project if contracted. Eddy's six-student team focused on space tooling. "With Barbara's help, we wrote a 40-page proposal to NASA. Every night we worked until 10 pm on this project. The last night, Barbara stayed with us until 2 am just going over the project proposal line by line to instruct us on how to make our proposal fit the standards of NASA.

After the proposal was approved, Eddy's team had to build the tool. "We had to write a safety document for the tool and then test the finished tool at the NASA Johnson Space Center. We then had to appear in front of a large panel of astronauts and testing and educational professionals and present our document. Because of all the coaching we got from Barbara and all the steps we'd taken on engineering and documenting the tool's function and adherence to design parameters; they didn't have any questions for us ... and weren't concerned about anything that we had done. For example, our tool allowed singlehand operation and did not have any sharp edges – just two design features required by NASA."

Eddy remembers most fondly the help Morgan gave her on understanding team leadership.

In addition, Eddy's familiarity with standardized modes of engineering communication now helps her work on a







remote team as a robotics engineer. Most of her efforts these days focus on those within the opensource Robot Operating System (ROS) - middleware that lends itself to prototyping and lets engineers plug and play robots after building custom applications to specification.

"My day-to-day work now is now on modes of building robotics from scratch ... currently for a pick-andplace robot. So I start my day with reading, and working on coding in Python, C++, and XML. Particularly satisfying is addressing changing design requirements and predicting design outcomes. Our remote team communicates a lot over online chat: 'This is what I did – does this work for you?' and 'I'm pushing my code to the repository; can you check it?' and things like that. It's guite a lot of communication, because we also have to divide up our tasks."

"Case in point: Our current robotic design requires some mode of gripping. Ultimately, we decided to use suction end effectors to pick up objects and move them. But how do we design this portion of the robot? What code to use in simulation for proof of concept? What about sourcing subcomponents? Such systems require careful consideration."

For holistic design conceptualization, Eddy borrows from her experiences on a design project for HP — to build a multifunctional end effector to test printer functions. Initial prototypes were cumbersome, and the kinematics in particular proved difficult: the final iteration was streamlined, modular, and 3D printed ... a simple cable-based push-pull system under digital control based on camera feedback.

When asked about ways to increase participation of young women and people of color in engineering and STEM fields, Eddy said cited inclusive workplaces as key. "It's not so important that we convince girls to pursue engineering. It's about fostering environments to ensure that once they enter their careers, they remain willing to stay. I myself have had been with several different companies and experienced things I liked and didn't like. Key is ensuring people don't feel like they need to come to work and advocate for themselves more than other people do – or work to protect themselves from certain situations. I think that's going to take a lot more work than simply attracting girls to STEM — an inherently interesting field." 📶

Women in engineering can potentially save lives—and the planet



Kimberly Gliebe is a chemical engineer currently working towards her materials science and engineering Ph.D. at Case Western Reserve University in Cleveland.

What first drew you to engineering?

I think that it is hard to completely grasp what an engineer does, considering that the field and the work done by engineers is so vast. However, in high school I was aware that engineers solve tough problems. They often use science and math for those problems, and they work at the forefront of technology. Also, it was important for me to incorporate my love of nature into my career. I have a deep value of our planet and from what I understood of climate change as a teenager, I knew we had a major problem on our hands as a global population. I decided that I could contribute solutions to this problem via my career.

From there, engineering was a good route to take because I knew that this would be a problem that engineers would face through the technology they develop. I thought that working on renewable energy technology, such as solar panels and batteries, would be one piece of the solution to this problem. As an engineer, I could design better products that would also be accessible to the greater society. Additionally, I found that engineering would be a career that would greatly challenge me, and I enjoy seeing how much potential I have.

Describe your involvement in a research or design project.

In my senior year of chemical engineering at the University of Dayton, I worked heavily with teams for several class projects. In the past, I had always preferred to work individually rather than in groups — as I like to have a sense of the timeline of completion for a project and an organized set of tasks. I always thought that this would be complicated with a team, but I realized that the sense of organization that I have makes me a good leader.

Our senior project was to design a chemical manufacturing plant for a polymer that would be used to assist in additive manufacturing of glass. Because it was such a complex project, it was helpful to break the project down into a set of tasks that needed to be completed and a timeline to complete them. With everyone in the team having a central

Kimberly Gliebe Chemical Engineer

direction and an idea of where to contribute, it made the workflow in a team very easy.

Describe your biggest research or engineering challenge to date.

When I was a senior in undergrad, along with having group projects for my classes, I was also working part-time at the Air Force Research Laboratory at Wright Patterson Air Force Base. I was put in charge of a project that required programming, use of specialized equipment, and advanced knowledge of materials science. I did not start the project with these skills, and I knew that I had less than a year to complete my work before continuing on to graduate school.

I am very grateful to have had so many people who were working full time at the Air Force Base to help me with my project. My collaborators could explain their specific set of knowledge and help me apply it to what was demanded of my project. In this way, I had access to a much wider arsenal of skills than if I worked alone. I learned new techniques and had additional time to focus on interpreting the results of my work.

What more can be done to promote greater participation of young women in engineering?

When I was growing up, seeking out STEM hobbies was not the status quo. But today we can change that by making STEM accessible through everyday people girls know (such as teachers and family) as well as cultural icons such as Disney stars and famous YouTubers.

What unique perspective do you think women bring to engineering?

If certain groups of people aren't involved in major design-engineering projects, then end products of those projects may be unsuited to them. This is especially bad if leaving out half of the population — women who have very different bodies and experiences than men.

For instance, in the book, Invisible Women: exposing data bias in a world designed for men author Caroline Criado-Pérez explains how "cars have been designed using carcrash test dummies based on the average male and 'when a woman is involved in a car crash, she is 47% more likely to be seriously injured than a man'" ... if more women were involved in the standardization of car-safety tests, perhaps they'd insist on tests that would prevent these serious injuries to women.

Additionally, for projects that do not have gender-based solutions (such as cracking the Enigma code during World War II, for example) women may help provide answers to very difficult problems simply because our unique experiences and perspectives might lead to different ideas and solutions. This is well explained in the book, The Difference: How the Power of Diversity Creates Better Groups. Firms, Schools, and Societies by Scott Page. I would highly recommend both of these books to anyone who contributes to a business that designs products for consumers. 📶

Leadership based on *authenticity*

In her day-to-day, Rebecca Lorman manages technically complex projects — from the initial collection of design requirements to the coordination of teams and SWOT analyses through to scheduling, fulfillment, and invoicing. Many of the projects she manages are related to critical life safety systems — specifically fire alarms, suppression systems, and integrated security and emergency communications.

Lorman was drawn to the sciences at an early age: "I've always wanted to understand how things work and how we gain understanding ... and most importantly, improve ourselves through learning. I was particularly fascinated with the vastness of the universe, and my dad fostered this curiosity. We would watch lunar eclipses and mathematically figure out by hand how many miles away stars were based on their light year distance — so enjoyable. He also taught me early on to work through problems one step at a time ... and to not give up due to frustration."

Project management is a natural fit for Lorman, who also developed leadership skills as a child — and often found herself in the position of group leader with peers and schoolmates. She's crafted her management style to incorporate the best of what she's seen in others.

"Every leader with whom I've worked has been instrumental in my development. I've learned valuable lessons under dynamic leaders — and I've learned valuable lessons from negative supervisors as well. All of those experiences have influenced how I lead teams today."

Of course, managing multiple complex projects at any given time demands that Lorman be organized and engage experts quickly. It's also critical to the success of projects and the betterment of teams to provide accurate and effective communication, she notes."

"One of the bigger challenges of being a woman in leadership is finding your unique voice and staying true to your leadership style. Women have a distinct view and provide input that sometimes goes against the tide." It is beneficial to the health of organizations to prevent the formation of a 'yes-men echo-chamber' by encouraging the expression of disparate ideas.

On the topic of ways to promote greater participation of young women in engineering leadership, Lorman sees a need to expose girls to interesting aspects of science at a young age — and continue mentoring them in STEM topics through their primary-school years.

"Being a strong leader means lifting up your team members and providing them every opportunity to succeed and grow. Finding out what motivates individuals and removing roadblocks are also key to being a leader," says Lorman.

"Women in visible positions provide encouragement to young women who also want to reach leadership positions one day. It's important to see people in such roles who are representative of the workforce we want to embrace. Female leaders also provide unique perspectives — often by considering complex issues and minute details holistically ... and remaining cognizant of the greater impact to customers and personnel."

Rebecca Lorman

Project manager • Johnson Controls

Women in Engineering

Dancing backwards in high heels

Remember--Ginger Rogers did every dance move that Fred Astaire did, only backwards and wearing high heels. Many women who studied engineering understand the challenges Rogers faced, for they face similar ones too. For example, required welding classes that only offer welding helmets and gloves built for men. Another example, class assignments geared to the interests of men rather than offering a range of assignments that include women. These are little things, but they speak volumes about perceptual bias in this field. Yet, women enter the field of engineering, primarily because they are good at solving problems, and that is mostly what an engineer does.

Elise Moss did not face such challenges initially. She first became interested in engineering because of her grandfather. "My grandfather was a civil engineer," she says. "And I was very close with him. We would build furniture together in his workshop and I was so impressed with how methodical he was drawing the plans, using a ruler and triangle to draft the drawings. He always drafted everything out before he built it. Plus, my dad is a metallurgical engineer. I didn't seriously consider becoming an engineer until I was an adult and Silicon Valley was just starting to launch.

At Silicon Valley, other engineers provided the inspiration. "I have worked with some amazingly talented engineers. They were patient, kind, and generous. I also have worked with a number of engineers with poor social skills, poor communication skills, and poor design habits. If you work in the industry long enough, you are exposed to the spectrum. All of my mentors have been men, but I'm seeing more and more women in my field and I find that very encouraging. Recently, I was approached by a woman construction engineer to help her develop curriculum to train journeyman electricians. I was recommended to her by another woman, who is also an engineer. I found that remarkable that three women engineers networked to achieve a very worthwhile goal!"





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In her career, Moss has been involved in a number of different design projects and industries. She worked at NUMMI as an assembly engineer with a team of engineers designing the first truck assembly line, collaborating with Toyota engineers from Japan. Her manager, Dan was an engineer and one of her mentors. Moss spent a lot of time with the assembly line workers to get their input on how to make the equipment safer to reduce repetitive stress injuries and make it more versatile.

In all of her projects, one stands out as an interesting challenge. "I needed to design a small aluminum enclosure for a print sharing device for a small start-up called ASP Computer Products," she says. "We didn't have the money to go directly into a plastic enclosure, but I wanted to design something more visually appealing than a box. I worked with a sheet metal shop to create special tooling that allowed several extreme bends so that the enclosure ended up looking like a small race car. The design actually ended up winning an award from PC Magazine (now defunct) and several competitors copied my packaging idea. The

product took off and we were able to move to a plastic enclosure."

Later in her career, Moss moved into teaching. As an instructor she has seen the challenges young women face when pursuing their engineering degree. It reminds her of her experiences and why she thinks simple changes will help encourage more women to pursue this field.

"When I was pursuing my engineering degree, I was required to take a welding class. That was fine, but none of the helmets, gloves, and other equipment available fit me. I passed the class, but it was a safety hazard to wear a helmet I couldn't see out of and to use gloves that were so big I could barely feel the torch. I got an A in the class. but I should have gotten extra credit for doing a "Ginger Rogers"--I was expected to do as well as any of the male students, but "walking backwards in heels." It would be nice if engineering programs provided equipment that fit women. This is not just something that academia needs to address. Recently, NASA had to postpone a space flight with women astronauts because the space flight suits were too big for the women. Obviously, we still need to work on those issues."

Moss also noticed that most of the class projects were geared toward subjects men like, such as automotive or anything motor-driven. However, there is more to product design than these subjects.

"There is a huge need for engineers to develop consumer products and electronic equipment and similar projects that are often more appealing to women," she says. "I teach engineering design at a community college. My students have to do their own design project. One of my women students designed a yarn winder for knitters. This is not something I would have thought about or even proposed as a possible subject, but it required understanding electro-mechanical packaging as well as electronics."

Encouraging women to become engineers is important to the field. "Women tend to be more collaborative and more in touch with design-for-use scenarios," notes Moss. "We like to pick things up and see how they work and interact with them."

And encouraging others from all walks of life will benefit the engineering field. "I love working with people from other countries and other cultures," says Moss. "I learn so much from them because they approach problems from a totally different perspective. Engineering is basically solving a puzzle and seeing how other people work a puzzle can be very educational. I have found that Russian engineers are great at cutting costs because in their work they have had limited resources. Israelis are extremely creative and usually think outside the box. Engineers from South India are very document driven - they are very good at using outlines to keep track of tasks and keeping everyone moving in the same direction.

However, Moss is not a fan of mandatory hiring. "I've seen mandatory hiring," she says, "which, frankly, doesn't work because men become resentful and think that any women hired are somehow less qualified."

Aside from these efforts, Moss finds mentoring in such programs and STEM and STEAM to be a helpful tool to encourage women and others to consider engineering fields.

"I regularly volunteer for engineering camps for high school and middle school students. I mentor the students I teach at the community college. It's important to be encouraging and not to be an Idea Scrooge. It is gratifying to teach people a skill that can support them and offer them a rewarding career. "Studies have shown that girls excel in math up until middle school and then they start falling behind," Moss continues. "Some of this may be due to socialization or stereotypes that say only nerds like math. But part of the problem is the way math is taught. Many middle school and high school math teachers don't like math either and it comes across in the way they teach the subject."

Removing barriers

For those women new to engineering, Moss offers a few tips. "It's important to understand the scope of any project and understand that the nature of any design is trial and error," she says. "I've observed that when male engineers fail or make a mistake, they tend to shake it off and see it as a learning opportunity. But women tend to take the failures

I am primarily a CAD person. This means I spend 8-10 hours on a computer designing equipment using 3D computer aided design software. I tell people that I get paid a crazy amount of money to essentially play a video game. I am figuring out how to fit pieces together like a puzzle. more personally. Everybody makes mistakes. The best inventions have often derived from useful errors -like the post-it note. If you make a mistake, own it and learn from it."

But women face a number of barriers in engineering not usually faced by their male counterparts. Notes Moss, engineering is especially demanding in the first decade of a career. "I was working at start-ups putting in 80-hour weeks in Silicon Valley. It was expected and it was rewarding work."

However, balancing a career with work and home life, especially with young children, can be challenging. "It helps to have a supportive spouse and/or family to help." Moss advises that women build a good support system because the work can be stressful.

Learning to be a leader

Leadership skills are not just for those you supervise. For engineers, it's important to learn to lead all types of people including customers and managers. "Deadlines are artificial," says Moss. "Sometimes you get rushed to finish a design to make a trade show or end of guarter. But there is always another trade show and another quarter. It's important to manage the expectations of upper management on what can be accomplished with the resources available. I have taped connectors inside sheet metal to make it look like there was something inside the box for a trade show. It doesn't matter as long as they have something for show and tell."

Once a new engineer has had a few years of engineering under their belt, it's tempting to consider what career advice they would give to their younger self. For Moss, she would advise her younger self to do more hands-on projects; build an engine or a radio. "Men have an advantage because they often get the opportunities to do those types of projects," she's observed. "Women have to seek them out."

The number of women with degrees in engineering is higher than the number of women actually working in engineering fields. Moss's perspective on this is that women tend to get moved into other fields. such as sales, project management or software programming jobs. "These are valid career options, but these jobs pay less than engineering work," she notes. "Some of the problem may be recruiters who think it is easier to sell women to their clients for those jobs or it may be because those jobs pay less, women are somehow considered a better option. Either way, I recommend that women don't take the bait. You worked hard for that engineering degree. Hang in there and it will pay off. Because otherwise, it's like someone passing the bar and going on to work as a paralegal."

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Women in Engineering

Leading all the way to the top

Growing up in Iran, Anoosheh Oskouian was always challenged by her junior high chemistry teacher, sparking a genuine interest in the subject. When Oskouian came to the United States to attend high school, her passion for chemistry grew and continued through her university studies, where she majored in chemical engineering. Because her home country was "full of refineries," she knew that she wanted to apply her education to the oil & gas sector.

While working as a chemical engineer at Fluor Daniel, Oskouian met John Von Bargen. His technical knowledge of pollution control technology inspired her to pursue the environmental engineering side of the field, and she eventually founded Ship & Shore Environmental — as the current VP of Engineering at Ship & Shore, Von Bargen is still someone she says she regularly turns to for technical advice.

Oskouian feels that women can bring a different perspective to engineering than men.

"Our tendency to assess the overall picture, ability to multitask, problem-solve as well as provide solutions from a macro point of view allows us to offer multifaceted solutions. After all, engineering is all about providing solutions to the unknown," she said.

And she thinks that it is important to have more engineering technical programs available at an earlier stage of the learning process (such as in high schools).

"Let young women know that it is cool to be an engineer and even cooler to be one of the only females in such a male-dominated field," she said, "because intelligence is attractive!

In her current role, she says that it is imperative to adapt in order to stay relevant.

"With the ever-changing industry of Pollution Control Technology, our Ship &

Anoosheh Oskouian

President & CEO · Ship & Shore Environmental
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Shore technical and engineering team is constantly spending time and effort on internal R&D," she explained. "Sometimes people need a challenge in order to find out that they in fact are capable of much more, and fortunately I like to challenge people. I always tell them that growth is essential to success and in 2019 alone, we have already successfully launched three new technologies for the industry."

She also thinks that making mistakes is an important thing for engineers to do, because they learn from these errors.

"Those who are new to engineering should know that making mistakes is not only inevitable, but it is essential for advancement," she said. "Engineers should be taught that a mistake does not mean failure, but rather the contrary — a mistake means a lesson learned and one step closer to success. At my company, our engineers work as a team where they feel comfortable enough to share ideas, technical information, and calculations with one another."

Leadership and the future

In the beginning stages of Ship & Shore Environmental, Oskouian was in a meeting with several males that mistook me for a secretary.

"They were quickly put in their place the moment I introduced myself as the President & CEO of an engineering company," she said. "Women engineers may be perceived as less capable; however, if you have the confidence in your skills and intellect, no one can bring you down."

Oskouian lists several things that have helped her advance in her career and helped her become an effective leader:

• Have confidence in what you do, in your expertise, and your team's skills is key. That way you can encourage them to do more and accomplish great things.

- Have a vision as well as effectively communicating that vision to your employees so that they share that same vision allows for growth.
- Be adaptable and flexible it's essential in an industry that revolves around technology and fields that are constantly changing.
- With any business, there will be individuals that seem to not want you to succeed. As a role model to her company, she likes to make sure that they are always putting their most positive image out there, despite what others may doing in the industry.

Ship & Shore Environmental has an Engineering Mentorship Program, where Oskouian and her employees invite students from any high school or university to visit the company's manufacturing site. There, they are able to speak with the engineers, take a tour and see how pollution abatement equipment is made, as well as hear some technical talks with the corporate VP of engineering.

In her personal time, Oskouian has also participated in several youth programs and given talks to students in the STEM field. Recently, she was invited to speak at an event at Sage Hill High School called, "Wonder Women: A Women Empowerment Seminar." There, she told the students how she was able to pave her way through such a maledominated field.

And to that young girl, sitting in that junior high chemistry class in Iran all those years ago? What would she say to her now?

"I'd tell her don't ever take no for an answer and stay on your path," Oskouian said. "Do not be discouraged because you can do everything you put your mind to, regardless of your gender."



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Dr. Natalie Rudolph Mechanical Engineer

Women in Engineering



Finding acceptance in engineering

Dr. Natalie Rudolph grew up in Germany where she received her degree in mechanical engineering. She went on to accept a professorship in the U.S. in mechanical engineering as one of four female faculty in a group of 36.

Coming to the U.S. was a bit of a culture shock to her. "In Germany, I never felt that I was one of a few women, that I was the only female engineer in either academia or business. We have fewer female engineers in Germany, but I was always in groups where we were quite balanced or at least we never thought of ourselves as a minority. Then I came to the US and realized I have almost no female colleagues.

"Then in my role as professor, I saw almost no female students. It really switched my perspective from being part of a majority (engineer), which I still am in a lot of aspects of my life, to becoming a minority. I think that experience, (of feeling as though you are in a minority), is lacking for a lot of people, especially men in the workforce. My experience with Latinos and African American men is that they are more receptive to the problems women face. So, I'm not surprised that many women experience some challenges in the engineering field.

"In Germany, in engineering, if you're there, you're respected. German engineers in general are more results driven and so there's less of a perceived difference.

But I've experienced being overlooked or not picked first for a presentation, for example. What I see is that women must push themselves forward more and 'toot



our own horn.' I don't think it's necessarily on purpose, it's probably cultural, but women do have to make more of an effort to get noticed for their skills."

Dr. Rudolph was raised with the belief that she could do anything. As a young college student, her first major was design. By the time she made this choice, however, it was too late to submit a portfolio and enroll in the curriculum. The dean of that program suggested she start with textile engineering and prepare her portfolio that way.

"I was sitting there for two weeks in all the classes and realized I really liked the class. I liked the chemistry, the physics, the technical aspects of it. I think I'd much rather do this than the design, which I could always do, but if I didn't get the engineering basics, then it would be much harder to switch back. That was really how, by accident, I ended up in engineering."

Dealing with challenges

One of Dr. Rudolph's engineering challenges came during her PhD studies. "In Germany, a PhD means you're working but at an institute. You don't take classes, you have engineering projects and you formulate a thesis to solve a problem."

She was studying the behavior of polymer materials under high

pressure. "I used a different way of pressure application. My results consistently showed different responses than if you measured the traditional way."

Advice from her chief engineer indicated that something was wrong with her setup, analysis, or something else. He advised her to keep measuring. She realized after two more attempts that she needed to understand the underlying reason or cause and then come up with a theory to prove that. She worked at it until she came up with the idea that time depends on compressibility.

"No one had looked at that before and so no one knew really that there was a time dependence," she says. "And time dependence is a very typical thing in polymers, but again no one had measured that before. Also, past tests were using older technology. In the '70s, we weren't able to do the experiment that I did. Even the pressure sensors weren't as sensitive and available back then."

Dr. Rudolph was able to prove that the time dependence existed and defend her PhD thesis. Later, when she attended a plastics trade show, she ran into Professor Mangus, one of the most senior professors in the plastics industry.

"He had heard about my work and told me, "It's so great you finished what we started. We just could never continue the experiments and get to

"Often girls are intimidated by the perception of engineering. If exposed early, they can see the skills needed to do amazing things that can change the world are within their reach."



the bottom of it. We weren't sure what was really happening. You added this piece of the puzzle and I think that's really great."

"I learned a valuable lesson," says Rudolph. "Just because we hadn't measured it before, did not mean it doesn't exist. This lesson influences me about how I approach every problem. It helped me with students who come up with an idea. Today, I ask what the idea is and what could they do to test it out quickly."

Connecting women to engineering

Given Dr. Rudolph's experience as a professor, she is very interested in helping more women get involved in engineering. She's observed a difference between men and women in that many women assume they won't do well in this field, while men often overestimate how well they will do.

Dr. Rudolph sees the benefits of having strong, supportive groups for women in all fields, including engineering. "Collective learning for girls and sharing experiences is very powerful."

When asked what women can bring to engineering, Dr. Rudolph said, "For me, engineering is about identifying a problem, understanding what the root cause of a problem is, and then working on a solution.

"From my experience, I think that women look at the problem, they try to see multiple perspectives and assume multiple perspectives rather than just, "I see this, I'll solve it. Let's do it." Women think about it more. Maybe it's the tendency of women to be sure that what they're saying is correct, so they take a little bit more time for research and then look at different aspects of the problem. Men can be taught that process, but I think women inherently bring that quality to the table."

On the job advice

Confidence and fear of mistakes are issues every young engineer faces. Tackling these issues is a frequent challenge for management. Dr. Rudolph suggests one solution is to create communities to ensure young engineers have mentors to advise them.

"Making a decision that doesn't have a favorable outcome, that's what I would call a mistake. Yet, it is still a learning experience that won't happen again and maybe something good comes out of it. It's important to take away the fear. The chances of making a fundamental mistake are really low. Being just in your head normally results in self-doubt. I think what has worked for me is to not doubt and get feedback from the outside and in the workplace. I don't think these steps are common. and in engineering especially, it's not that common to seek constructive feedback on the good things. I think feedback is very important to create an image of yourself that's grounded more in reality than in doubt and questioning."

Dr. Rudolph's experience in academia and now in research and development have contributed to her leadership skills. "My nature is to be curious about everything, including people. I want to know and learn and I want to know what a person is about and what their hopes and dreams and fears are. That often gives me good insight in how people will react and interact and how I can support them to be the best version of themselves because I strongly believe that's the way to get highly productive employees. I don't know who said it, but someone smarter than me said there's not really a wrong employee, there's just a position that doesn't work.

And what would she say to herself if she were younger? "I would say follow your dreams. It will always be fine. Even if you studied something different there are so many ways of getting to a new career, but you don't know that until you've been there and maybe changed it and see other people change.

The joy of engineering

For Dr. Rudolph, the joy of engineering comes from doing something different, exciting and new every day. "There's an infinite amount of challenges to tackle which I see as very cool.

Dr. Rudolph sees the need to develop empathy in many people, but also sees it as a cultural challenge. "It's about putting yourself in someone else's shoes. Just play with a new perspective and see what thoughts might come up." M



Exploring creative problem solving

What draws a woman to study engineering? In a field considered to be dominated by men, what is the enticement? It varies from woman to woman. Some have family that either inspired or encouraged them to explore engineering. Some found inspiration in historical figures. Dr. Amanda Schrand found three motivators.

"First, I've always been drawn to solving problems and finding creative solutions as a process," she says. "Second, during my Master's studies in Biological Sciences, I also worked closely with the Electrical Engineering Department on an electrical current-based wound healing project. The two aspects of science and engineering seemed to go hand-in-hand to design the experiments and understand some of the biochemical and histological aspects of the cell alignment to direct or pulsed current.

"Lastly, I had the opportunity to work at Wright Patterson Air Force Base during my Master's degree in the Microstructural Characterization Laboratory. During this time, I realized that I enjoyed working with a variety of materials, not just biological or medical applications, but metals, ceramics and polymers for defense applications. So, at this point, I went back to school in the Department of Materials Engineering to formalize my education in engineering."

And, what could be considered a fourth influencer, Schrand says that Leonardo da Vinci and Frank Lloyd Wright exemplified both the artistic and creative side of engineering and were an early inspiration for her.

Schrand works for the Air Force Research Laboratory. She manages a team that has been working on developing new capabilities to address the survivability of electronics made through additive manufacturing. Schrand and her team have developed many new protocols and processes.

But all engineering faces design challenges. "We are in our biggest engineering challenge in one of our current projects to design and prototype a functional, conformal antenna to survive gun launch conditions," she says. "There will be a variety of optimizations in materials, mechanical and electrical engineering to generate strong adhesion, reduce mass and protect the surface."

Engineer, manager, woman and serving in the Air Force—that's a rare combination in this arena. But it doesn't have to be.

How to engage more women in engineering

It's no secret that the number of women with engineering degrees is higher than the number of women working in an engineering field. Schrand sees a number of factors contributing to the discrepancy

Dr. Amanda Schrand

Senior Engineer and Group Leader at Air Force Research Laboratory

– Women in Engineering

between engineering degrees and employment in engineering. She notes that for many women, the workplace is not flexible enough to meet family and career aspirations in the traditional nine to five working hours. Other women may not want to relocate where the greatest number of engineering jobs are and rather stay close to family, she adds.

Still, it's important to encourage young women to pursue a career in engineering. And for Schrand, the encouragement should start when the women are young.

"The biggest factors I see for promoting greater participation of young women in engineering is early engagement and encouragement," she says. "In fact, the primary reason that I pursued higher math and science was the early encouragement I received in grade school. The teachers that told the girls that we were doing good and could do and be anything if we put our minds to it had a lot of influence on my career choice."

A major factor when encouraging women into engineering fields involves instilling confidence in them. Mentors. teachers, and fellow engineers all play a role, but is it also up to the woman to develop her confidence. Notes Schrand, confidence in your engineering skills takes time and practice. However, it will happen faster with mentorship and encouragement. "And on the job training is one of the biggest factors in success for niche fields such as printed electronics. Don't be intimidated by technology, continuously learning, or about reaching out to women and men in the field who can guide your training.

"The foundational principles of electronics taught in college are applied, but the test methods and machinery are specialized and require the development of new protocols and processes, which requires on-the-job training," she continues. "As a check and balance, we have a small team that works closely together with other labs to share information and ask questions."

Schrand has been active in mentoring throughout her career. "I have worked with the American Chemical Society (ACS) Science Coaches (formerly Chemistry Ambassadors) program for many years," she says. "This program pairs a Scientist/Engineer with a Teacher and provides the classroom with a \$500 grant to buy classroom science supplies. It's been a great experience to share my career and encourage the next generation to pursue their interests."

For the younger generation, she suggests they build their skills and seek out early opportunities in programs like STEM. Other approaches that encourage the younger generation include simple steps like going to work with a parent or friend, or learning about STEM on YouTube, and trying experiments at home (with parent's permission and hopefully encouragement!) or attending STEM summer camps. "It's amazing how other doors will open once you get your foot in," she adds.

The feminine touch

It's no secret that men and women think differently, so the female perspective can offer insights and solutions to a range of problems and design challenges. But sometimes, it's the non-technical skills that make a difference, such as the search for efficiency.

"Most of the professional women I know are also mothers, so one of our biggest challenges is time management," she says. "But this also turns out to be a great asset once mastered. For example, many women have a great drive for efficiency in problem solving and are diligent in following up on tasks no matter the time or day. These traits are not uniquely 'female,' but sometimes emphasized due to other commitments and part of 'proving' that we can excel in our work, which may not be as prevalent in male counterparts."

Another aspect where men and women differ is in leadership styles. Schrand says her leadership style mirrors the idea of Dwight Eisenhower's quote "Leadership is the art of getting someone else to do something you want done because he (she) wants to do it."

"My responsibility is to set the team vision based on knowledge of the state-of-the-art and build a team based upon both the individual team member's skills and interests. I have learned the value of time spent listening, which is that it fuels the strongest relationships and supports the best decisions. I've also learned to follow my intuition and choose activities for myself and team members that rely on our unique skills and expertise for the greatest combined success."

When building that team, Schrand considers diversity an important aspect. "Diversity is a huge asset to a team if done for the right reasons," she says. For example, a diversity of complementary fields such as electrical, mechanical and materials engineering can lend different engineering viewpoints. Similarly, a diversity in level and type of education (including self-taught, technician, senior engineer, post doctorate, and so on) and diversity in training such as backgrounds in industry, academia and government strengthens a team. The diversity of gender and age bring additional valuable perspectives and experience to the table, especially on goal and efficiency oriented teams."

Because engineering is primarily about problem solving, the more perspectives one can bring to the problem, the greater the chances of finding the best solutions. *1*/2

Someone just suggested that she'll make a very good princess someday . . .

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Florbela Coroas Da Costa

Technical Project Manager Aerospace **maxon**

MSc Aeronautical Engineering

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What makes your company inclusive or supportive of women? What do you enjoy about working there as an engineer?

I feel that maxon appreciates having women on the team to create diversity in the workforce, and bring together different skills and mindsets. What I enjoy the most as an engineer is the process of finding a solution for a specific problem; by brainstorming with the team, asking questions with the expert or by requesting laboratory tests. At maxon, I feel that I learn new things every day.

What first drew you to engineering?

My favorite subjects in school were mathematics and physics because you need to understand the logic behind it. With that understanding, you start seeing these subjects in everything you do and it gets so interesting to recognize the how and why things works as they do. That is what drew me to engineering.

Were there any influential engineers (women or men) who helped shaped your decision to become an engineer? If so, who and why?

Yes, my uncle who is a mechanical engineer in the automotive industry and works as a project manager. I remember one day when I was in college, I asked him to explain to me about the project he was working on. He showed me a 3D drawing of the interior of the car his team was developing and explained a production issue he was facing. I was fascinated.

What barriers do women face in today's engineering world, if any?

Unfortunately, this is still a male dominated field and many still do not view women as competent as man in the engineering community, but luckily this is changing. My first boss told me once that he did not agree with women being in charge. Fortunately, he changed his mind a few years later and put me in charge of the biggest aviation project that my previous company was working on.

Describe your biggest engineering challenge and how you resolved it.

In project management we face new challenges all the time. What I really like is, at maxon, the team works together to solve challenges and trials; tests are run when a new technology or process is needed to resolve the issue. It is very interesting to be a part of these discussions, since it is the best way to learn and grow.

For more of Florbela Coroas Da Costa's comments, see them online at www.designworldonline.com





Faith Wilson

Outside Sales Engineer Newark Electronics

BSEE, DeVry University



Talk about the culture at your company. What makes it inclusive or supportive of women? I am fortunate to work for a company which promotes growth and enhances knowledge and skills. My management and leadership team are supportive for continued educational endeavors. Newark provides consistent training, tools and the ability to enhance their employees desire to learn. It was through the support and assistance of Newark that I was able to obtain my Engineering Degree and have been afforded the opportunities to use my knowledge to assist my peers and customers with my knowledge. There is a constant promotion of team work, with all members sharing in the pride and passion of everyone's success. Whenever a challenge or opportunity presents itself, there is a combined effort to ensure success both, professionally and personally.

What first drew you to engineering?

I have always had an entrepreneurial spirit. During my early years, I always had ideas of future inventions and knew that one day I would take the steps to fulfill this passion.

Describe your biggest engineering challenge and how you resolved it.

The largest hurdle was to get started. There was always the mindset that "there is not enough time, or I will never be able to finish obtaining my degree." The thought that it would be too hard to obtain the degree was always a dilemma. One day, I said, I can and will do this – I focused on working very hard from start to finish - it was easier than I thought it was going to be!

Talk about your leadership skills. What lessons have you learned?

I am always excited to help a team member who would like to take a sale to the next level and requires technical assistance to get there. I have learned to work closely with all team members to discover what our clients require and utilize my training to assist my team with their endeavors. Through the years, I have learned how to be of maximum benefit to my coworkers

What career advice would you give to your younger self? YOU can do this! Don't be fearful that the challenge is too great. Ask as many questions of people who have been through this process and have excelled in your chosen field. Seek guidance through educators and people in your community who already have the knowledge that you are seeking.

For more of Faith Wilson's comments, see them online at www.designworldonline.com



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