

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-



FINALISTS DUKE IT OUT IN THE FIRST ROBOTICS NATIONAL COMPETITION IN ST. LOUIS

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. 📧



2014 SWPA BOTS IQ COMPETITORS PREP THEIR BOT FOR BATTLE

PICTURE CREDIT: MIKE ASPER

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 Penns 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 BOTS IQ 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 Titaniax Mayhem

Best Engineering Documentation: Highlands HS Notorious B.O.T.

Best Engineered Bot: Hempfield HS K.A.R.A.

King of the Ring: Admiral Peary AVTS Biohazard

Coollest Bot: Punxsutawney HS SAW-3PO and Admiral Peary AVTS Biohazard

SWPA BotsIQ \$500 Scholarship Award

Renee Huey - Punxsutawney HS

Joshua Worstell - Keystone Oaks HS



NAOKA GUNAWARDENA (BOTTOM LEFT) AND THE GIRLS OF STEEL



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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. ▶



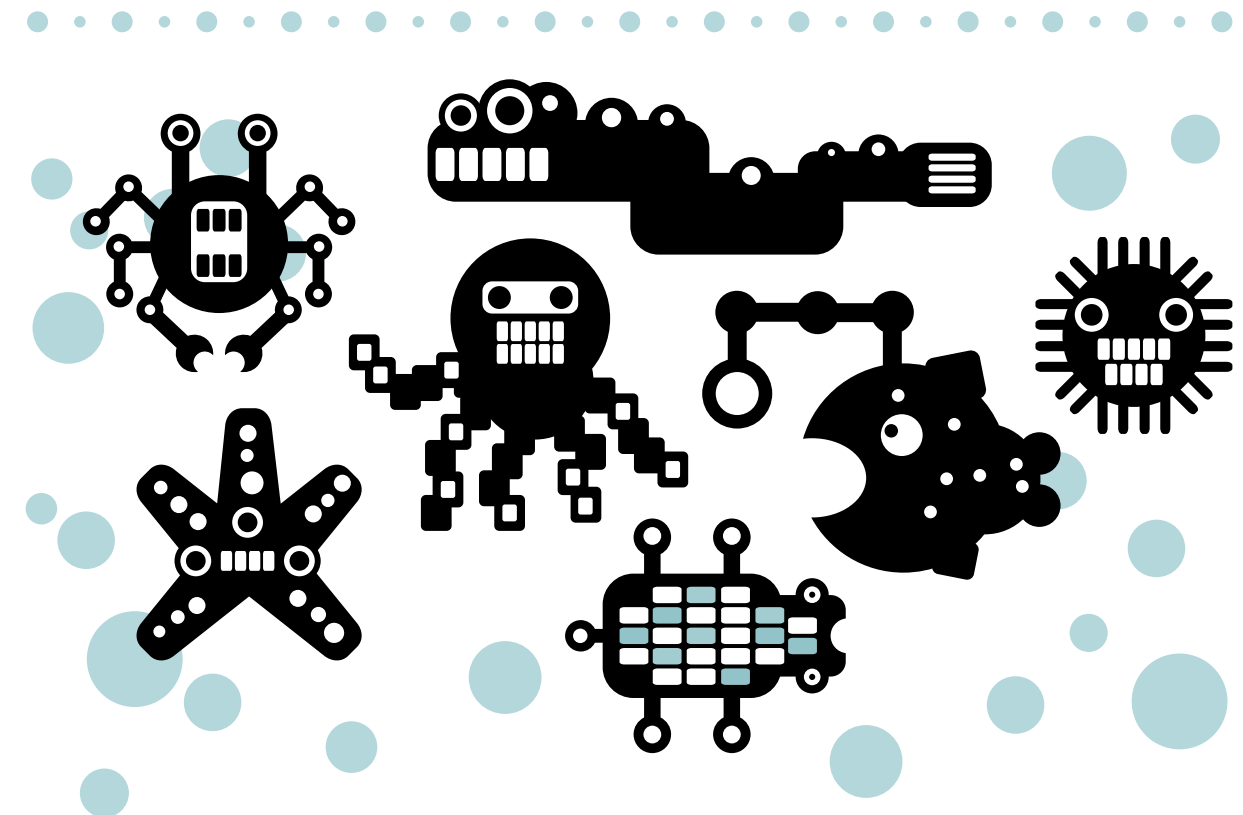
VISITORS AT EXPLOROCEAN GET SOME HANDS-ON EXPERIENCE BUILDING AQUATIC ROBOTS

▶ 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. ◻



THESE ARE THE DROIDDS 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

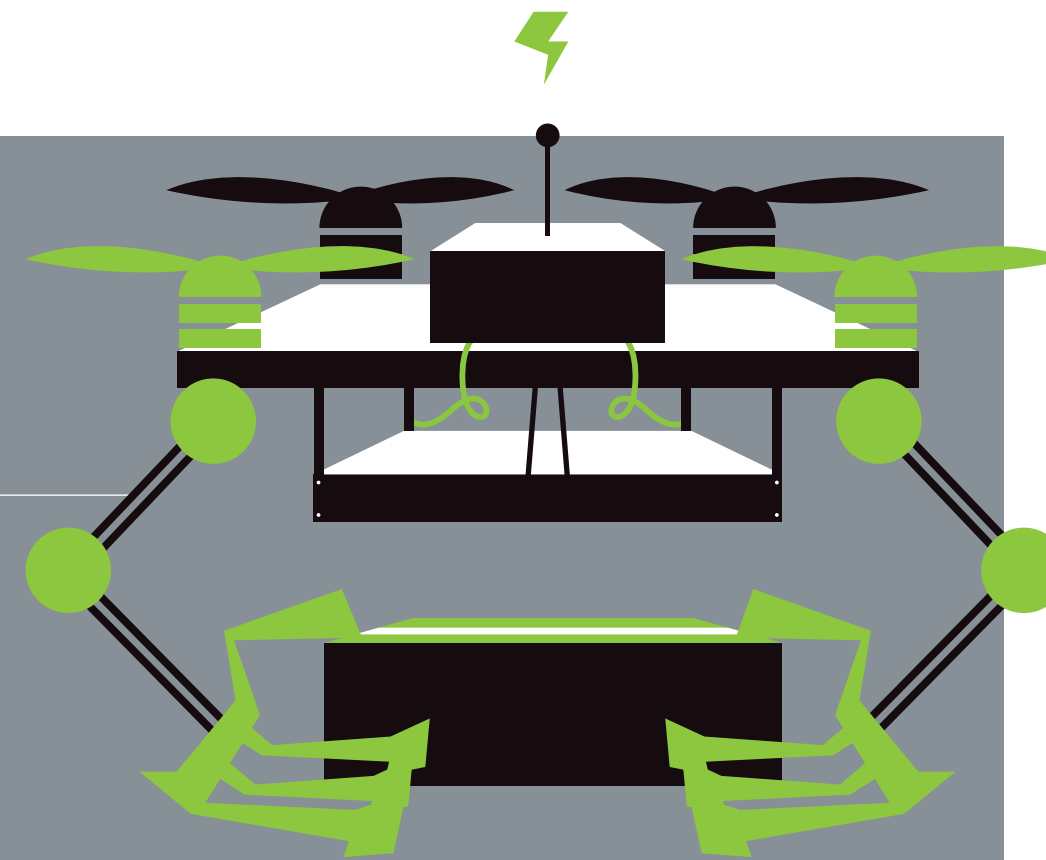
Internet retail giant Amazon.com has been testing new delivery drones that could revolutionize the way we receive our packages. While the technology is still a few years away, this delivery system could get your order to you in less than 30 minutes after you place it!

source: usatoday.com

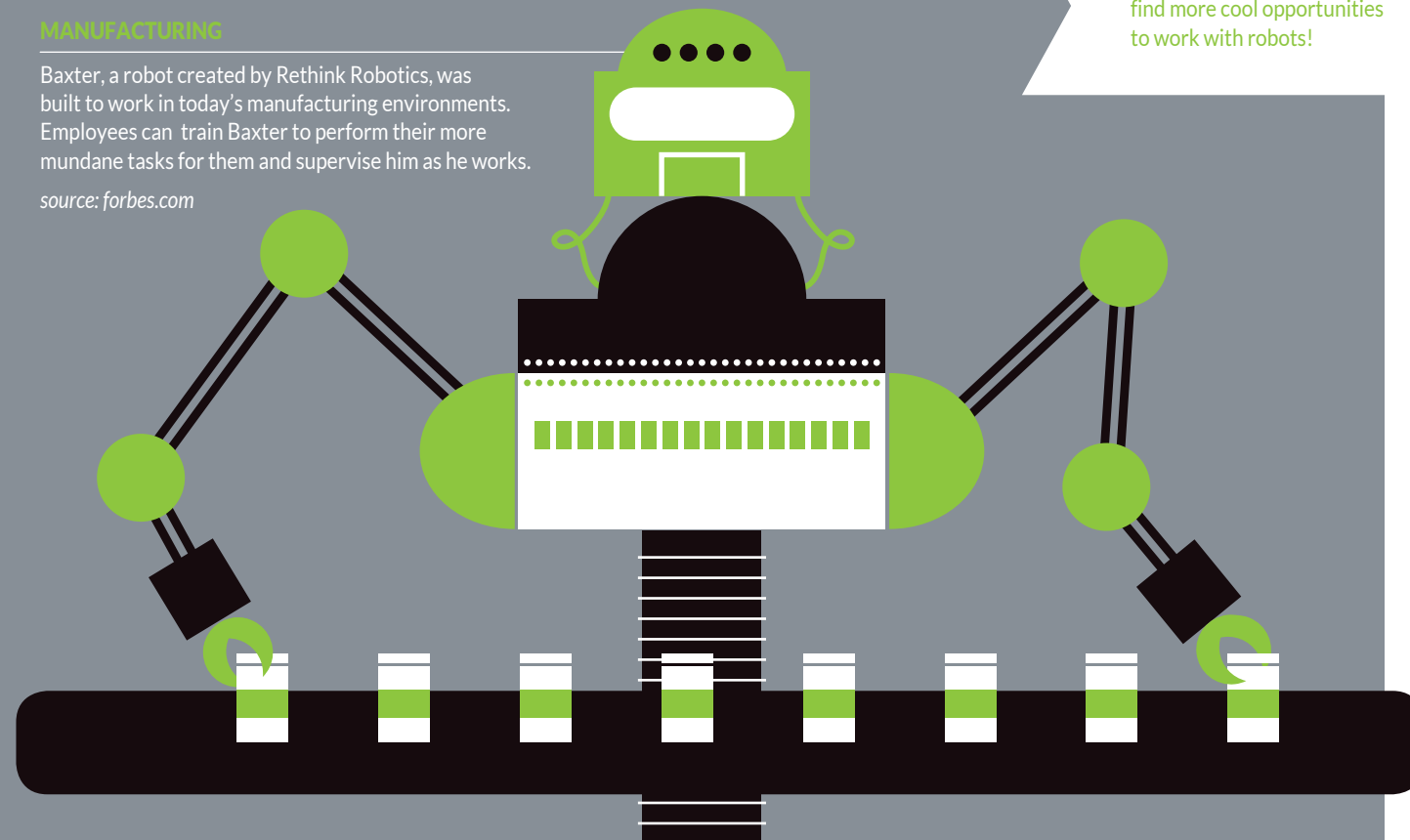
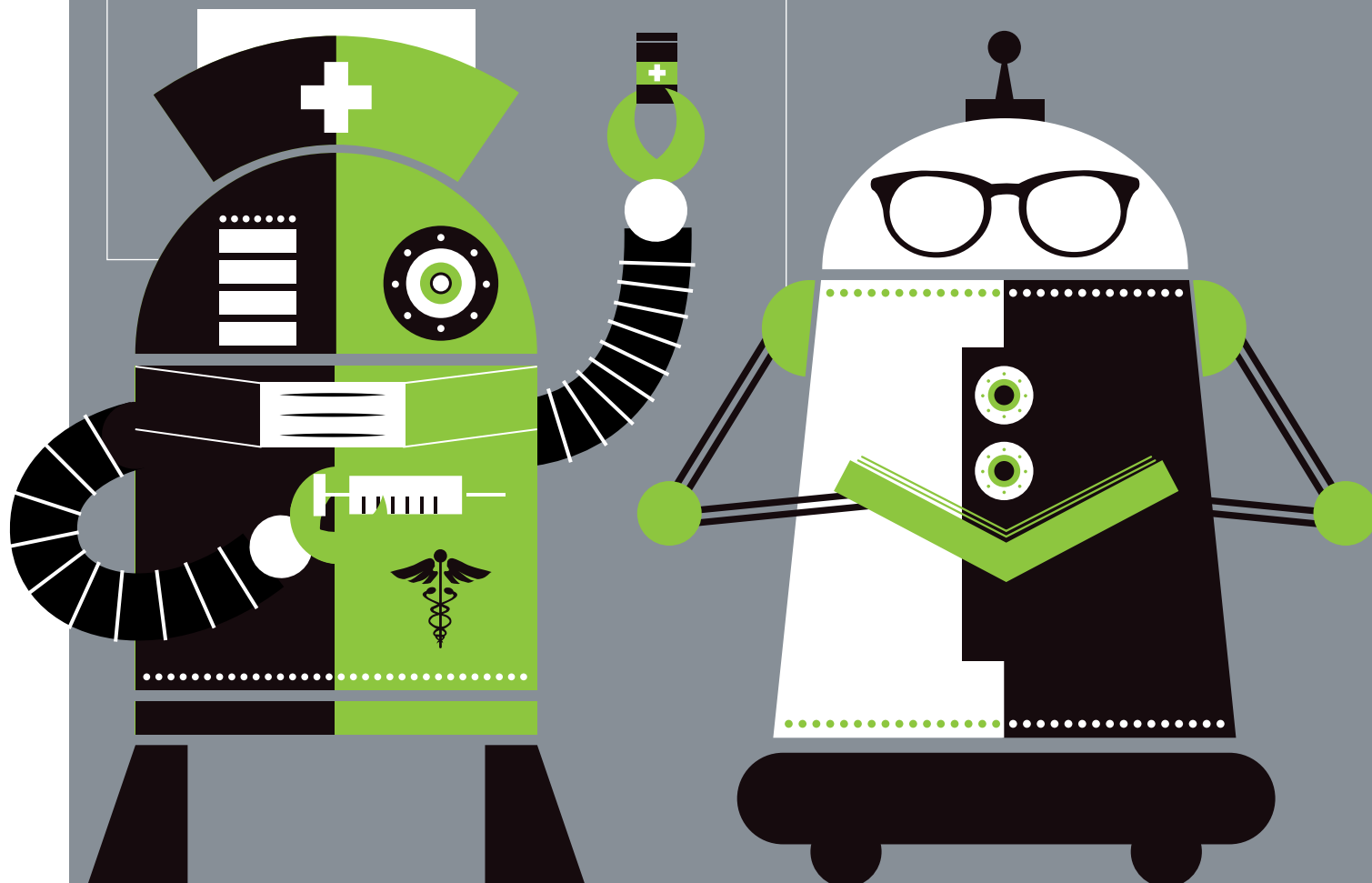
MANUFACTURING

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!





ROBOTICS STEM JOBS BY SALARY

WANT TO KNOW YOUR STEM JOBSSM TYPE?
LOG ON TO STEMJOBS.COM AND CLICK 'TAKE
THE STEM JOBSSM TYPE QUIZ' TO FIND OUT!

	ELECTRO-MECHANICAL FIELD SERVICE TECHNICIAN	ROBOTICS MACHINIST	AUTOMATION CONTROL SPECIALIST	BIO-MEDICAL ROBOTICIST	MECHANICAL DESIGNER	DATA TECHNOLOGIST	CONTROL SYSTEMS ENGINEER	SOFTWARE PERCEPTION ENGINEER	DRONE / UAV OPERATOR	HUMAN FACTORS ENGINEER
WHAT WILL I DO?	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.	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.	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.	You work hand-in-hand with machine and robot operators and clinicians to troubleshoot, refine, 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.	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.	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.	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.	You write the software, conduct sensor experiments, test robots on rough terrain in the rain and snow, communicate results to experts and laymen, operate with the team to pull off high-profile demos and develop innovative solutions to new problems.	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!	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.
MEDIAN SALARY	\$40,000	\$46,000	\$54,000	\$56,000	\$58,000	\$60,000	\$61,000	\$61,000	\$70,000	\$90,000
STEM JOBSSM TYPE	Explorer	Designer	Investigator	Solver	Designer	Solver	Designer	Integrator	Producer	Advisor
WILL I LIKE IT?	Magneto is your favorite Marvel character.	Machines don't make themselves ... yet.	You think the kid from <i>Home Alone</i> was brilliant.	Saving lives with robots, what's not to love?	You hope the next <i>Star Wars</i> movie corrects those droid design flaws.	You know who you are and have the data to prove it.	You are a control freak, and you're OK with that.	Bumper cars is more fun if you try to miss everyone else.	You like flight simulators don't you?	You will be the one that creates the machine that takes over the world.
SCHOOLS THAT TRAIN	<ul style="list-style-type: none"> Amarillo College Excelsior College Mississippi Gulf Coast Community College Pinnacle Career Institute Texas State Technical College 	<ul style="list-style-type: none"> Acadiana Technical College Bakersfield College Central Community College ECPI University Hawkeye Community College 	<ul style="list-style-type: none"> Central Lakes College Glendale Community College Hennepin Technical College Mitchell Technical Institute South Central College 	<ul style="list-style-type: none"> Idaho State University Illinois Central College Marshall University Santa Clara University Southern California Institute of Technology 	<ul style="list-style-type: none"> Grove City College Marquette University Oral Roberts University Rochester Institute of Technology Virginia Tech 	<ul style="list-style-type: none"> DePaul University North Carolina State - Raleigh Randolph College Towson University Western Governors University 	<ul style="list-style-type: none"> Grove City College Johns Hopkins University MIT Southern Methodist University University of South Florida College of Engineering 	<ul style="list-style-type: none"> Carnegie Mellon University MIT Slippery Rock University South Dakota School of Mines & Technology University of Michigan 	<ul style="list-style-type: none"> Bowling Green State University LeTourneau University Seminole State College Tennessee State University University of Central Missouri 	<ul style="list-style-type: none"> Bentley University Carnegie Mellon University Iowa State University Rensselaer Polytechnic Institute St. Ambrose University
WHO'S HIRING	<ul style="list-style-type: none"> Perrone Robotics Robotive Automation Systems Thermo Fisher Scientific ULC Pipeline Robotics Valeant 	<ul style="list-style-type: none"> ATS Automation DAVIS Companies Rogue Fitness Schilling Robotics Spears MFG 	<ul style="list-style-type: none"> ALCOA Flexible Automation Inc. Flextronics Ford Motor Company Goddard Space Flight Center 	<ul style="list-style-type: none"> Aethon InTouch Health Intuitive Surgical Touch Bionics VGo Communications 	<ul style="list-style-type: none"> DMC Express Scripts iRobot Corp. Jabil Circuit Ultra Tech Machinery 	<ul style="list-style-type: none"> Boeing Fusemachines Johnson Controls Neogen Northrop Grumman 	<ul style="list-style-type: none"> 3D Robotics Adept Technology Amazon.com Inc. Autonomous Solutions Bastian Solutions 	<ul style="list-style-type: none"> Dyson Ekso Bionics FANUC Robotics Honda Robotics Honeybee Robotics 	<ul style="list-style-type: none"> 3D Robotics AeroVironment Boeing Ebit Systems U.S. Air Force 	<ul style="list-style-type: none"> Boeing Federal Aviation Administration Flextronics Northrop Grumman