For the FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition, teams of high school students and their professional mentors build a robot to participate in regional competitions in hopes of advancing to the championship event. After a satellite broadcast announcing the season’s game, teams have six weeks to design, build, and test their remote-controlled robots.

We asked members of the winning team of this year’s Chesapeake Regional Competition to share their experiences before they head off to the FIRST Championship in Atlanta, Georgia. Here, FIRST participant Sterling Huber provides an overview of the season. On the following pages, three of his teammates give their take on the skills needed to build, compete, and win.

“You all were shouting pretty loud yesterday,” the MC announced to the crowd at the Baltimore Convention Center, “but I know you were just warming up!” Every member of every team screamed and cheered at the top of their lungs, and the stadium erupted in a terrific, charged roar—the signature sound of a FIRST Robotics Competition.

A week earlier, my team, “P4” (Phi, Pi, Pho, Phun—a nod to our school mascot, the Green Giants), had worked its way to the quarterfinals at our hometown event in Manchester, New Hampshire. Now, at the Chesapeake Regional Competition, we were aiming for the top.

As we do each season, we learned about this year’s game in January, at the beginning of what we affectionately call the “six weeks of death.” This year, we would design a robot to compete in Breakaway, a game similar to soccer, but with obstacles. To get started, we met at our coach’s house, where we’d work on the robot for the next six weekends. We bounced ideas around until we arrived at a simple but effective design: a robot with rubber treads for traction and a kicker on the front for scoring.

Then we broke into smaller groups to bring our vision to reality. With the help of our coach and mentors, the build team constructed the robot from scratch. They manufactured parts, put together the framework and the control system, and spent a lot of time looking for the treads that would make our robot move. The spirit team made buttons, posters, banners, and displays for the competition. As part of the programming team, I helped devise a scoring program for the 15-second period at the beginning of each match when the robot has to work autonomously and made sure we could drive the robot properly for the rest of the match.

At the end of the six weeks, we sent the robot off to our first competition of the season; for us, this is always the Granite State Regional Competition in Manchester. The location of our second competition varies—I’ve competed in Las Vegas, New York City, Seattle, and most recently, Baltimore. Our team usually does well, but we’d never won a competition. That’s why many of us were happily surprised in Baltimore when we were in second place heading into the direct-elimination matches, when the number of teams is reduced by about half.

For these matches, we needed to choose two other teams as alliance partners, and all three robots would compete as a team against other alliances. As the team scouter, I’d observed other teams throughout the competition to choose our alliance partners: Team #2377 (C Company) and Team #2534 (The Lakers). Through the quarterfinals, we were excited to win our matches. Through the semifinals, we began to think we might actually win the whole thing.

When the last match’s final score was posted, our alliance had won 6 to 1. We stormed the field in excitement, hugging and cheering. We collected our trophy at the awards ceremony, and we’d earned our chance to compete in the finals in Atlanta, Georgia. We are going to try our best to win, but no matter what the final score is, this will be an excellent and fun experience for us all.

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As any FIRST Robotics participant will tell you, a winning team needs a diverse set of skills. Bishop Brady High School’s FIRST team is a great example. As these team members show, whether your strengths are technical or artistic, there is a place in FIRST for you.

**NAME:** Jonny Slocum  
**GRADE:** 12  
**YEARS COMPETING IN FIRST:** 4  
**INTERESTS:** Engineering  
**WHAT’S NEXT:** MIT in the fall

The best feeling I had during FIRST was seeing our robot drive and compete the way we intended it to. These machines are prototypes, so most don’t work according to plan. And winning the Chesapeake Regional was a feeling I had never experienced. We were on top of the world there.

All my life I have been surrounded by engineers, so I’ve grown up around machinery and new inventions. I guess you can say it’s in my DNA. I love being a gearhead and FIRST was a perfect way to express that.

I am one of the robot designers and a lead builder on the team. I’m in charge of making sure our robot can do all the tasks our game strategy requires. Some teams will focus on a few things—like throwing the ball to score—and get really good at those things. We wanted our robot to be good at everything so other teams would want us in their alliance. This year, our robot can play better defense than almost any other robot out there—and it can score and change zones, so it’s extremely versatile.

One of the biggest challenges was getting the treads on our robot to work properly. Because the surface we were driving on was stationary (i.e., not a loose surface like dirt), turning became a real problem as the robot got heavier: The tracks had too much contact with the floor, which created friction. Since only two points of contact are needed between the track and the driving surface in order for our robot to drive, we removed a pulley from the bottom, so only half the track was touching the floor. This solved our problem, but it took us several long and stressful days to figure it out.

The best advice I can give actually comes from Sir William of Ockham: “Do not multiply entities beyond necessity.” Elaborate and flashy designs are cool, but they require time and multiple brains to perfect. In the real world, the simplest machines are often the cheapest and the most effective.
NAME: **Casey Burr**  
GRADE: 12  
YEARS COMPETING IN FIRST: 3  
INTERESTS: Photography, journalism, graphic design  
WHAT’S NEXT: College

My favorite FIRST moment was when I understood that FIRST values students with skills and ideas like ours because we really can shape the future. But winning the Chesapeake Regional was the most exciting moment.

I wasn’t interested in working directly on the robot, but I knew my creative and organizational skills would be useful for things like making posters and organizing spirit and fundraising activities. For the past two years, I have created the videos we submit to compete for the Chairman’s Award, given to the team that best represents the FIRST goals and standards. During competitions, I organize the newer members of the team in spirit and safety activities. For example, we wander the crowds and the pits with our “Safety Man” mascot distributing safety kits, safety tips, and of course, team buttons.

Our laptop froze right before our video presentation for the Chairman’s Award in Baltimore. Unable to show our DVD, we quickly retrieved three of our posters that described our team and our accomplishments. Thanks to quick and clear thinking, we were back with the posters with time to spare before the interview. Although we didn’t win the award, the judges liked the pictures on our posters so much that we were almost thankful for the laptop mishap.

I am most proud of the work I did that helped us win the Underwriters Laboratories Safety Award, which is awarded to “the team that progresses beyond safety fundamentals by using innovative ways to eliminate or protect against hazards. The winning team consistently demonstrates excellence in industrial safety performance that shines throughout the competition.” It was amazing to be that team.

No one starts out as team captain. Do what little things you can do in the beginning, and work your way up to the big stuff. On a FIRST Robotics team, every contribution is important and appreciated.

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NAME: **Lincoln Tosi**  
GRADE: 12  
YEARS COMPETING IN FIRST: 3  
INTERESTS: Basketball, track & field, guitar, game making  
WHAT’S NEXT: DigiPen Institute of Technology in Redmond, WA

After a disappointing year on Bishop Brady High School’s basketball team freshman year, I decided to join the robotics team. I have always been interested in technology, and FIRST let me create some of my own.

My role on the team has changed each year. I started off by learning the basics. The team initiates new members by letting them build and program their own small robots from VEX kits, which include wheels, metal parts, a controller, and a small CPU onto which you can download code to run the robot. I ended up making three of these. My second year on the team, I created our team’s website (www.bbrobotics.org), which includes information about our team, a calendar of upcoming events, a team blog, and even a countdown to the FIRST Championships in Atlanta.

This year, I am the lead programmer. Communicating with the builders on the team is essential as I program the robot. I need to know how many motors we have, what ports they’re connected to, and when and how to make them spin. I have also experimented with encoders (parts we attach to motors to detect exactly how far they’ve spun and in what direction) and a small webcam that can track targets above the goals, which allow us to line up our robot with a goal and score from any distance. After I have figured out exactly how I’m going to make the robot move, I teach the robot drivers how to use the joysticks. This year we have three joysticks—one for each tank tread, and one for the kicker/suction device (tilting the joystick forward and backward moves it up and down, pressing the trigger powers a quick kick, and another button makes the suction cup on the front of our robot hold a ball in place).

During the competition, I am usually in the pit workstation helping with construction on the robot or making quick edits to the code. I make sure everything is ready so that the robot won’t spontaneously fail during the next match. I also set up the only live stream of the competition at the Chesapeake Regional. Without the stream, my family as well as many others wouldn’t have been able to watch us win our first competition ever.

The main challenge for any FIRST programmer is autonomous mode. Every match starts with this 15-second mode in which the robot controls itself, trying to score with no human interaction. I had a working autonomous program that used the encoders and camera to score up to three goals, but FIRST decided to release an update only a few days before we had to ship our robot. The update broke my code, and the only way I could fix it was to remove the encoder and camera code. This meant that our robot was driving blind, literally. I had to use time as a way to measure the distance our robot traveled; otherwise, our robot would have been motionless for the first 15 seconds, which likely would have cost us the championship.

I am as proud of making the team’s website as I am of writing the robot’s code. Though the code is essential for making the robot run, the website informs parents, other teams, and the general public about our team and how much we love FIRST.

If your middle school has a FIRST LEGO League (FLL), join it. After helping run our own FLL competition at Brady, I have realized how much it prepares you for FRC (FIRST Robotics Competition), which, in turn, prepares you for a job in engineering.