

# Engineering Women

*Three Shaker moms blaze to the top of a male-dominated profession*

By Amy Garvey

The Mattel Toy Company is overlooking a major marketing opportunity. They may have appeased some people when they removed the “Math-is-hard” Barbie from the market, but they didn’t go far enough. Think of it: Metallurgical Engineer Barbie. Biomedical Engineer Barbie. Electrical Engineer Barbie. There isn’t a mother in Shaker who wouldn’t consider those to be Barbies worth purchasing.

There are at least three mothers here who could provide tips on developing the new line. Clare Rimnac, 47, is an associate professor of mechanical and aerospace engineering at Case Western Reserve University. She spends much of her time researching the biomechanics of joint replacements. Kath Bogie, 41, also works at Case. Her research specialty is biomedical engineering. Linda Rae, 37, took her electrical engineering experience and parlayed it into a position as senior vice president and general manager of Keithley Instruments in Solon. They were among the first few women to enter their fields, and are pleased that more females are following their footsteps.

Rae says that she simply always liked math. When her high school calculus teacher asked her what career path she was considering, she replied that she thought she might be a math teacher. The teacher’s quick response was that there was no money in it, instead she should apply her skills in some way. Coming from a long line of engineers — her father, grandfather, and great-grandfather were engineers — Rae decided to study computer engineering at the University of Florida. When she discovered that was more about software than the nuts and bolts of a computer, she changed her major to electrical engineering.

“There were probably less than 10 females in the program,” she recalls. “I hung out with men all day. In graduate school I was the only female in the field. There were more females in the other engineering disciplines, but the double E’s is mostly male dominated.

“I think being female actually helped me. You definitely stand out as a student. You get noticed. I’m sure it helped me when it came time to get a job. There simply weren’t any other female applicants.”

Rae’s first job took her into chemical plants as the lead engineer on projects. “There would be some guy who’d worked in the plant



**Linda Rae**, senior vice president and general manager of Keithley Instruments in Solon, lives with her family in Boulevard.

**Clare Rinnac** both researches bone fractures and investigates joint replacement failure at Case Western Reserve University.



for 30 years and I walked in and introduced myself as the lead engineer – it usually raised a few eyebrows. They may have been skeptical, but once you show you know what you're doing, they forget about it."

Wanting to move into management, Rae earned an MBA from Case. She entered marketing at Keithley Instruments, and was recently promoted to senior vice president and general manager. Keithley makes testing instruments that measure the flow of electricity for manufacturers, research institutions and engineering schools.

"I've had a great career," she says. "The engineering was a great foundation for me. I wouldn't recommend taking business as an undergraduate and expecting to do what I do in a high-tech field. If you take the engineering then you can understand the language of the actual business. I'm still speaking that language every day."

Rae would encourage any woman to consider any of the engineering fields, as long as they are comfortable with math.



“I feel like I have my cake  
and can eat it, too. I have  
engineering colleagues now,  
and I have my research. I  
don't have the commute and  
cost of living of New York  
City. I traded the commute  
for a four mile drive through  
a beautiful park.”

— *Clare Rimnac*

“When girls are young, they love math, then in their teens for some reason, society teaches them that they can't or shouldn't like it and excel in it. Their confidence level plummets. Parents should not discourage them to study. Women can excel in math and science. In this technical age a numeric background is going to be necessary for most jobs.”

Rae's downtime is spent decorating her Boulevard neighborhood home and raising her children Madeline, 5, and Sam, 7. She and her husband, pediatrician Andrew Hertz, appreciate the irony of their dual-career home. “He spends most of his day with women, and I spend most of my day with men,” she laughs.

Clare Rimnac originally thought she might study genetics and biology but once she learned that to do that she'd have to pursue a doctorate, she was concerned that she might not have the stamina to follow it through. “I guess I was a risk averse person,” she says. Her family pointed out that she was very practical minded and ought to consider some kind of engineering. “I had no idea what an engineer did, but I was intrigued,” she says. “I can actually remember looking in the mirror and saying, ‘Is this the face of an engineer?’” As an engineering student, Rimnac initially considered chemical engineering but found that metallurgy and materials engineering was more to her liking. The department welcomed her warmly.

“Any time anyone showed any interest at all in metallurgy and materials, the department was keen to hold onto you. I remember I received an invitation to a department event for students which I didn't attend, and soon after I had a note from them saying, ‘We really missed you! Please come to the next meeting!’”

“There were only a few women in classes with me at the time. It's better now than it used to be, but it still could be better. Of the engineering students at Case, about 25 percent are women. Someone once described engineers to me as problem solvers. That's exactly what we are. Someone who is practical, is interested and good in math, and enjoys physics, chemistry and biology is perfect for the field. As an engineer, you learn how to diagnose and solve problems.”

Rimnac's undergrad studies were done at Carnegie Mellon University in Pittsburgh,

Pennsylvania, where she became involved in a research project studying railroad steel. She did her graduate studies at Lehigh University in Bethlehem, Pennsylvania where her advisor was studying how and why plastics fracture and fail in certain situations.

“He was a very enthusiastic and colorful man who was infectious with his enthusiasm for his topic,” she says. The next thing she knew, she was going after that Ph.D. after all. Following her doctorate, she worked at the Hospital for Special Surgery in New York City in a research department of biomechanics. “My advisor was doing some consulting work for them and he took me with him for some meetings and I was very excited by their research on total joint replacements. They offered me a post-doctoral fellowship and eventually an appointment as a scientist with them.”

Rimnac stayed there for nearly 10 years studying various materials used for joint replacements and the functional properties of bones. “It got to a point where I wanted to break away from the place where I did my post-doctoral work and be associated with an engineering school,” she said. “As luck would have it, there was an opening at Case where there is a long history of interdisciplinary research between the Departments of Mechanical and Aerospace Engineering and the Department of Orthopaedics. I was offered a faculty position in 1996.”

Rimnac’s research is primarily funded by the National Institutes of Health. One of her research interests is failure analysis of joint replacements. “It’s a way of closing the design loop,” she says. “When joint replacement devices fail and are removed from a patient, they come to my lab. I look to see what kind of damage there is, what in the design might have caused it, is there a better material that could be used.”

“I also study the mechanical properties of bone tissue – what leads bone to weaken and how cracks form and grow in bone. I’m interested in the natural repair process that occurs so easily when we are younger, but not as easily as we age. We are also developing custom scaffolds that will someday be used to replace large defects in the skull.”

Heady stuff, indeed. In her downtime, Rimnac enjoys gardening and playing piano in “a very bad trio” with other faculty members. “We have a go at it about once a week, she says. “And every once in a while we even sound musical!”

Rimnac’s husband, Tom Hering, is an associate professor and molecular biologist in the Department of Orthopaedics



Following her doctorate in engineering at the University of Oxford, **Kath Bogie** set up a spinal injuries clinic in England. She now works at CWRU.

at Case’s medical school. The three teenagers in their home, Michael, Heather, and Greg, are sort of surrounded by science. “Our poor kids,” Rimnac says. “I can remember someone asking Heather, ‘Do you want to grow up and be a scientist, too?’ She said, ‘No.’ She wanted to ‘be a hair cutter.’”

“I must say my career has been very interesting and satisfying. And now I feel like I have my cake and can eat it, too. I have engineering colleagues now, and I have my research. I don’t have the commute and cost of living of New York City. I traded the commute for a four mile drive through a beautiful park. I feel I really have it all.”

Kath Bogie’s road to biomedical engineering wasn’t a straight one, but never for a moment did she feel she shouldn’t be studying science. Perhaps that’s because she went to an all-girls school near London, England. “In high school, you either studied the arts and became a teacher, or the sciences and you became a doctor. Well, I didn’t want to do either one,” she says. At the University of Manchester she studied metals and materials technology but didn’t want to spend her life “studying widgets” so she began casting about for ways to apply her knowledge to people. That’s how she found biomedical engineering.

“It’s a huge field, really, and covers an awful lot of different things from fixing the machines in hospitals to doing research. What I really wanted to do was take my knowledge and apply it to helping people. Once I figured out what it was I didn’t know where I could do this. I ended up sending letters out asking about it and it turned out Oxford University was doing clinical applications in the field. My project was seating assessment – how seating affects the func-

tion of the body. I studied posture and chairs and made measurements and came up with an adjustable chair that could be adapted to fit anyone.”

Her specialty brought her to the attention of the National Spinal Injuries Center in England. “It was the very first hospital in the world to be dedicated to the study of spinal injury. It was founded after World War II when, for the first time, there were so many veterans with spinal injuries who were surviving. They were developing new treatments for these people, figuring out how best to look after and rehabilitate them. I did some research there that had clinical applications. In fact, the clinic I started is still running.”

Like Rimnac, Bogie found a new home with Case Western Reserve University. Her research is done at the Cleveland Functional Electrical Stimulation Center, a partnership of the Cleveland Disabled Veteran’s and Metrohealth medical centers and CWRU, where she studies clinical applications and therapeutic applications of electricity for muscle function.

“The body runs on electricity, really,” she says. “Someone with a spinal injury no longer has the full electrical functions of the muscles beneath the injury. We can provide electrical stimulation to their muscles to help them contract and be healthier muscles. We can help with many types of function, from standing to bladder control. Right now, I’ve been working on using artificial stimulation to help prevent pressure sores and ulcers. Someone with a spinal injury basically just sits all day. They can’t even fidget. And essentially, the skin just begins to die. It can get quite gruesome, really. And the healing is a long process.

“With implants, the muscles can be electrically stimulated to allow the person to shift position and keep the skin healthy. We’re also looking at ways to use electricity to help in the healing process, not just the prevention.”

In Bogie’s current position, she doesn’t design the devices, she just has to come up with the idea. “Here I can go to the electrical engineers and say, ‘This is what I want to do.’ And they develop the technology.”

Bogie’s downtime is spent with sons, Joseph, 9, and Nathaniel, 4. She chose to live in Shaker Heights because of its sidewalks and interesting architecture. “I just think laundry chutes are really neat!”

she says. "And being so far from home, this is a place that gives us a sense of community."

Without a daughter to urge into the sciences, Bogie has turned her attention to female students at Case. She helps organize the WISER program: Women in Science and Engineering Round Table. "The number of women in the science and engineering fields hasn't changed much since I entered," she says. "And we found that too many of those who began studying in the field were discouraged and dropped out. We set the program up

"Women can excel in math and science. In this technical age, a numeric background is going to be necessary for most jobs."

— *Linda Rae*

to support freshmen women as they make their way through what is still a fairly male-dominated world.

"We have discussion classes where the women speak freely. In mixed classes it's still the males who do all the talking, and we all know that women can talk. We want them to feel confident about speaking in public and questioning people."

WISER also started a mentor program where juniors mentor incoming female freshmen. The first year they had about 15 people volunteer to be mentors; the group has recruited nearly 40 mentors for next year. "It's just a great support system, not just academically," she says. "The mentor has already been through what you are going through and can share ideas about how she dealt with it, even if it's advice on how to deal with a certain professor."

Rimnac, Bogie and Rae succeeded in their fields without the benefit of an aptly-named Barbie as a role model. Now they stand as better-than-Barbie role models for legions of smart girls everywhere. Now it's your turn — hand this article to the smartest girl you know. 🍌