

SUMMER PROGRAMS, COMPETITIONS, INTERNSHIPS, COLLEGE COURSES: ASPIRING ROBOTICISTS TODAY CAN EXPLORE THE FIELD THROUGH A WIDE RANGE OF OPTIONS. ELIZABETH BIANCHINI'S LIFELONG PASSION FOR BUILDING LED HER TO MANY OF THESE OPPORTUNITIES. NOW A SOPHOMORE AT MIT, ELIZABETH EXPLAINS HOW THESE EARLY INTERESTS HELPED HER REALIZE WHO SHE WANTS TO BECOME.

# BORN to BUILT

## The Making of An Engineer



by Elizabeth Bianchini

CRL's MultiSense SL, a 3D stereo and laser sensor

**N**ot every kid building sandcastles on the beach will become an engineer, but that's how I started: Before I could walk or talk, I built sand walls until I completely surrounded myself. I've been building things ever since, whether it was my fourth-grade Halloween costume (a robot complete with a circuit board with flashing LEDs) or the steel cantilevered lamp my uncle helped me design and weld in ninth grade.

At the time, I thought I was just making interesting and increasingly useful objects—shelves, a nightstand, a couch. But looking back, I realize I was foreshadowing the rest of my life.

### **FIRST: An Engineer's Launchpad**

When I got to high school, I found for the first time opportunities to get involved in organized engineering. I joined my school's chapter of the Technology Student Association (TSA), through which I competed in events involving aspects of technology such as computing, the design process, construction, and problem solving. But it was during my sophomore year, when I got involved in *FIRST* Robotics, that my engineering interest really solidified. I joined the Girls of Steel (GOS), an impressive community team of between 40 and 60 girls from over 20 schools in the Pittsburgh area. The team was beginning its second year when I joined. To this day, they have qualified for the *FIRST* World Championships every year since they started.

I came to GOS with technical experience in machining and computer-aided design (CAD), but I was also introduced to programming,

electronics, and even business aspects of running a team, such as finance, outreach, and media. While learning these new skills was fun and incredibly worthwhile, my team also valued each member's specialization. Initially, I contributed to the team with the welding skills I'd learned from my uncle. Then, during build season I learned the more challenging skill of welding aluminum. My team chose me as welding leader for two years, and in my senior year, I became the mechanical leader, overseeing not just welding but all of the hardware construction.

My involvement in *FIRST* connected me to a huge community of aspiring engineers and scientists, from whom I learned about numerous other programs. One summer, I signed up for computer science and design classes through Carnegie Mellon's precollege program; the next, I participated in the Pratt Institute architecture and design precollege summer program. Throughout my junior year, I completed a robotics apprenticeship at the Carnegie Science Museum. And during my senior year, I dual-enrolled at Carnegie Mellon to take physics and mechanical engineering classes.

### **Real-World Applications**

I'd had amazing engineering experiences throughout high school, so I didn't hesitate to choose MIT for college. In between life stages, I wanted to make the summer before college count, but I wasn't sure how. One of my *FIRST* mentors pointed me toward Carnegie Robotics, LLC (CRL), an industry spin-out of Carnegie Mellon's National Robot-

ics Engineering Center. Luckily for me, CRL was looking for interns.

I didn't exactly know what CRL did, but I knew robotics would be involved. So in the winter of my senior year, I sent them an email with my résumé. I was thrilled when I got called in for an interview with then-CEO John Bares, and ecstatic when he offered me a summer mechanical engineering internship.

In June, I reported to the office for the first time and met my supervisor, Chris Osterwood, a senior mechanical engineer. Chris soon threw me into the same projects as other full-time employees, starting me with editing code to run data collections from a couple of CRL's MultiSense 3D stereo and laser sensors.

I usually worked for eight or nine hours a day, five days a week. Mainly I was working with CRL's MultiSenses in order to map underground city infrastructure. I spent countless hours driving a rover, with our MultiSense mounted on it, up and down some test pipes behind our building. I also did some coding and network configurations in order to log data from two of these MultiSenses at once. Afterward, I analyzed the data to find the optimal driving conditions that resulted in the most accurate 3D mapping.

In addition to those tasks, I was encouraged to jump in on other projects: I tested different lasers, helped wire a rotary jig to test the robustness of some CRL products, took apart a Microsoft Kinect to study its electrical components, and configured computer boards to communicate with a MultiSense. Every day was different in terms of tasks and projects.

Before my internship was over, John Bares told me he had heard good feedback from my supervisors and collaborators. He ended the conversation with an invitation to come back the following summer. I kept that offer in the back of my mind as I headed to college.

### Freshman on a Mission

By the time I arrived at MIT last fall, my solid technical background had prepared me well for the academics of engineering school. But there was still more to learn outside of classes, so I took advantage of many unique opportunities.

Among other incredible experiences, I joined MIT's Robotics Team, took a winter internship at New Valence Robotics, Inc., and conducted research in MIT's architecture department. I helped organize MakeMIT, an annual hardware hackathon for over 200 U.S. undergraduates, and assumed the role of MakeMIT 2016 Event Director. I also joined the Society of Women Engineers and the Association for Women in Science.

It was an intense, energizing year at MIT. Once it was over, I wanted to apply all I had learned by contributing to CRL again. I couldn't wait.



Top: Elizabeth's FRC team, Girls of Steel, in the pose of their mascot, Rosie the Riveter.  
Bottom: Elizabeth with the MakeMIT team.

### Seeing the Future

A lot of things from the previous summer were still the same. I welcomed every offer of a spontaneous task to do, just as I did the summer before. While I started my main work on more lasers, collecting 3D range data, and coding, I got pulled from behind my desk to work on CRL's latest military contract project—a mine detection robot.

Other things about CRL have changed a lot, but none more than I have. I am a different person from the high school graduate who walked into CRL's office in June 2014. I have made many more connections to the engineering world through CRL, MIT, and the countless new friendships these places have afforded me. It is a path I have been on since childhood, but the whirlwind of the past year has helped confirm what I want to do with the rest of my life: I want to create things that improve people's lives. I want to be an engineer. ■



**Elizabeth Bianchini** is a sophomore at MIT, majoring in mechanical engineering. She loves every water sport she's ever tried, being ridiculous, playing very bad beach volleyball with friends, running, building things, and blessing too many moments with her unforgettable karaoke. Elizabeth tries to be nice to her sisters and would do just about anything for her dog.