

THE CIRCUIT

Baxter Academy for Technology and Science's monthly newsletter

The real world starts now.

April
2018

Next Stop: The World Competition!

Baxter Academy's Robotics team, the Outliers, is headed to the FIRST world championship competition after becoming the first Maine team ever to win all three of its district events in New England. Last year the team advanced to the highest level of competition in world competition and emerged as part of the fourth-ranked alliance.

Twenty-six Baxter students, along with engineering teacher Jonathan Amory as their coach and STEM professionals as their mentors, began working on January 6 toward this year's Power Up Challenge. The team had six weeks to build a robot that could, among other skills, pick up blocks and heft them onto a scale. During matches, they play with two other teams in an alliance, a model that promotes cooperation.

The team represents engineering at Baxter among a field of exceptionally strong Maine teams. The number one ranked team in New England is B.E.R.T. from Bonny Eagle High School. B.E.R.T. and the Outliers were part of a winning alliance with the RoboTies of Old Town at the Pine Tree District Event in Lewiston on March 24. The alliance faced off against another all-Maine alliance in the finals, overcoming teams from Connecticut, Massachusetts, and New Hampshire in earlier rounds of play.

In 2014, the Outliers blazed onto the FIRST scene as a "powerhouse" rookie, winning five rookie-specific awards and competing at Worlds competition in its first season. It has

since won seven official events, including a world championship division in 2017 at the St. Louis championship event. It has won eight technical awards, including the "quinfecta" of engineering awards; the team won the fifth one, the Creativity Award by Xerox, at the Pine Tree District Event.



The Outliers celebrate their success at the Pine Tree District event last weekend. Their win qualified them for the WORLDS competition in Detroit.



Students Lily Callow, Abigail Steinberg, Lydia Elliott, and Isabella Phipps work together to complete a critical thinking exercise at Systems Engineering. The IT firm in Portland partnered with code.org to sponsor an afternoon of computer science activities for young women.

Baxter engineering teacher and Outliers team Coach, Jonathan Amory, notes that the Outlier's major challenge is one shared by all the Maine teams, which is to compete financially with FIRST teams from other states, where they are often supported with five-figure sponsorships by STEM industry leaders like General Dynamics, Bose, and Bosch. "What's amazing about Maine teams, given how limited resources are, is how successful they are anyway. That's partly due to camaraderie and collaboration among the Maine teams," Amory says.

In April, the Outliers road trip to Boston for New England regional competition and will then fly to Detroit for world competition.

Support for the Outliers is welcomed through online donations at <https://www.theoutliers.org/donate/>

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Forming Alliances with the Competition

FLEX FRIDAY
FOCUS

FIRST Robotics is all about circuitry—in the robot and among the human players. The international program emphasizes the interconnectedness of the player, their communities, and - most uniquely - their competitors.

At the start of every season, the team of twenty-six students must first organize themselves around their individual strengths to develop and build a machine that will meet the challenges presented to them. There are subset teams working on the electrical, mechanical, and programming aspects of the robot. Even more team members structure fundraising, communication, and project management efforts. With limited time for meetings, the Outliers use a variety of project management tools to organize and communicate with one another throughout the build season and beyond.

While teams across the state are working around the clock in their own labs, they still make time to support each other during the build season. Though the Outliers' robot designs were top secret in the pre-competition phase, members of the team offered Computer Aided Design (CAD) courses to B.E.R.T and Northern Force - teams representing Bonny Eagle, Falmouth, and Gorham. Jake Willette, class of 2018 and project manager for the Outliers explains: "All of the teams operate under the FIRST (For Recognition and Inspiration of Science and Technology) mission. The organization was founded on the idea that building community around STEM will inspire future entrepreneurs and engineers. When we offer tutorials in SolidWorks, we're providing other teams with knowledge they may not have access to otherwise."

The Outliers have also been working with area teams to build a cooperative practice space in Falmouth for all to use. "If we share resources, we're all going to be better for it," Julian Bernard, class of 2018, remarks.

Though it seems counterintuitive to the nature of "competition," teamwork, collaboration, and communication across teams are most evident during matches. Teams travel

to regional events where they spend hours in qualification rounds. During these early matches, professional judges are scoring each robot on a variety of standards, but the teams are also paying careful attention to each other's strengths and weaknesses.

Teams ranked in the the top eight will go on to choose two other teams to form an alliance and compete during the playoff rounds.

Cutter Meeker, class of 2018 and lead scout is responsible for gathering the data on other teams and guiding the alliance decisions for the Outliers. He notes that the Outliers will often look at some of the lowest ranked teams: "We need to find the sleeper robot that may have slipped past the judges and team scouts. We are then given the opportunity to work within our alliance to create a strategy for all three of our robots to work together to win our matches."

This kind of strategy and communication is crucial to the success of these students later in life. Jake reflects: "We learn to

build a network. You could compare talking with other drive teams to talking with a coworker and sharing ideas to be successful in a work project. It's also about building relationships and having fun together. All the Maine teams are pretty close."

Shavonne Smith, class of 2018, agrees: "FIRST strives for 'gracious professionalism.' We are entering competitions to win, but also to have fun and connect with other people. You start to see other teams as your friends and you want to help them succeed as much as you want your own team to be successful."

Between the grueling days spent designing and building the robot and the long travel weekends for competitions, the team has little time for much else. However, Jake recently gave a presentation on project management to a group of employees at Preble Street, a social services organization located in the Bayside neighborhood. "Our team has spent a lot of time working on project management. It's great when we can share our experiences with adults who are trying to navigate their own challenges. Hopefully, they'll also see what kinds of opportunities FIRST provides to local communities. Maybe we'll even increase our fanbase!"



Baxter 12th graders Cutter Meeker and Julian Bernard talk strategies with their alliance teams, DiscoTechs from Brookfield, Connecticut, and HYPHER, from Quincy, Massachusetts.

Flex Friday dedicates 20 percent of the week to student-managed, long-term projects that are relevant to each student's interests and goals. Student teams identify a real-world problem, define how they might solve it, pitch their solution to a faculty review board, network with outside experts, and then set to work.

An Independent Study: Artificial Intelligence and Language

Chris Gifford had no doubt that he wanted to spend his final year at Baxter in the Summit program. The pathway, launched in the fall of 2017, is open to students who have met eighty percent of their graduation requirements. Students are able to design a project to meet the rest of the standards necessary to complete their high school diploma. Chris has spent his year researching and developing an Artificial Intelligence (AI) program focused on language.



Chris Gifford has spent his 12th grade year researching and building an Artificial Intelligence program.

Since coming to Baxter his 10th grade year, Chris has immersed himself in the world of electronics and computer science. He says, "At my old high school, I had so much homework. It was challenging for me to have time for other interests. Baxter classes are better suited to what I want to be learning inside and out of class." Chris thinks back to a project he started in Alan Lukas' Electronics II course. "I created a binary adder which takes two numbers represented in binary digits and adds them together. I designed the schematic during school, but ended up testing and building a functioning prototype at home. Baxter classes have helped me understand how to work towards a project and meet long-term goals."

Chris spent his 11th grade year as project manager for a Flex Friday group developing wireless sensors. Though they hit a number of stumbling blocks in the research, design, and building phases, this experience prepared him to work solo and manage his own year-long project in the Summit pathway. He checks in with Hal Larsson and David Rawson when he feels overwhelmed, but otherwise, "I'm my own manager and I'm in charge of making sure I get things done."

He has spent the year giving himself assignments in order to research and develop an AI language program. "I have always been interested in the way our brains process information, and I'm very curious about how we can program computers to do 'machine process learning.'"

Chris explains: "The first kinds of AI were more about linear regression, or the line of best fit. Computers were programmed to make predictions based on a finite amount of information input by the programmer." Consider the way

autotext features work on smartphone keypads. Apple's iOS software has been programmed using the linear regression model. The goal is for the user to be able to send texts faster by selecting from a few words that the program predicts the user want to use based on commonly used words and phrases that have been pre-programmed. You've probably noticed that the predictions do not always suit your communication needs, nor do they improve over time. Chris says, "though programs using linear regression have improved in their accuracy, they are not true 'Artificial Intelligence.'"

Chris has been researching computer programs that mimic 'natural language processing,' which is how human brains learn and understand language. In addition to using linear regression to program a computer to make 'a decision,' computer scientists have also been using the Hidden Markov model. This system uses probability to draw a conclusion and determine the missing set of data.

Chris' project is focused on part-of-speech tagging. He is creating a web application that will allow users to type a sentence into the program, which the computer will then parse to identify a variety of grammatical components of the sentence including nouns, adjectives, participles, and prepositions.



The Baxter Players performed in the Regional One Act competition. Simon Herghenhan, class of 2018, received All Festival Cast Award. Rylee Sinclair, class of 2018 received the Promising New Playwright Award. Julie Winger, class of 2018, says: "It was a great final Oct Act experience for me. We did a great job and there were a lot of other great plays and performers to watch."

Though getting the web application to function is important to Chris, this is not the end goal for him: "I hope to get a better understanding of how language works and how our brains learn language."

Thanks to the flexibility of the Summit program, Chris has spent on average 30 hours a week on his AI project. He has also been able to take classes at St. Joseph's college.

Next year, Chris will continue his undergraduate education with the Computer Science department at the University of Southern Maine. "I'm excited to advance my understanding of AI and natural language processing with the professors in that field. I also hope to spend more time working on individual projects in USM's C12 lab."

Baxter Academy is a rigorous, college-preparatory high school promoting student ownership of learning through curriculum focused specifically on science, technology, engineering and math (STEM). Baxter Academy students study complex, real-world problems, using and building technological tools in a collaborative environment with scientists, engineers and other professionals.

**LEARN
BY DOING**

YOUR STORIES

Alumni Correspondence

What have you started, led, joined, built, fixed since graduating from Baxter?

Since graduating from Baxter, I've been able to engage in new opportunities by using the leadership skills I learned during my high school

tenure. I am currently a Resident Assistant on campus, a senator for the Adrian College Student Government Association, and a member of the Adrian College Honors Society. For my extracurricular activities, I am part of the Adrian College Varsity Synchronized Skating Team, the Adrian College Mock Trial Team, and a participant in Adrian College Theatre. In addition to the groups previously mentioned, I am also part of several campus research blogs, including ones on feminism and Buddhism. I am also working with several Adrian College faculty to complete a research project of Politics in Malaysia for my capstone and post-grad studies through a Fulbright Academic Scholarship.

How have you brought your experience as a learner at Baxter to your current community?

Though my experience at Baxter, I've been able to bring a different side of learning and education to my peers and professors at Adrian. Most of the people I work with come from schools that had 500+ people each in the individual grades. Since there are only about 1,200 people total at Adrian College, it's been an interesting learning curve for them. For me, however, I felt more prepared to be in smaller, intensive, classes that require me to work hard and take control of the classroom, as opposed to just hiding in the background as I could've at a regular public school. At Baxter, it felt like we looked at academics as something we could always learn from, not just a means to an end. I've definitely noticed a difference in the quality of my education in contrast to my peers because I've been able to see the classroom as someplace I can grow as a person as opposed to just a way to earn credits.

Katie Kusturin, 2016

Currently: Attending Adrian College, studying Political Science, double minor in Philosophy and Religion, with a Pre-Law focus

What advice can you give current Baxter students?

If you have the opportunity to step out of your comfort zone, do it. If you have the opportunity to be in a leadership position, do it. If you have the opportunity to challenge yourself and those around you in any way, do it. In college, I think that the only things I've ever regretted are the things I didn't do when I had the chance to do it. I'd rather try everything once and then decide something isn't for me. Through all of those experiences, you can begin to shape who you are and what you want in life during a time where no one knows. At Baxter especially, students have countless opportunities to explore different studies to find what works best for them. I know that without my education and experiences at Baxter, I wouldn't be the student and person that I am today. I only hope that future graduates can come away feeling like they've achieved something greater than just earning a diploma during their time at Baxter Academy.

Which Baxter course do you still think about? Why?

Definitely *Confronting Genocide*, taught by Angie Taylor. I think that genocide is such an interesting topic not only from a historical point of view but from a futuristic point of view. I went into that class knowing the bare minimum of knowledge of the Holocaust and left the class with a vast understanding of how systematic oppression works in different walks of life. I was able to develop my thoughts on how we as privileged Americans can work to change future international relations for the better. Because of that class, I was able to develop my passion for international relations and politics, later going on to join the Baxter Model UN team. Now, I've been able to use the knowledge learned in that class for my other courses such as Feminist Theory, Comparing Democracies, and The Ethics of Immigration. What I learned in that class has definitely changed the way that I think as both a student in the classroom and as a leader in contemporary society.



What news do you want to share with your Baxter family and friends?

I have been blessed with the opportunity to continue my tenure with Baxter Academy through working with the school during my school breaks. I am so happy to continue to be part of the Baxter Academy family and it really just goes to show that the relationships and impressions you make during high school don't just disappear after you graduate. It's been an amazing experience to work with the faculty behind the scenes and be able to truly understand how hard everyone works to keep Baxter the school that it is.

**Reach out and share your news:
email heather.dippolito@baxter-academy.org**