DO YOU WANT TO BUILD A ROBOT?

HOW STUDENTS ARE DISCOVERING NEW CAREER PATHS THROUGH FIRST.

BY LEN VERMILLION

There are varsity sports, and then there are sports for the mind. And you don’t have to worry about boys competing against boys, girls against girls. Sometimes freshmen can get the better part of the seniors, too. It all depends on your design—and your robot.

The FIRST Robotics Competition is a just that type of high school sport. The brainchild of legendary inventor Dean Kamen, FIRST—For Inspiration and Recognition of Science and Technology—is a not-for-profit organization that inspires young people to pursue science and technology careers through a progression of four programs that offer robotics and innovation challenges. The FIRST Robotics Competition is one of the programs, and each year FIRST hosts an annual international championship for all four programs. The recent 2014 championship helped some 67,000 high school students around the country compete in regional and national competitions. The high school teams, often from one school or organization and mentored by a local company, design and roll robots that shoot balls into a goal and compete against each other in what amounts to a pretty intense competition.

STEM JobsSM visited one regional event held at California University of Pennsylvania this past spring and met up with several teams vying to make it to the international championship in St. Louis. The scene inside the college basketball arena rivaled any high school or college sporting event. Cheering crowds filled the seats. Vendors sold hot dogs. Fans held up signs. And the action on the floor was thrilling and often came down to last-second shots.

One of the teams in action was one you might not expect to see in a robotics competition. The all-girl team, Girls of Steel (GoS), has been a staple of the competition for the last few years. Dressed in flannel shirts and red and white polka-dot bandanas, reminiscent of the old “Rosie the Riveter” image from the 1940s, GoS featured girls from multiple schools in Pittsburgh, Pa., who gather at Carnegie Mellon University each year to build what they hope will be a winning robot. And the girls often come to the team without having any previous interest or skills in robotics. “I had no hands-on experience in STEM fields before coming into FIRST, so this is really my first time getting into robotics,” says Naoka Gunawardena, who has been on the team for four years and this past year served as one of its two main leaders. “One of the cool things about FIRST is that I not only get to do design stuff, but I’m the business leader for GoS. I get to learn all of these amazing skills.”

Since she has been involved with GoS, Naoka has found her calling in life. She’ll attend Yale University this fall in the mechanical engineering program. “I used to want to always be an astro-
naut, but I think I’m now leaning toward doing planetary robotics, “ she says. “Working with FIRST has been incredible, “ Naoka continues. “When I started I didn’t think I’d be this into it, but when I joined I realized that this is what I love doing. This became my main extracurricular and I dedicate a lot of time to it.”

Talking over the cheering crowd in the arena during a break from preparation for the next GoS match, Naoka explains just how much students get to learn from FIRST. “The design team is a really small group of girls, and we’re responsible for designing a whole robot, “ she says. “It was scary because getting into the nitty-gritty of the design is a big challenge, but it taught me a lot. “

For many students, their time with FIRST doesn’t end when high school ends. Even after their experience leads to career path choices, many participants return as young adults to serve as mentors. Rachel Holladay is one of those mentors. A freshman at Carnegie Mellon majoring in computer science with minor in robotics, the Louisiana native mentors GoS while at college. She also co-mentors her former team in Louisiana with her mom, Wendy, who works at NASA Stennis Space Center.

“I really feel as though I am a product of FIRST Robotics. It shaped me in a large way. It’s like a family, “ she says. “The mentors who guided me had a huge impact, and I’m paying them back. “The experience exposed me to computer science and robotics, “ she continues. “It actually gave me experience in robotics and the chance to discover that this is what I am passionate about. This is what I want to do with my life. “

GoS finished 6th at the Pittsburgh Regional, and while the team did not qualify for the finals at the Pittsburgh Regional, it did qualify for championships in St. Louis at the Buckeye Regional held March 20-22, 2014, by winning the Engineering Inspiration Award at those events. This award “celebrates outstanding success in advancing respect and appreciation for engineering within a team’s school and community” and is presented to the team at a regional competition that best achieves this by reaching out to their schools, sponsors, other FIRST teams and their community with educational activities, robot demonstrations or presentations about their team, raising awareness of FIRST and STEM fields.

Simran Parwani and Sylvie Lee, both of GoS, won Dean’s List Finalist Awards at the Pittsburgh Regional, and Simran won one of 10 Dean’s List Awards at the championship in St. Louis. The final in St. Louis came down to a heart-pounding conclusion in front of a roaring crowd of 20,000, when four teams from San Jose, Calif.; Bloomfield Hills, Mich.; Dallas, Texas; and Holland, Mich., won the coveted FRC® Championship Winning Alliance.

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MILITARY VETERANS & ACTIVE DUTY I NATIONAL GUARD I AND RESERVISTS

You served with integrity, commitment, and a relentless pursuit of excellence. Values like those make America’s military veterans and ideal fit for Intel. And they’ve helped make Intel the world’s largest chip manufacturer. But today’s mission is even bigger: in this decade, we will create computing technology to connect and enrich the lives of every person on earth. And we’re looking for mission-driven veterans to join us on that journey.

BotsIQ OF SOUTHWESTERN PENNSYLVANIA

STEMers were going robotic as the ninth annual Southwestern Pennsylvania BotsIQ Competition kicked off at the California University of Pennsylvania Convocation Center.

The two-day event invites 72 student teams from across southwestern Pa. against one another to battle bots. This is a great way for students to have some fun with STEM, but the even more exciting part comes from the opportunity to learn some skills that will help them in their future careers. Companies come from across the state to scope out potential STEM talent in the works.

One sophomore from Penn Manor High School said that he learned a lot from the competition including electrical, engineering and programming. “It is definitely exciting and a learning experience, “ he says.

2014 SWPA BotsIQ Competition Winners

Grand Champion: Plum HS Still ‘N Shock 2
First Place: Plum HS Still ‘N Shock 2
Second Place: Hempfield HS K.A.R.A.
Spirit Award: Punxsutawney HS
Best Rookie: Freedom HS VEKA
Best Sportsmanship: Eastern Westmoreland CTC Titanix Mayhem
Best Engineering Documentation: Highlands HS Notorious B.O.T.
Best Mentor: Bot: Hempfield HS K.A.R.A.
King of the Ring: Admiral Peary AVTS Biohazard
Coolest Bot: Punxsutawney HS SAW-3PO and Admiral Peary AVTS Biohazard

SWPA BotsIQ $500 Scholarship Award
Renee Huey - Punxsutawney HS
Joshua Worstell - Keystone Oaks HS
EXPLORING STEM // THERE ARE ROBOTS IN THE OCEAN!

SINK OR SWIM

As summer winds down, the beach may seem like a distant memory. Wouldn’t it be awesome to have a job that let you be at the ocean year-round? Well, you can. ExplorOcean is America’s premier ocean literacy education center, and it seeks to inspire, educate and engage the explorer within through interactive experiences centered on the seven principles of ocean literacy. ExplorOcean aims to create the ocean literate citizens of tomorrow through rewarding, enriching and experiential programs and services that excite, inspire and educate. The organization believes it is vital for individuals to think critically about the ocean and to understand its impact on the world and how people impact the ocean.

Dr. Wendy Marshall, director of education and public programs for ExplorOcean, is dedicated to helping students reach their full STEM potential. The Orange County, Calif., organization offers world-class educational programs from the perspective of science, technology, engineering and math education. ExplorOcean is a cultural institution where visitors immerse themselves in interactive hands-on activities devised to build 21st century skills. Its high-quality educational programs are grounded in the seven principles of ocean literacy and include single- and multi-day camps, after-school classes, school field trips, and monthly lectures and seminars. Its underwater robotics program has been nationally recognized by the U.S. Navy Office of Naval Research.

Headquartered on the Balboa Peninsula between the sparkling Pacific Ocean and the bustling Newport Beach Harbor, the facility’s nearly two-acre location is the perfect place for people of all ages to delve into the immense depths of the seven seas and unlock the secrets held within. With quality curriculum, enthusiastic educators and programs that foster hands-on learning, teamwork and communication skills, ExplorOcean seeks to inspire the next generation of ocean voyagers and explorers.

VISITORS AT EXPLOROCEAN GET SOME HANDS-ON EXPERIENCE BUILDING AQUATIC ROBOTS

THERE ARE ROBOTS IN THE OCEAN!

USE YOUR STEM SKILLS TO EXPLORE THE OCEAN.

BY NICOLE RAYE

As summer winds down, the beach may seem like a distant memory. Wouldn’t it be awesome to have a job that let you be at the ocean year-round? Well, you can. ExplorOcean is America’s premier ocean literacy education center, and it seeks to inspire, educate and engage the explorer within through interactive experiences centered on the seven principles of ocean literacy. ExplorOcean aims to create the ocean literate citizens of tomorrow through rewarding, enriching and experiential programs and services that excite, inspire and educate. The organization believes it is vital for individuals to think critically about the ocean and to understand its impact on the world and how people impact the ocean.
COOL INDUSTRIES // ROBOTICS
DO THE ROBOT

THESE ARE THE DROIDS YOU’RE LOOKING FOR

ROBOTS ARE INVADING TODAY’S INDUSTRIES!

BY MIKE ASPER

HEALTHCARE
The University of California, San Francisco is home to a high-tech pharmacy that utilizes robots to count and process medications. These robots have processed over 350,000 doses of medication without making a single error!
source: ucsf.edu

EDUCATION
French robotics company Aldebaran has developed humanoid robots that can help children with autism to learn more effectively. Since the robots have no emotion, autistic children find them less threatening than humans, and therefore easier to engage with.
source: bbc.com

LOGISTICS
Internet retail giant Amazon.com has been testing new delivery drones that could revolutionize the way we receive our packages. While the technology is still a few years away, this delivery system could get your order to you in less than 30 minutes after you place it!
source: usatoday.com

MANUFACTURING
Baxter, a robot created by Rethink Robotics, was built to work in today’s manufacturing environments. Employees can train Baxter to perform their more mundane tasks for them and supervise him as he works.
source: forbes.com

Check out STEMjobs.com to find more cool opportunities to work with robots!

source: STEMjobs.com
## EE.0 ROBOTICS

### STEM JOBS BY SALARY

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### WHAT WILL I DO?

**Electro-Mechanical Field Service Technician**
- You operate on customer sites in an on-call capacity. Duties include installing and repairing robots and robotic systems, and training customers on how to maintain them. You perform trial tests of the robots to ensure performance rates and quality to meet established specifications.

**Robotic Machinist**
- You make the parts that make the robots, and likely use robots or at least programmable machines to make the parts. The world of Computer Numerically Controlled (CNC) Machining is changing with the advent of new technologies and especially 3D printing.

**Automation Control Specialist**
- You set up new programs and configure the interface to perform specific tasks. Additional activities will include troubleshooting programs to get machines running at desired capacity and efficiency.

**Bio-Medical Roboticist**
- You work hand-in-hand with machine and robot operators and clinicians to troubleshoot, reprogram or operate in high-pressure situations. You are the mind behind the machine, and few robotics environments are transforming more rapidly than in the medical fields.

**Mechanical Designer**
- You create machines, products and new technologies, or at least their physical and final forms. You work as part of a mechanical design team to design, build, field-test and deliver the most advanced dynamic robots on the planet.

**Data Technologist**
- You leverage your technical skills, business acumen and creativity to extract and analyze massive data sets and have it make sense. All the data in the world is meaningless if it cannot be converted to actionable knowledge.

**Control Systems Engineer**
- You design robotic control systems and create dynamic simulations of robotic systems for early stage development, as well as, on robot testing to deliver real-world machines.

**Software Perception Engineer**
- You write the software, conduct sensory experiments, test robots on rough terrain in the rain and snow, communicate results to experts and laymen, operate with the team to push high profile demos and develop innovative solutions to new problems.

**Drone / UAV Operator**
- Remote vehicle pilots or drone operators are more system commanders than pilots, but will still require a commercial pilot license for aerial drones, though drones increasingly are land and sea based. Fly without getting airsick!

**Human Factors Engineer**
- You combine the skills of psychology and engineering to design human-machine and human-computer interfaces and investigate ways to add address issues and improve these relationships.

### WILL I LIKE IT?

**Amarillo College**
- You make the parts that make the robots, and likely use robots or at least programmable machines to make the parts. The world of Computer Numerically Controlled (CNC) Machining is changing with the advent of new technologies and especially 3D printing.

**Academia Technical College**
- You set up new programs and configure the interface to perform specific tasks. Additional activities will include troubleshooting programs to get machines running at desired capacity and efficiency.

**Central Lakes College**
- You work hand-in-hand with machine and robot operators and clinicians to troubleshoot, reprogram or operate in high-pressure situations. You are the mind behind the machine, and few robotics environments are transforming more rapidly than in the medical fields.

**Idaho State University**
- You create machines, products and new technologies, or at least their physical and final forms. You work as part of a mechanical design team to design, build, field-test and deliver the most advanced dynamic robots on the planet.

**DePaul University**
- You design robotic control systems and create dynamic simulations of robotic systems for early stage development, as well as, on robot testing to deliver real-world machines.

**North Carolina State - Raleigh**
- Remote vehicle pilots or drone operators are more system commanders than pilots, but will still require a commercial pilot license for aerial drones, though drones increasingly are land and sea based. Fly without getting airsick!

**Marquette University**
- You combine the skills of psychology and engineering to design human-machine and human-computer interfaces and investigate ways to address issues and improve these relationships.

### WHO'S HIRING

- **Perrine Robotics**
- **Robative Automation Systems**
- **Thermo Fisher Scientific**
- **LIC Pipeline Robotics**
- **Valant**
- **ATI Automation**
- **DAMIS Companies**
- **Boise Fitness**
- **Shilling Robotics**
- **Sparks MFG**
- **ALCOA**
- **Flexible Automation Inc.**
- **Fleetronics**
- **Ford Motor Company**
- **Goldmaid Space Flight Center**
- **Aston**
- **Intouch Health**
- **Intuitive Surgical**
- **Touch Bionics**
- **Vigo Communications**
- **DMC**
- **Express Scripts**
- **Robot Core**
- **Jabil Circuit**
- **Ultra Tech Machinery**
- **Boeing**
- **Fusionmachines**
- **Johnson Controls**
- **Neogen**
- **Northrop Grumman**
- **3D Robotics**
- **Adept Technology**
- **Amazon.com Inc.**
- **Autonomous Solutions**
- **Baxian Solutions**
- **Dyon**
- **Ekso Bionics**
- **Fanuc Robotics**
- **Honda Robotics**
- **Honeybee Robotics**
- **Air Force**
- **Boeing**
- **Federal Aviation Administration**
- **Fleetronics**
- **Northrop Grumman**

### SCHOOLS THAT TRAIN

- **Amarillo College**
- **Excelsior College**
- **Mississippi Gulf Coast Community College**
- **Pinnacle Career Institute**
- **Texas State Technical College**
- **Academia Technical College**
- **Bakerfield College**
- **Central Community College**
- **ECPI University**
- **Hawkeys Community College**
- **Central Lakes College**
- **Glendale Community College**
- **Hennepin Technical College**
- **Mitchell Technical Institute**
- **South Central Technical College**
- **Idaho State University**
- **Illinois Central College**
- **Santa Clara University**
- **Southern California Institute of Technology**
- **Virginia Tech**
- **DePaul University**
- **Marquette University**
- **Oral Roberts University**
- **Rochester Institute of Technology**
- **Virginia Tech**
- **Grove City College**
- **Johns Hopkins University**
- **MIT**
- **Southern Methodist University**
- **University of South Florida College of Engineering**
- **Carnegie Mellon University**
- **North Carolina State - Raleigh**
- **Randolph College**
- **Towson University**
- **Western Governors University**
- **University of Cincinnati**
- **CMU**
- **South Dakota School of Mines & Technology**
- **University of Michigan**
- **Boeing**
- **Northrop Grumman**
- **Flextronics**
- **Johnson Controls**
- **DMC**
- **Ultra Tech Machinery**
- **Jabil Circuit**
- **iRobot Corp.**
- **Express Scripts**
- **McKesson**
- **Ebit Systems**
- **U.S. Air Force**
- **Bentley University**
- **Carnegie Mellon University**
- **Iowa State University**
- **Rensselaer Polytechnic Institute**
- **St. Ambrose University**