



# The Celt-X Knot

Keeping you linked with Bishop Ryan Robotics  
Volume 2, Issue 1, June 2018

Celt-X's fourth season was, without question, our best one so far! Our team reached new heights both on and off the field – from qualifying for IRI in the summer of 2017 until our return to the World Championships in Detroit last month. It has been an amazing year, and we are sure the one ahead will be even more awesome.

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## Fundraising Update

In the spring of 2017, Celt-X applied for, and received a great financial boost from the Heritage Green Community Trust, which awarded us nearly \$70000 for the purchasing of advanced manufacturing equipment. This amazing grant was a catalyst in accelerating the team's move to a new Robodrome facility in December. With these funds, we were able to purchase multiple CNC (computer controlled) machines, including a mill, router, and laser cutter.



In the fall of 2017, John Deere Canada joined Celt-X as a platinum sponsor. Our team is the first FRC team in Canada to partner with John Deere, and with their support, our Green Zone continues to engage other teams and exemplify the ideals of FIRST.

## Fun in the Summer

Celt-X stayed operational during the summer months with weekly Thursday night meetings, cleaning the Robodrome and working on a second robot as an off-season project. We participated in outreach events like CODEfest, Scout STEM night, Mini Maker Faire, and the grade nine week at Bishop Ryan. Students helped to research the machines we would be obtaining, and they were sourced and ordered. Students got a chance to learn CAD with new Solidworks licenses, and then saw their creations come to life on our 3D printer. The marketing team devised a new recruitment campaign to draw students from all areas of the school, and prepared for a fall release.



## Indiana Robotics Invitational

The team was invited to, and attended, IRI in July. This event is known for having only elite FRC teams compete. Making the cut in our third year, speaks volumes for the respect the team has achieved in the FRC community. A lean mean team of students, mentors, parents and siblings made the journey. It was a great time for those who attended, and gave the students a chance to compete against teams they had never met. Despite being the second youngest team in attendance, we made it to playoffs as a first pick.





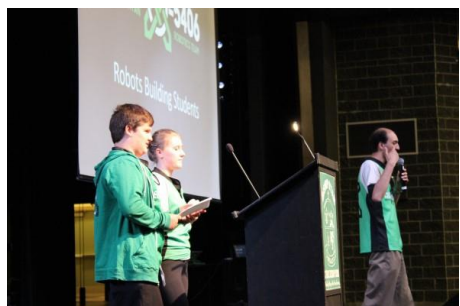
## Labour Day Party - Moving On Up!

Over the Labour Day weekend, the Robodrome acquired its first CNC machine! Early on Sunday morning, a team of Celt-X students, mentors, parents, and even a Superintendent received, dismantled, and moved the 1500lb mill into the workshop at C.E.R.C., kicking off our expansion into our new home. The largest and most challenging of all the manufacturing equipment to transport, the Tormach PCNC 1100, required a major disassembly and some finesse to get it installed in the future Robodrome workshop.

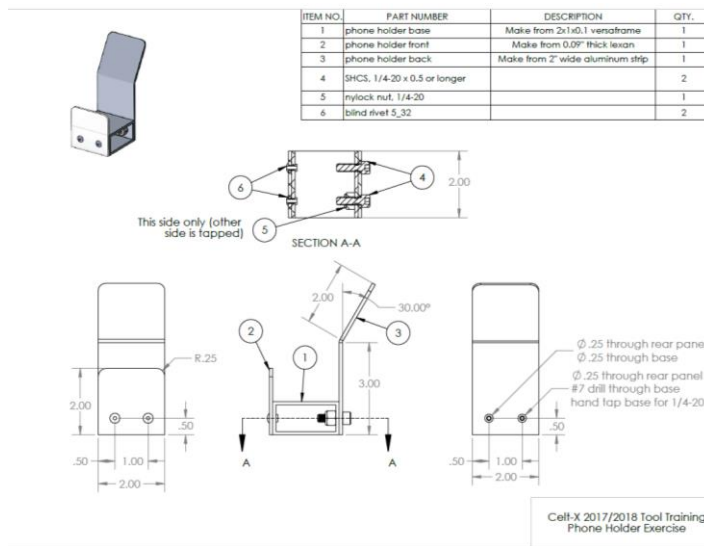


## 2017-2018 School Year Begins with a Bang!

In September, the team promoted STEM in all corners of the school, and recruited over 60 students to attend information meetings. Of these, 50 students signed up, and participated in team building meetings in one of Bishop Ryan's science labs. Many of these students have remained dedicated members of the team.



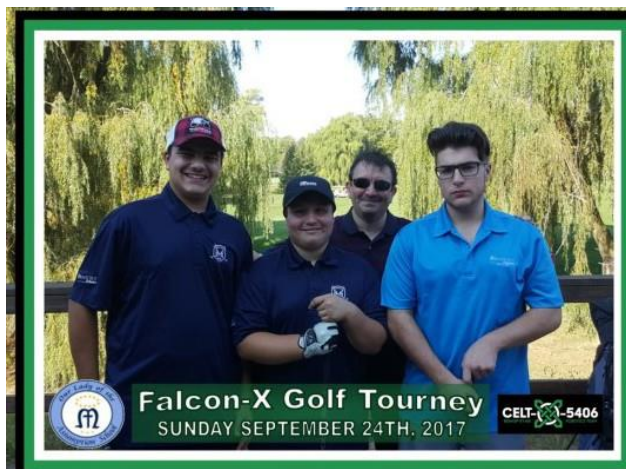
In October, the meetings moved to the Robodrome at Holy Family. Our veterans helped guide our rookies as they completed their safety training and built phone holders. Within the first few weeks at the Robodrome, our rookies were helping us wire, and finish our second robot, in preparation for Rochester Ruckus.



## Falcon-X Golf Fundraiser

Celt-X teamed up with Our Lady of the Assumption's Falcon Tech Team to co-host a very successful FALCON-X Golf Tournament Fundraiser at The MontHill Golf and Country Club.

We are planning a repeat of the event on September 30th, 2018. We encourage all to come out for a great day of golf. Hole Sponsorships, grab bag items, and prize donations would be greatly appreciated. Visit [golf.5406.ca](http://golf.5406.ca) for more information.





# 2018



# Sponsors



Along with financial support, our team loves interaction with our sponsors. The President of John Deere Canada, Debra Harrison, came to the Robodrome during build season to see what we had created, and to tour the new facility. Upon qualifying for the World Championships, we also received John Deere safety glasses and additional support with our registration fee. Executives from John Deere visited our sponsored 'Green Zone' pit at the World Championships, where teams were green with envy over our John Deere tool box.



The team joined numerous local FRC teams at ArcelorMittal Dofasco's head office for a robotics display. Staff from all departments interacted with the students and watched as the teams put on a demonstration of the robots' abilities.

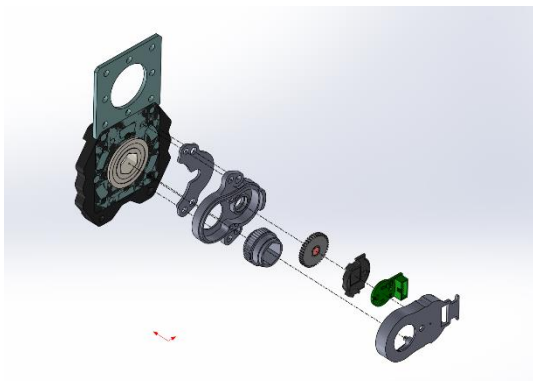


Earlier in 2017, our team members were inspired when executives of IBM Canada visited the Robodrome to check out our facility and robot, as well as to share stories about their projects, such as IBM Watson. The team was also invited by IBM Canada to participate in the company's 100th anniversary staff BBQ. Our students interacted with many of the 3000 employees, discussing FIRST Robotics and showcasing Oscar and the Celt-X T-Shirt Quad Cannon Robot. After launching stress balls into the crowd during the BBQ, the entire team was invited to pose with the robots in the IBM staff photo.



Throughout the year, we have received support from numerous other sponsors, including software licenses for Solidworks; electrical connectors from Anderson Power Products; pool noodles (used for bumpers) from Alcot Plastics; and waterjet cutting from Vykan.

For the second year, Siemens provided championship grants for the 10 youngest Ontario teams that qualified for the World Championship. Given our stellar performance throughout the competition season, many were surprised to be reminded that we were the 3<sup>rd</sup> youngest Ontario team to qualify for World's this year.





## Rah Cha Cha Ruckus

In the wee hours of October 29th, Team Celt-X boarded a bus for a one-day event south of the border. The team had geared up for an off-season event in Rochester, New York, called Rah Cha Cha Ruckus. During the off-season, we prepared by streamlining our practice bot into an efficient gear-scoring robot to give our recruits a taste of what a build season would feel like. We entered both robots in the competition – our 2017 competition robot driven by our veterans along with our off-season creation driven by rookies.



At the competition we played a series of matches, with randomized partners and opponents, called qualifications. At the conclusion of qualifications, our competition robot was seeded 7th with a record of 4-1. During alliance selections, our veteran team was selected first overall on the first alliance and we ended up selecting our rookie team to join us on our quest to take flight. At the conclusion of the event, we came back to Hamilton as champs for both Robots! This was a great team building exercise that truly set the pace for the rest of the year. Celt-X came to play! And they played hard!



## Co-hosting H.W.C.D.S.B. STEMley Cup

In November the team co-hosted the H.W.C.D.S.B. FRC off season STEMley Cup event at St. Mary's Secondary School. A hockey themed event that is quickly becoming a favourite with FRC teams near and far. Our team mentored rookie team Saint Jean Brebeuf - Odyssey Robotics and turned the Celt-X controls over to the students of SJB to enable them to participate. Celt-X students and mentors took on volunteer roles throughout the event from picking up all the equipment and delivering it to St. Mary's, to judging, food service, setup, teardown, field reset, ambassadors, Remembrance Day ceremony, games, entertainment, trading card sales, pit assistance and security. Celt-X Green could be seen every- where, including a local broadcast featuring Abby instructing Board Chairperson Pat Daly on how to operate Oscar.





## Lego Robotics

Students from our team helped to mentor several local FLL teams, one of which advanced to the provincial championship. Our team also volunteered at the FLL qualifier held at Cardinal Newman and had a chance to demonstrate our robot for the excited elementary school students.



## The BIG Move to the NEW Robodrome

In December the team was given the green light to set up shop in the new Robodrome. With assistance from all the H.W.C.D.S.B. robotics teams the trucks were loaded and the team equipment and build rooms were transported from the former Holy Family School to the Catholic Education Resource Centre building in downtown Hamilton, on MacNab Street. The Board had acquired a full size practice field and it was picked up and delivered by a Celt-X mentor from FIRST Canada storage.



Over the Christmas holidays, the team received word that the new CNC equipment was finally being delivered. Numerous students, mentors and family members from the H.W.C.D.S.B. rallied in the evening to unload, dismantle, and move the new equipment into the new workshop. With the big reveal coming up in 10 days, the team worked long and hard to have the new facility ready.



## The Power Up Game Release

On January 6th, the Saturday before the school started back from the Christmas break, Celt-X 5406 students, mentors and family held a Game Reveal Potluck Party at Bishop Ryan. All watched the FIRST broadcast of the Power Up Game in the auditorium and then excitedly discussed the details over a potluck lunch supplied by the team families. After lunch the team secluded themselves into a classroom and dissected the game manual and video for the rest of the day. Planning had begun.

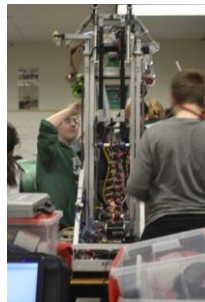


In the midst of all the excitement and hard work of build season, Celt-X ran a coat drive, and managed to collect and deliver 7 garbage bags of warm winter wear to The Good Shepherd.

The Board and Celt-X hosted a Robot in 3 Days adult team at the Robodrome and the Celt-X team launched into a grueling 6 week build season working 4 nights a week from 5pm to 9pm (ish) and a full day on Saturdays. Design, build, test, redesign, modify, test. Parents rallied and provided lunch on Saturdays and snacks and nourishment during the week.

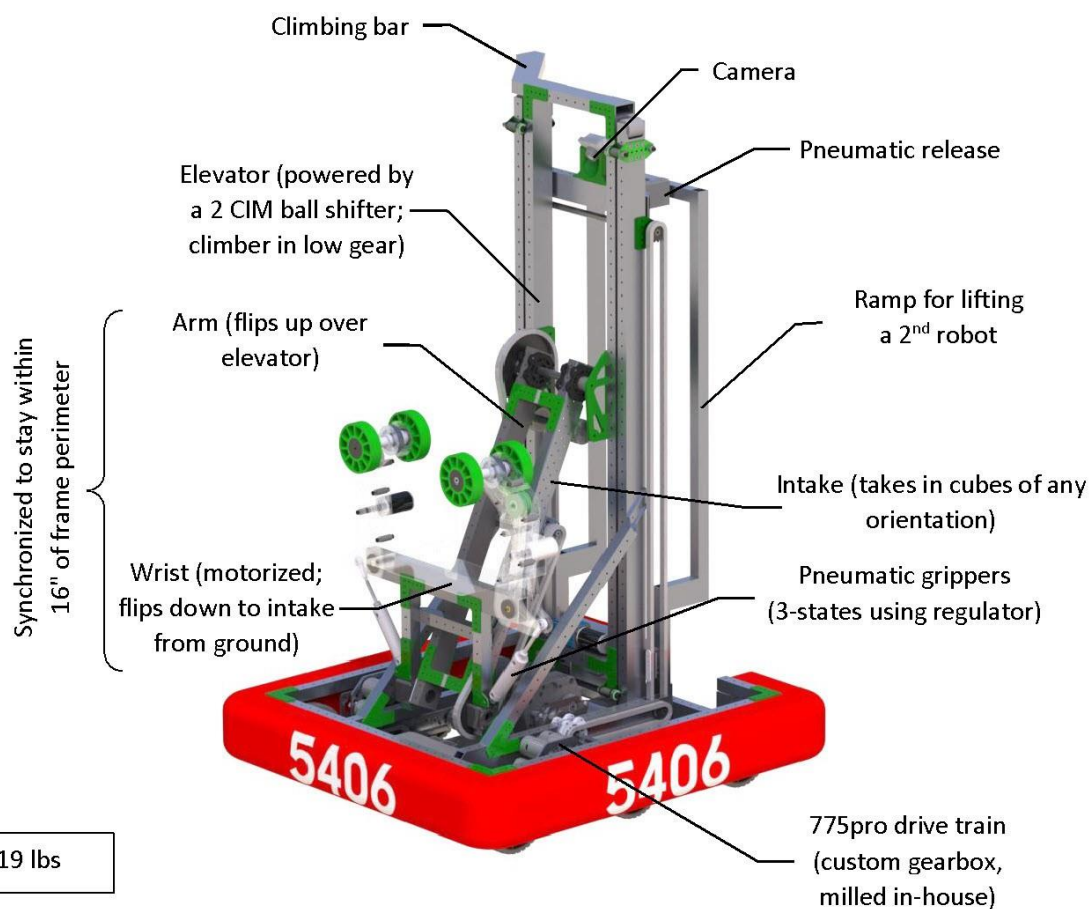


A Field Build Day was held and volunteers built the necessary game elements to fit into the practice field. By Bag Night in February the team had built and programmed a functioning competition robot and a second practice robot. Both were designed to effectively handle all the challenges of the FRC Power Up Game.





## Meet Topsy



Weight: 119 lbs

### Worth a mention:

- 3D printed (in-house): camera mount, encoder housings, wrist hard-stops
- Milled (in-house): gear box plates, wrist blocks
- CNC cut (in house): gripper plates
- Waterjet (sponsored): arm mounting plates

### Learned from past years:

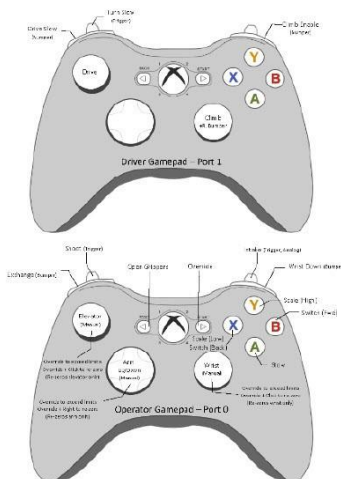
- POE to provide redundant power to radio
- Battery connector locked with reusable zip tie
- Compression fittings on pneumatics
- Weidmuller ferrules in wires going into VRM, PCM, PDP, and Rio

### Software & Controls:

- Sensors: NavX, SRX Mag Encoders, Laser Time of Flight (distance) Sensor
- Motor Controllers: Talon SRX and Victor SPX, using CAN
- Controls: automatic movement to default positions; manual adjustments (within limits) and overrides if needed
- Autonomous: uses Bezier splines to plot paths, followed with feedback from encoders and gyroscope
- System check: drives each output independently; tests individual motors, encoders, and pneumatics

### Performance:

- Can deliver cubes to switch, scale, exchange; Can retrieve cubes from portal, floor; Can climb and lift a second robot
- Autos: 2 cubes in switch or multiple cubes on scale
- 1<sup>st</sup> seed & winner at Ryerson



## Ryerson Ontario District FRC Competition—Toronto

The Ryerson event took place during Week 3 of the FRC competition season, from March 15-17th. The team's first competition of 2018 took place at Ryerson's Athletic Centre in the former Maple Leaf Gardens downtown Toronto. We partnered with St. Jean Brebeuf Odyssey Robotics to share a bus, hotel reservations and we even requested adjoining pits at the venue so they could borrow any necessary tools and we could be on hand to assist the latest rookie team on the H.W.C.D.S.B. with anything they needed.

From the minute we arrived, Celt-X was hard at work. Those not involved in pit set up and drive team became roving 'Green Machine Pit Crews' interacting with and assisting any team that needed the help. Scouting pit crews surveyed all the teams gathering important data for compatibility and strategy planning for alliance plays. The media team took on the challenge of recording every match for uploading to YouTube and for the scouting meeting at the end of the qualifying rounds.



The team played a grueling twelve qualifying matches, with short turn arounds, and entered into the playoff rounds as the first place seed. One of the most memorable moments of the qualifying rounds was round 13 when the team finally got someone to properly drive onto their ramp for a double robot lift. Seeing 30 other teams' mentors stand up to get a better look at how we did the lift and then making their way down to our pit to get a better look was awesome.



With data from the Scouting Team in the stands, Celt-X, as captain of the 1st place alliance confidently choose team 1114, Simbotics, and team 6878, SJB Odyssey, to join them in the playoff rounds. The alliance made a clean sweep of the quarterfinals, semi-finals and championship rounds bringing home the coveted 1st Place Blue Banner. The team was also honoured to accept the Entrepreneurship Award. Odyssey also came home with a 1st Place Banner and the Rookie Allstar Award.





## McMaster Ontario District FRC Competition—Hamilton

Celt-X's second competition took place during Week 6 of the FRC competition season, from April 6-8<sup>th</sup>, at McMaster University. Celt-X was on home turf with the event in our own backyard - no hotels or buses. We unloaded and set up Friday night with practice matches running until 9 pm. During our first practice match we discovered that the competition field had a different coefficient of friction than our practice field. This affected the autonomous mode's drive paths and we were unable to score in the scale. With this discovery, the software team quickly made changes to the code while the drive team competed in another two practice matches and called it a night. Out of eighty qualifiers we were to compete in 12.



For the first match on Saturday we were paired with Orchard Park, team 2056. Together we worked efficiently and easily won the match gaining four ranking points. Over the following two matches the team soon realized the higher caliber of competition that we had to address. In a display of expert cooperation with Chingbotics and Theory6, our drive team secured a win with a score of 480 to 378. The next match, qualifier #30, we lost in a close battle to teams from Milton and Windsor, by a little over 20 points. The following three matches were encouraging as we racked up three wins and a total of 9 ranking points. Another difficult cube battle occurred against opposing alliance, where we faced off against close partner and friend Makeshift Robotics, 4039. Although we suffered a loss, we were not disheartened, and instead made the necessary repairs to be successful in future matches. The following three qualifications, 62, 68, and 75 we won easily, bringing in 11 more ranking points to increase our rank to 5th place!



## McMaster Continued...

After qualifications, alliance selections began. During alliance selections competition partners are chosen based on scouting data gathered by alliance captains. Our team and robot was selected by our good friends and alliance partners at our Georgian College win in 2017, Revolt Robotics. Our solid alliance #4 was rounded off by team 4308, Absolute Robotics. After careful planning between the three alliance drive teams, a strategy of autonomous modes, cube placement and efficiency was formed.



With a competitive strategy we easily won our two quarter final events and progressed on to semifinals. In semis we had three close matches against teams 2200, 1325, and 2935. The third match had to be replayed due to a field fault - increasing the stakes. After a speedy repair by the pit crew we won the third match and advanced to finals. Our hardest match was yet to come, versing 2056, 1241 and 6135 in finals. Another three matches occurred in finals due to technical issues with the field network. In the first match we lost with a score of 410 to 331. In the next match we beat Orchard Park in a battle for the scale during autonomous mode, but narrowly lost the match, due, in part, to issues with the field network. The second match was replayed, and although we lost the rematch, we fought hard and proved ourselves a worthy opponent against a more experienced alliance, and earned a much deserved silver medal. Celt-X also came away with Excellence in Engineering Award sponsored by Delphi.





## Ontario District FRC Championship

The FIRST Ontario Provincial District is one of four Canadian events where teams can qualify for the World Championship. The top 80 teams were invited to participate in the Ontario District Championship held at the Hershey Center in Mississauga April 11th. We had only three days after the McMaster event – not even enough time to unload our truck. Celt-X rallied and prepared for the challenge. Our team was randomly allocated to the Technology Division – which featured some of Ontario’s best teams – so we promptly began pre-scouting teams in the division through internet data.



After their twelve matches, Celt-X was ranked the 2nd place team going into elimination rounds. Taking Team 4917, Sir Lancerbot, from Elmira and Team 4939, Allspark9, from Brampton the alliance swept all six games to capture the Technology Division Championship while also beating two previous world championship teams.



The Alliance then moved on to the Ontario District Championship Finals against the Science Division’s winning alliance: Team 2506 - O.P. Robotics out of Stoney Creek, Team 1325 - Inverse Paradox from Mississauga, and Team 6875 - Build A Dream Robotics - Amazon Warriors from Windsor. This was the strongest alliance Celt-X had faced all season. At the end of the first match Celt-X score was ahead - the arena went wild with jubilant cheers while we waited for the final confirmation and tallying of any penalties. We were loved! The cheering turned to dead silence when the final score showed we had lost by 12 points. It was also the closest any alliance had come to beating O.P. Robotics undefeated record for the entire event and we had the attention of the seasoned O.P. Mentors.

The second match started as a neck to neck race to fill the scale but a catastrophic break in the frame of alliance partner 4917 left Celt-X’s Tipsy taking on two scale bots for the remainder of the match. Finishing the match with only a 100 point difference the Drive Team and Tipsy gave the power house red alliance a serious run for their money.

Celt-X came home with the Technology Quality Award, the Ontario District Championship Finalist Title and a 4th place ranking in Ontario. This was the highest season ranking position we have ever had as well as securing a seed at the Detroit FRC World Championships 11 days later.



## Detroit World FRC Championship

For the fourth time in our four year history, Celt-X qualified for and attended the FIRST Robotics Competition World Championship. With a shortened travel time from last year's St. Louis destination the team took a tour of the Ford Rouge Factory to experience robots at work before unloading the team pit in the Cobo Center and checking out the new home for the competition. 6 divisions divided up the 405 FRC teams for two days worth of qualifying rounds.



No longer considered the new guys on the block the team entered into the Darwin Division focused and ready to compete. With only 10 matches to play out of the 112 matches the team had to make every point count to place high in the alliance selections. The Scouting and Match Video Crews worked diligently in the stands to ensure the most accurate and complete information was recorded of each match. The pit scouting crews had to navigate a city of 405 random pits to gather up close information for alliance selection data and game strategy. The drive team and pit crew were challenged to coordinate practice field time with potential alliance teams, often spending more time in line for the limited field space than in the actual team pit.

Gathered information quickly revealed that for the first time all season Topsy's partner climbing ramp was not going to be as effective as in past competitions since most of the teams in the division were taller scale oriented bots with an offset center of gravity. The game strategy needed to change and new approaches were developed on the fly. Winning 8 out of 10 matches Celt-X left the event at the end of day two as the first place seed in their division.

The Detroit competition was visited by the Governor General as well as by executives from John Deere. Our team was again joined by Deborah Harrison, president of John Deere Canada, and we made a great impression on many of the international teams that we interacted with.



After a team dinner, many joined the scouting meeting to present data and insight on the two days of competition. The meeting continued long into the wee hours with video review and statistical analysis being looked over and over. The decisions were made. Coming into the event on the Saturday morning the team was hit with shocking news. There had been a computer scorekeeping error the day before and Celt-X was actually the 2nd place seed. This would affect the team's alliance selections. The team rallied and entered into the selections confident of their plan. Taking Team 2451 PWNAGE from Saint Charles, Illinois and Team 2481 Roboteers from Tremont, Illinois as their partners for the finals the team prepared for battle. Sweeping the quarter finals in two matches the team braced for tough competition in the semi-final matches. Appearing to win the first match against teams 865, 494 and 4917 by one point the team left the field to prepare for the second match only to be informed later that there had again been a field accounting error and they had lost the match by one point. The team rallied and won the second match with a 157 point advantage. Coming into the third tie breaking match the alliances fought bumper to bumper for control of the scale with a strong defence game being played. Both alliances had two robots in the air at the end of the match but the Celt-X alliance lost by 11 points. This is the farthest into the finals Celt-X robotics has come in it's four year history and returned to Hamilton 22nd in the world. The highest seeded team in the H.W.C.D.S.B.



## CELT-X 5406 - 2018 FRC Robot Record

- ⊗ FRC Top25 (World): Ranked #22
- ⊗ World Championships (Detroit): Semi-finalist, Darwin
- ⊗ World Championships (Detroit): 2nd Seed, Alliance Captain, Darwin
- ⊗ FRCTop25 (Detroit): Ranked #9
- ⊗ Ontario District Champs: Quality Award, Recipient
- ⊗ Ontario District Champs: Finalist
- ⊗ Ontario District Champs: Winner, Technology Division
- ⊗ Ontario District Champs: 2nd Seed, Alliance Captain, Technology Division
- ⊗ McMaster District: Excellence in Engineering Award, Recipient
- ⊗ McMaster District: Finalist
- ⊗ Ryerson District: Winner
- ⊗ Ryerson District: 1st seed, Captain of Alliance 1
- ⊗ Ryerson District: Entrepreneurship Award, Recipient
- ⊗ Ryerson District: Safety Award, Runner Up



## No End to The Season! Still Rolling - “Buy Out” Quad Cannon Demos.

Celt-X took a week off after Detroit but was right back to work getting Lola the Quad T-shirt Cannon up and running for the Basketball “Buy Out” day the week after. We have returned to the weekly Thursday night meetings and are preparing for our year end banquet and a trip to Indiana for the I.R.I off season Power Up competition in July. We have plans to work through the summer into the fall.



## Rotary Night

The Rotary Club of Hamilton East Wentworth became a sponsor of the Celt-X team this year. On May 26th they held their annual Silent Auction, Dinner and Dance with the Stoney Creek Rotary Club who sponsors OP Robotics. Both were invited to participate. We brought 2017's Oscar and OP brought their 2018 OP12. Guests interacted with the students and watched an impressive display of 'robot catch' as Oscar filled the Power Up cube being held 8 feet off the ground by OP12. OP12 would then dump the balls back into Oscar. Fun was had by all and Celt-X team members helped with the silent auction and took over the D.J. booth until the wee hours of the morning. (OP Robotics left before dinner!)

## Air Cadet Demonstration

Oscar and the Celt-X team were back on the road on May 29th when they invaded the 779 Black Knights Air Cadet Meeting in Mount Hope. We gave the cadets a brief history and explanation about FIRST Robotics and Celt-X 5406. We then let Oscar have center stage to show off while team members answered any questions.

## Upcoming Celt-X Events

### June 1 - Year End Banquet

We have accomplished a lot this year, and it is time to celebrate our successes, reminisce on the fun times, and recognize the contributions of all those who made this amazing season possible.

### June 2 - Strawberry Thunder

The Keith Neighbourhood, the area around the Robodrome, is hosting a summer festival and we have been invited to demonstrate our robot. Several individuals from this community came out to the McMaster event and we are hoping to continue engaging them.

### June 7 - Scout STEM Night

Scouts of various ages will be joining us for a chance to learn a little about the Robodrome, our team, and the things we work on. We are hoping to plan some fun and engaging activities for the children.

### June 13 - Mohawk CodeFEST

We will be demonstrating our robot for around 400 elementary school students learning about technology. This is a repeat invite following the workshop we ran at CodeFEST last year.

### June – Sound of Music Festival

Celt-X will be volunteering at the Sound of Music Festival in Burlington to help organize recyclables, and to fundraise for our upcoming season. We hope to see all students, parents, and siblings present.

### June 29 - Last Day of School

School's out for the summer – now the hard work begins.

### July 12 - IRI Offseason Competition

Featuring many of the top teams in the world, IRI is an invitational event and a great opportunity to see matches played at the absolute highest calibre.

### Aug 26 - Tesla Electric Festival

This festival will be similar to the Maker Faire of previous years, and will feature a number of robotics team demonstrating their robots.

### Planning Ahead:

Aug - Grade 9 Demo

Sept 4 - 1st Day of School

Sept 4 - Recruitment Start

Sept - Parent Team Meeting

Sept 30 - Golf Tournament

Oct 27 - Rah Cha Cha Ruckus

Nov 3 - STEMley Cup

Jan. 6 - Deep Space Reveal

Feb 17 - Bag Night

Apr 5 - McMaster District

Apr - Ontario Districts

Apr - World Championship



A huge thank you to our parents, sponsors, and mentors:  
without your support none of this would be possible

**VOLUNTEERS NEEDED NO EXPERIENCE REQUIRED!**

**WE NEED MENTORS FOR  
BUSINESS / MARKETING / PROMOTION**

**ENGAGE US TODAY!!!!**