BROWNCOATS
Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 2, 2018	AvaLAN Wireless	12:00 p.m.	6:00 p.m.	18

Meeting Goals: Elevator

Team Members in Attendance:
Brooklynn, Ian, Megan, Joseph, Patrick, Rosie

Tasks	Reflections
Glyph Collection System	The team focused on finishing the lower stage today. John brought his 3D printer to print more custom Tetrix pulleys for the upper conveyors, and slowly added them to the lower conveyor on the upper stage as they finished printing. The TETRIX axle solution seems to have solved the issues with friction, but it will have to be tested. They also started placing the sprockets to power the conveyor today. Because the sprocket axles are only supported at one point, they wobble a lot. Considered using TETRIX beams to support them in more places. Megan, Ian, and Rosie started building the part of the elevator that will score the top two glyphs. They put an axle through the Lexan plates and held that in with bearings and shaft collars. To mount on the axle, two of the custom aluminum parts were connected with two pieces of REV extrusion. On the top and bottom of these two plates, a shorter axle, two axle hubs, a 3D printed pulley, and a shaft collar were placed. There are now two pulleys and timing belts on each axle.
Relic Arm	The relic arm grabber was reprinted on a 3D printer. It fits now, whereas it was too small previously. However, the holes are out of alignment for the custom double pillow block piece, so will need to either drill into the PLA or print one solid piece with the pillow block attached

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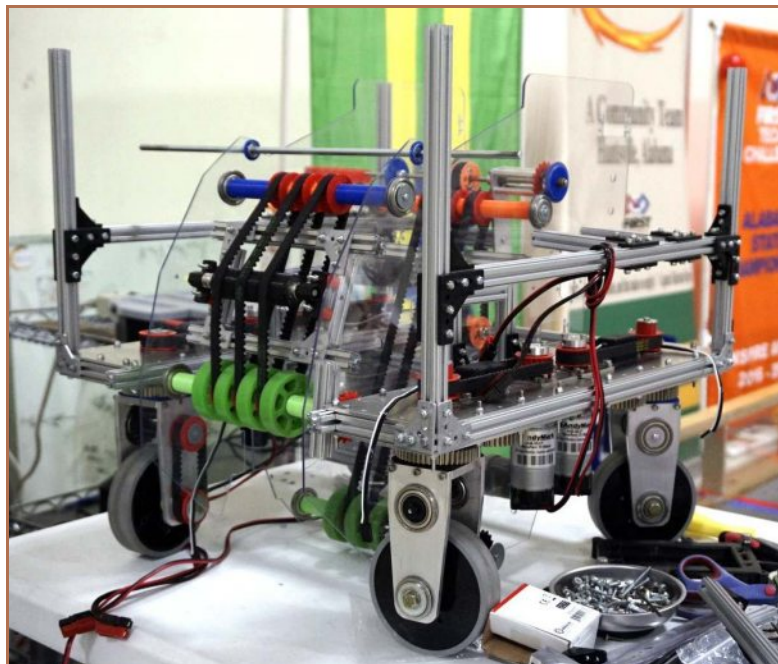**Team 7842 Engineering Notebook - *FIRST* Relic Recovery**

Date	Location	Start Time	End Time	Week #
January 3, 2018	AvaLAN Wireless	12:00 p.m.	6:00 p.m.	18

Meeting Goals: Elevator Conveyor

Team Members in Attendance:
Ian, Megan, Rosie

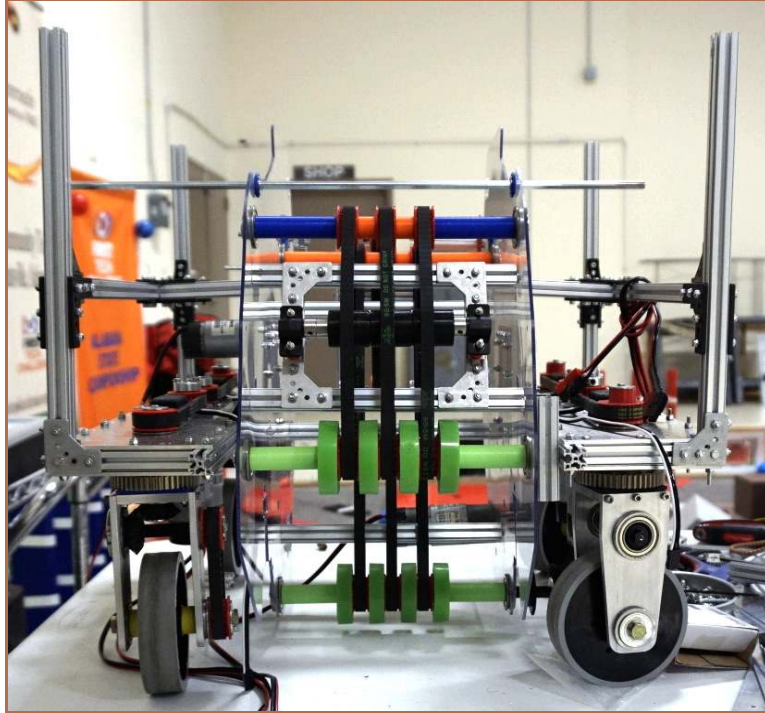| Tasks	Reflections
Glyph Collection System	Ian finished assembly of the lower conveyor today by adding latex tubing to tension the actuation of the arm, paracord as a hardware stop, and chain to power it. He ran a glyph up the conveyor, using his hands to keep pressure on the glyph. It works, but it will need some sort of guide to keep the glyph straight.

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Date	Location	Start Time	End Time	Week #
January 4, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	18

Meeting Goals: Elevator

Team Members in Attendance:
Ian, Megan, Rosie

Tasks	Reflections
Glyph Collection System	Ian and Megan finished mounting the part of the elevator that scores the top two glyphs. It had two pulleys and two timing belts mounted onto it. Chain was added to motorize it. The glyphs moved smoothly; however, there was nothing to keep them from falling off, so construction was begun on the conveyor belt that willd encase the top part of the glyph, while the first conveyor lifted them from the bottom. This part was built the same way as the prior one: two longer metal custom plates were connected with REV extrusion. Two pulleys and two long timing belts were then added. Once this was mounted, it was realized that the glyph would have a tight fit. Latex tubing was used to keep the conveyor in place, though the tubing had a little give so the glyph could come through. Once the drive chains were added, it was tested using the motor. Found that the metal plates were digging into the glyphs, as the plates were only about half the glyph's width. Longer pieces of extrusion were then used to connect the metal plates, keeping that part from actually touching the glyphs. This helped immensely and actually took a lot of the pressure off. Once it was tested, the conveyor belts gripped them well and dropped them easily.

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Team 7842 Engineering Notebook - *FIRST* Relic Recovery
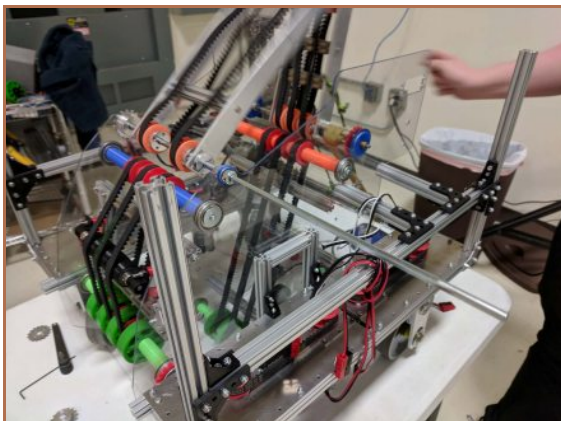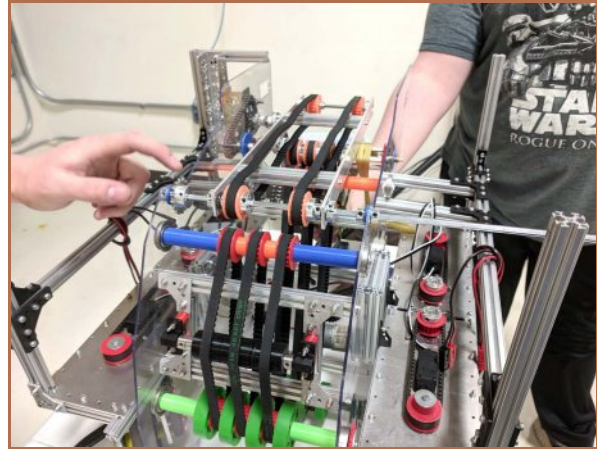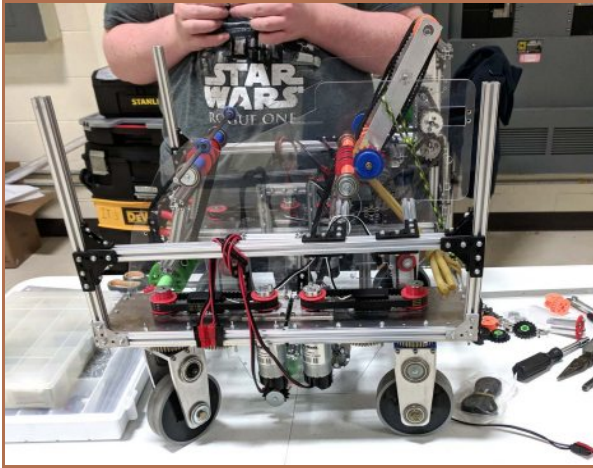
Date	Location	Start Time	End Time	Week #
January 5, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	18

Meeting Goals: Elevator

Team Members in Attendance:
Brooklynn, Ian, Megan, Rosie

| Tasks	Reflections
Glyph Collection System	The first thing Ian and Megan did was look at the top conveyor belt. The timing belts were slightly loose, so were tensioned like the others. On top of two pieces of REV extrusion, two pillow bearing blocks were used to hold a hex axle in place. On the axle, two 3D printed rollers and three thin spacers were used to fit snugly. The rollers work to tension the belts, while still making it easy for the belts to turn. At this point, the top two conveyor belts were motorized, but the bottom of the elevator hadn't been chained together. A Neverest 20 motor was mounted onto the Lexan, but when they tested the system, the motor and axle it was chained to bent out of place because of the flexibility of the Lexan. The out of place axles caused the chains to fall off of their sprockets. Zip ties were used to hold everything into place, and while it worked well enough, this will only be a temporary solution. Once all of it was in place, the team moved the robot onto the field to test the elevator. They found that the compliant wheels that help feed the glyphs into the elevator were too tight to let the blocks come in, and therefore the glyphs got stuck and couldn't go in any farther. The compliant wheels were taken off, and this made it a lot easier.

|	
Glyph Collection System (continued)	It was decided that the three compliant wheels would probably not be necessary, as that two bigger compliant wheels on fold out arms will feed the glyphs in. The only other problem is that the pulleys on the axle–the one the compliant wheels were on–dig into the foam glyph slightly. To fix this, bigger diameter spacers the same size as the pulleys are to be 3D printed so there won't be any sharp edges to dig into the glyphs. One more problem that also has to be fixed is on the top of the elevator as the glyphs are dropping into the cryptobox. The glyphs have a tendency to fall off to the side. At the next meeting, side guards will be added to keep them in place. Ian also started mounting the intake arms today. A dead zone was discovered between the back of the intake arms and the elevator. Testing is required before a solution can be found.
Relic Arm	During the meeting, John printed out a piece for the relic lift that will keep the rack and pinion in place so it doesn't move around. Four more will be printed to hold the whole thing in. The team also decided that their main priority is to have the elevator working for the Alabama State Championship. If the relic arm is not done before State, they will aim to have it on by Super Regional, if they advance.
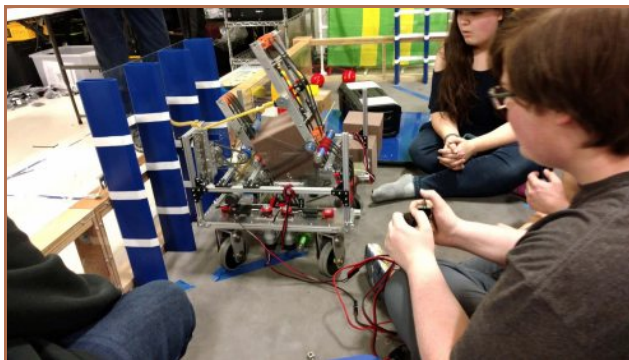
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Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 6, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	18

Meeting Goals: Wiring and Intake Arm Tweaks

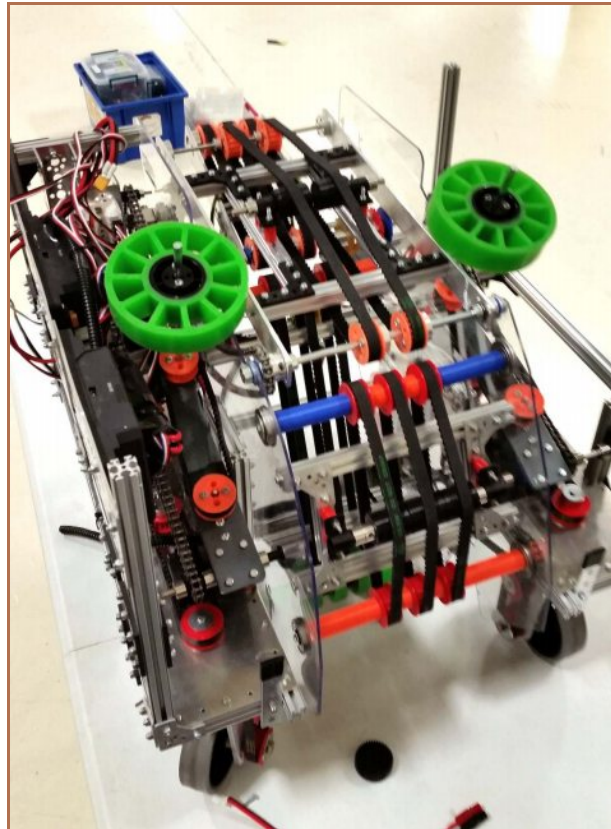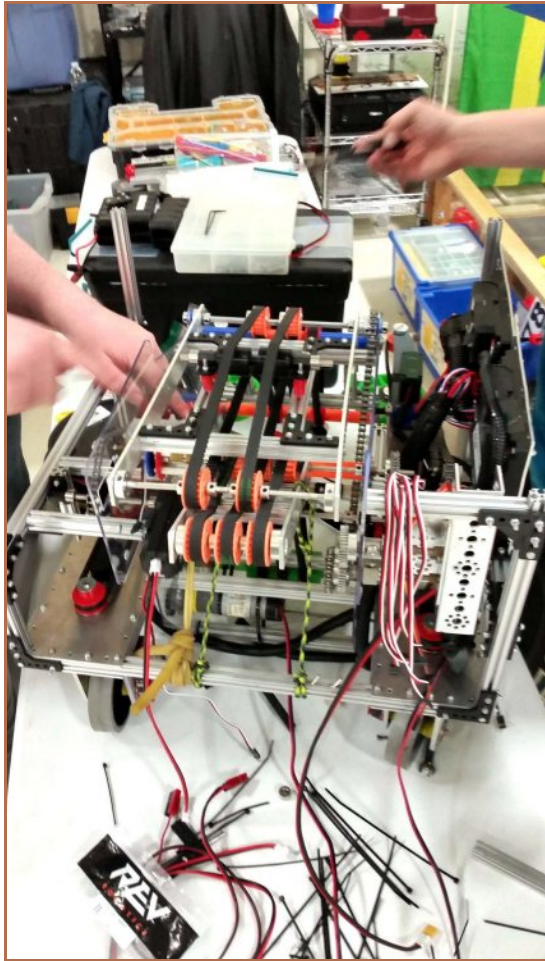| **Team Members in Attendance:** |
|---|
| Ian, Megan, Rosie |

Tasks	Reflections
Glyph Collection System	Wiring and intake arm tweaks were accomplished today. Ian moved the arms closer together, as the gap between them was too large for the glyphs. Unfortunately, he couldn't test the whole system today, because wiring took a long time.
Drive Train	Ian wired most of the robot to the REV hubs (albeit not very cleanly), which will allow TeleOp software to be coded and tested over the week.
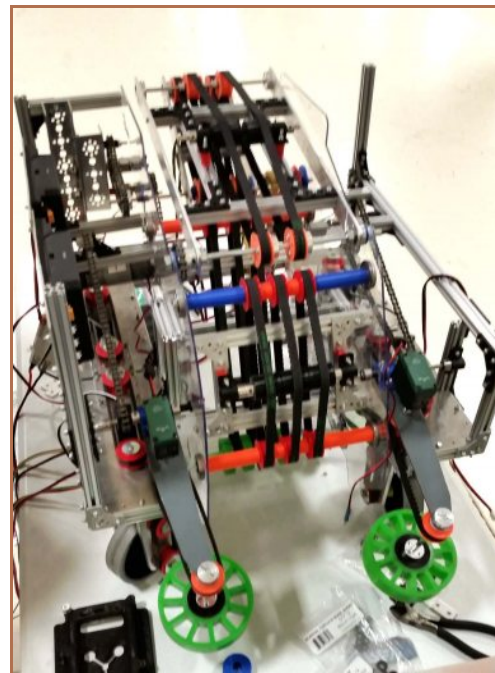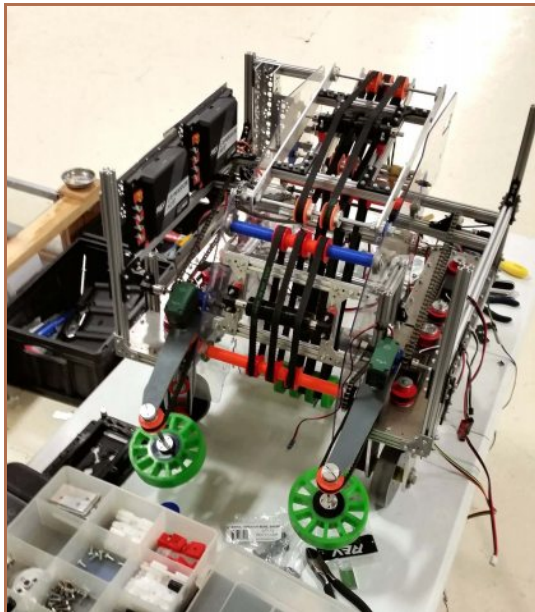
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Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 13, 2018	AvaLAN Wireless	11:00 a.m.	6:00 p.m.	19

Meeting Goals: Glyph Collection

Team Members in Attendance:
Ian, Megan, Joseph, Rosie

Tasks	Reflections
Glyph Collection System	The top conveyor belt was tensioned correctly so that a glyph would fall evenly into the cryptobox; however, if a glyph didn't come into the bottom of the elevator aligned perfectly, it would get stuck and wouldn't even make it up to the top part. Another issue was actually getting the glyphs into the elevator. The compliant wheels were not working properly, so those were taken off and replaced with zip ties. The zip ties were covered in latex tubing and fastened on with the heads of the zip ties. Zip ties were also put on two of the rollers on the top of the intake; however, this just caused the glyph to become even more misaligned, so that idea was quickly scrapped. While the zip ties on the arms of the intake worked well enough, it still didn't send them in straight and help the elevator to pick them up. The plan is to put more zip ties on the bottom rollers of the intake before the scrimmage. Inside of the elevator, side guards were placed to help straighten the cube out. It worked at the top; however the glyphs at the bottom were still having a really hard time straightening themselves out.
Autonomous Navigation	Joseph spent the meeting debugging the autonomous software. He had some problems with the robot's rotation, and found that there is a big difference between compass angles and the angles used by the software's math functions.

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Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 14, 2018	Huntsville High School	2:00 p.m.	6:00 p.m.	20

Meeting Goals: Test Vera during Scrimmage

Team Members in Attendance:
Ian, Megan, Joseph, Rosie, Brooklynn

| Tasks	Reflections
Glyph Collection System	Apex Predators invited us to attend their "Scrimmage Extravaganza" with a several other Alabama and Tennessee teams. The robot and a lot of tools were brought, so that we would be prepared to work out any kinks found throughout the day. There were a lot of issues found throughout the day that could not be fixed. By the time the scrimmage was over, the team was beginning to seriously doubt if they would be able to get this design working as expected. They decided to sleep on it and think about what could possibly be done to help it or if it should be changes completely. During the scrimmage, the top conveyor belt's tensioning had loosened a bit causing it to fall backwards and to not assist the glyphs in any way. After the match, the tensioning was quickly fixed and the knot tightened as much as possible. The intake system still wasn't picking up the glyphs as desired. The latex tubing on the arms didn't work well, and it was soon realized that they were causing more problems instead of fixing them. The compliant wheels were put back on with the latex tubing, but that made it even worse.

Glyph Collection System (continued)	On the back of the intake system, zip ties were put on the rollers to help lift the glyphs into the elevator. While this helped slightly, it also occasionally caused the glyphs to get stuck. As a last resort, the latex tubing was taken off of the arms and the zip ties were tied onto the compliant wheels making Vera look like a street sweeper. This actually helped a lot, but it can't be used in an actual competition because there was no way to make the zip ties fold up within the eighteen inch limit.
Autonomous Navigation	During the scrimmage, Joseph worked to convert math angles into compass angles. Mr. Bateman helped him come up with the calculation required to convert math angles into compass angles.
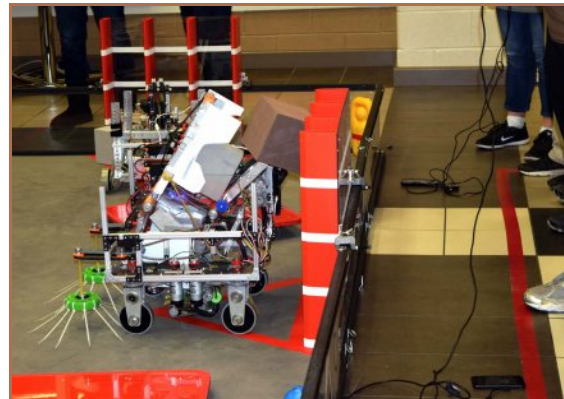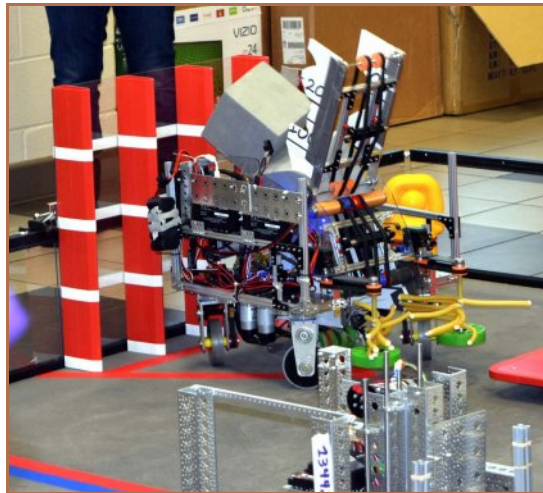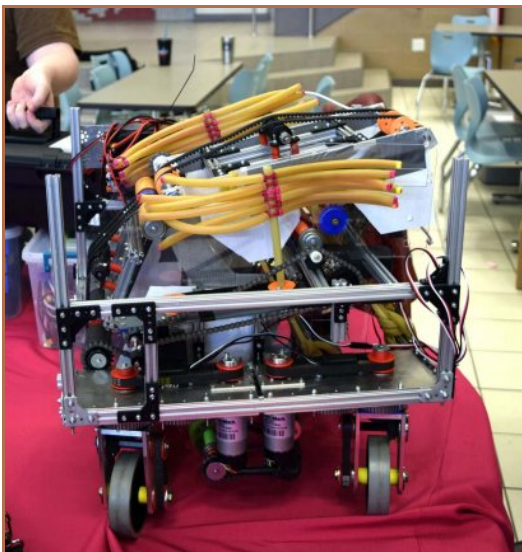
Date	Location	Start Time	End Time	Week #
January 15, 2018	AvaLAN Wireless	11:00 a.m.	6:00 p.m.	20

Meeting Goals: Redesign and Rebuild Vera

Team Members in Attendance:
Ian, Megan, Joseph

| Tasks	Reflections
Glyph Collection System	The team got together over the Martin Luther Kind holiday to discuss the future of the robot. There were a lot of issues identified with the complex system during the scrimmage, and there were quite a few other teams with simpler robots who did a lot better. After much discussion, it was decided to quickly prototype a system that would gather glyphs with wheels, push them onto a collection pan, and then just tip them into the cryptobox. It was agreed that the elevator wouldn't be taken apart until it was decided that the prototype was promising enough to do so. First, Ian and Megan built the intake arms that would bring the glyphs into the robot. Tetrix beams, axles, gears, and motors were used. On each side there were two wheels, a large compliant wheel and a large foam wheel. 3D printed pulleys were put on the wheels' axles and connected with a timing belt. One wheel had a gear that meshed with a gear on the motor. Originally, Neverest 20 motors were used for the system, but when tested, the glyphs went flying out the back of the robot and across the field, so 40s were used instead. For the part of the system that would tip the glyphs up, a slide with angled sides was used to keep the glyphs in place. After some testing, it was decided that it should be a little shorter, so it was shortened to fit two glyphs perfectly. Then an axle was put through it as a hinge so that it would tip the pan and drop the glyphs into the cryptoboxes. On the angled intake beams, corrugate plastic was duct taped so the glyphs would slide across the surface and onto the pan on the top of the robot.

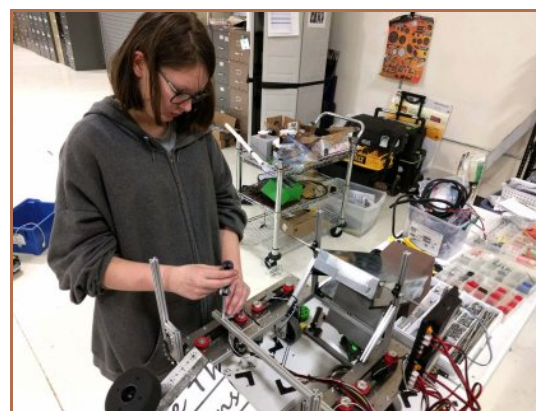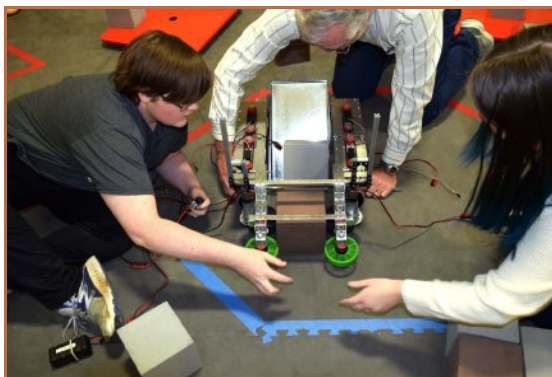|	
Glyph Collection System (continued)	At this point, the design looked very promising, so the elevator was taken off of the swerve drive chassis and disassembled it. Vera is now onto her third design of the season.
Autonomous Navigation	Today, while the rest of the team reworked the robot hardware, Joseph made progress debugging the autonomous software. He ended up removing all mention of compass angles and switching entirely to math angles.
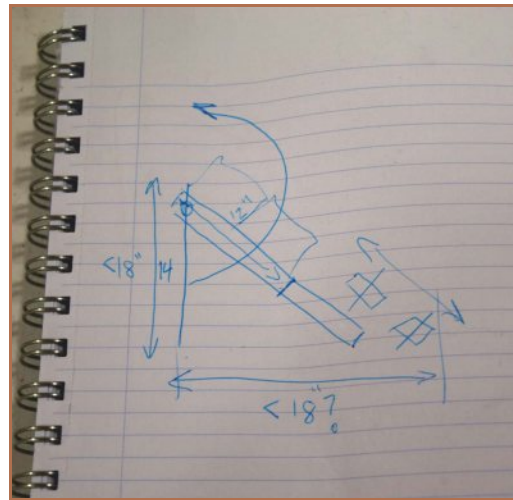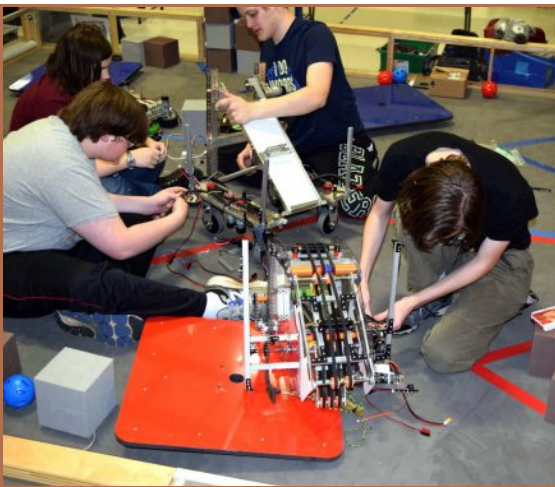
BROWNCOATS
Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 19, 2018	AvaLAN Wireless	2:00 p.m.	6:00 p.m.	20

Meeting Goals: Rebuild of the Glyph Collection System

Team Members in Attendance:
Brooklynn, Ian, Joseph, Rosie

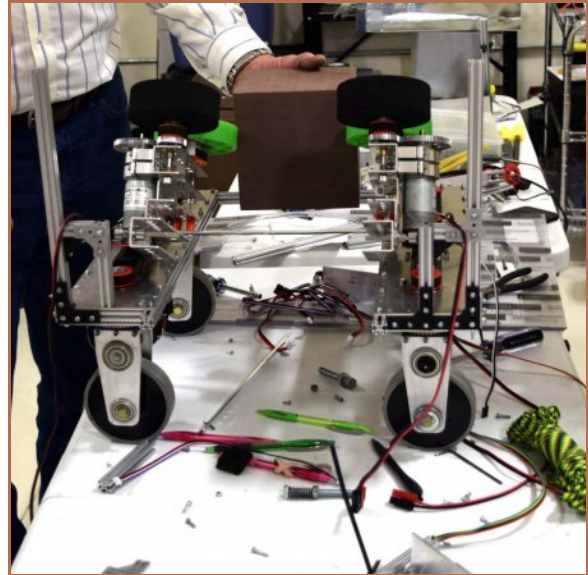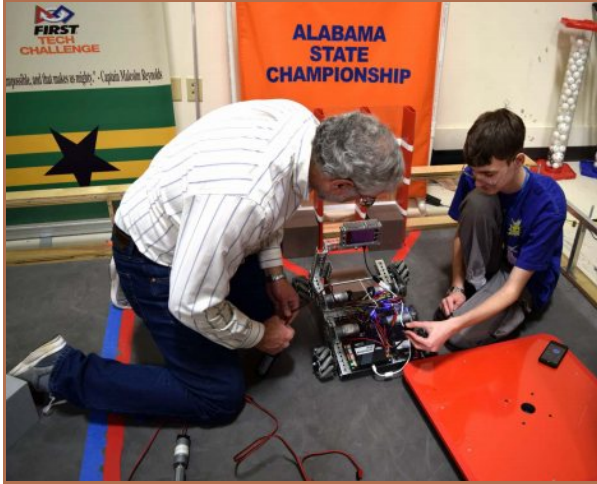| Tasks	Reflections
Glyph Collection System	Ian discovered that Swerve was interfering with the glyph intake, due to its height. Another issue was the angle of the intake. It couldn't rotate glyphs off of the mat and onto the intake slide. After considering a design that incorporated a lift under the collection pan, it was discovered that there were no parts to build a lift. Due to this, he went back to the mounted collection pan above 12". The intake was redesigned to cause glyphs to flip before going into the intake by grabbing them at the top, then depositing them out. This allows the Swerve drive's height to be ignored (it's actually more of an advantage here), and the glyphs can easily be lifted and deposited into the collection pan, because they're at a similar angle.
Autonomous Navigation	Joseph continued to make progress on the autonomous, and got it nearly doing general navigation.

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Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 20, 2018	AvaLAN Wireless	9:00 a.m.	6:00 p.m.	20

Meeting Goals: Glyph Collection System

Team Members in Attendance:
Brooklynn, Ian, Megan, Joseph, Patrick,

| Tasks	Reflections
Glyph Collection System	First, Ian and Megan looked closely at what was already working and what wasn't. The compliant wheels and foam wheels worked together well, but there was a bit of a dead zone where the glyphs almost slid off of the pan. To fix this, two more compliant wheels–these were some of the stiffer kind–were placed next to the foam wheels. One problem found was that timing belts could not be put on the top of the beams like the other two wheels. So, they were added on the bottom of the beam. There were only two seventy tooth belts, so an eighty tooth belt had to be used, and it needed to be tensioned a lot with 3D printed rollers. More belts were ordered at the end of our meeting so this could be fixed to avoid error. Once the system was tested with the new wheels, it worked extremely well and rather consistently. The only problem was that the intake would no longer fold into the robot as needed. The wheels get stuck on the drive train as it tries to fold. Possible solutions were discussed to correct to this. It was decided that the glyph intake would be put on longer beams, thus moving the wheels out far enough to not get caught, but still close enough to be effective.
Jewel System	Brooklyn worked on the jewel subsystem. Since Vera was still under construction, she had to put the jewel arm on Binky so that Joseph could work on it in autonomous. Her first trial on putting it on was to make it go sideways, left to right movement. Since that didn't seem to work as accurately as she planned, she disassembled it and put it back together so it would move up and down instead of sideways.

Autonomous Navigation	Today Joseph made HUGE progress on the autonomous, getting to the point where it could navigate to any spot and made it able to distinguish between the ciphers. Unfortunately, Binky broke at this point, but as he had gotten it to the point where it needed to be ported over to Vera, this was not a big deal.
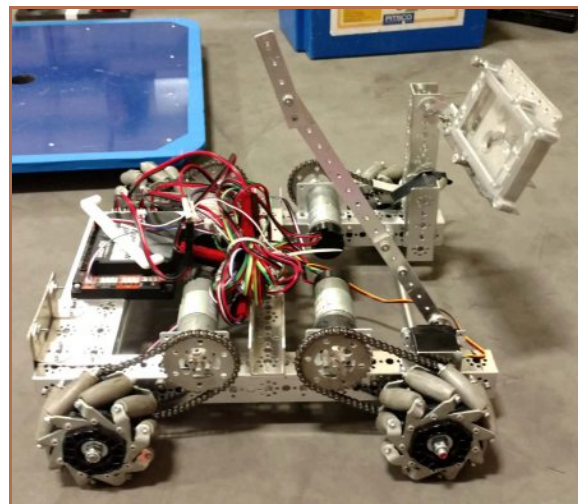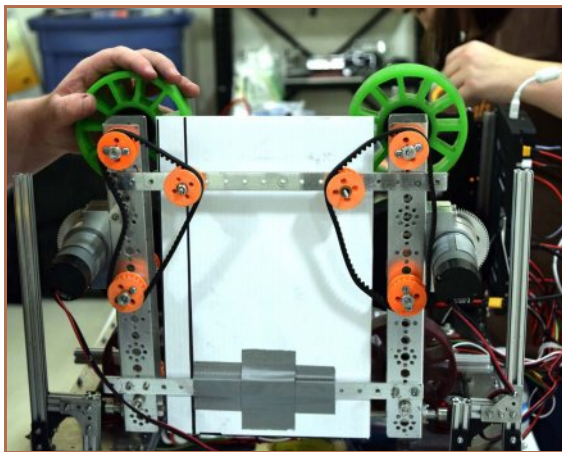
BROWNCOATS
Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 26, 2018	AvaLAN Wireless	11:00 am	6:00 pm	21

Meeting Goals: Glyph Collection System

Team Members in Attendance:
Brooklynn, Ian, Joseph, Rosie

Tasks	Reflections
Glyph Collection System	Ian and Rosie reworked the intake with longer beams, which successfully accommodates the 3rd set of wheels when folded in. Unfortunately, there aren't enough 70t belts to power all the wheels. 80t belts are currently being used for the front ones, which require quite a few tensioners, and 70t belts for the back. Those are also being tensioned, because we can't move the 3rd set of wheels as far back as we want until we get the new set of belts. As the design stands now, we have the 80t belts on the bottom of the intake (due to all of the tensioners required), and the 70t belts stacked below the 80t belts on the bottom. This was to reduce the height of the 3rd set of wheels, allowing the intake to fold into the robot. These problems will be solved once we have the new, shorter belts. The collection pan was also mounted to two REV 5mm hex pillow blocks, allowing it to be tipped up with a gear. The plan is to use one of REV's core hex motors to tip up the collection pan. This will eliminate set screws in that system, and – because the entire system is mounted to REV extrusion – will allow gear ratios to be changed quickly and efficiently. This means that the perfect balance of speed and control for the collection pan can be found, and glyphs may be scored more quickly because of it.
Autonomous Navigation	Joseph spent the day porting the autonomous software from Binky over to Vera. This required changing the hardware map.

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Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 27, 2018	AvaLAN Wireless	9:00 am	6:00 pm	21

Meeting Goals: Glyph Collection System

Team Members in Attendance:
Brooklynn, Ian, Joseph

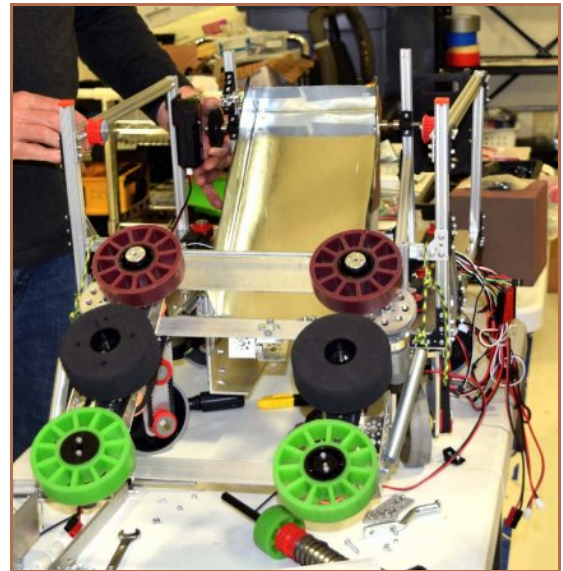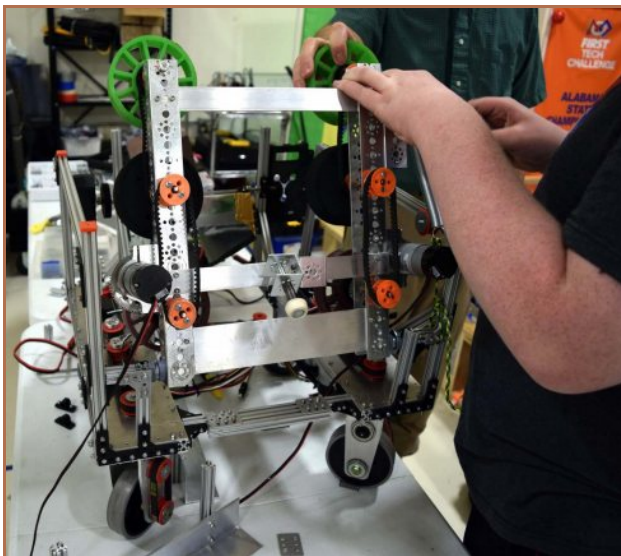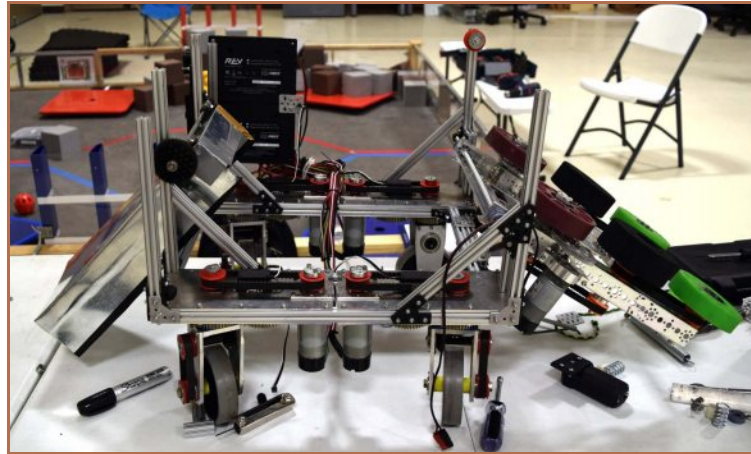| Tasks	Reflections
Glyph Collection System	The 70t belts arrived today, allowing a few major reworks to be done to the glyph intake. First, the belts were replaced, yielding more room to work. Also replaced were the two 5mm hex axles that previously supported the glyph intake with one long rod of all-thread. This gives the intake more support, without affecting the glyphs very much. Additionally, after some testing, it was discovered that a 5.5" inner distance between the wheel sets was too little when he tried to collect glyphs on the upper end of the tolerance (the tolerance being 5.75" to 6.25"). To alleviate this, aluminum flat stock was used to make custom spacing for the intake, making a gap closer to 5.75". Glyphs on the far upper end of the tolerance still hang in the intake a bit, but they don't jam now. A spring-loading was then built for the intake. The goal was to avoid using a motor if at all possible. After multiple ideas were brought up, it was decided to use 3D printed pulleys from the old elevator as fulcrum points for springs. Paracord was used to attach the springs to the front of the robot. The springs were then bolted to the intake, and the tension was adjusted with taut line hitch knots, which are adjustable. Even with springs, it was discovered that the intake doesn't accelerate enough to make it past the vertical point (allowing gravity to do the rest). To solve this, the motors were moved closer to the point of rotation, drastically reducing their effective weight. After this change, the springs worked fantastically. The only issue with the system is the violence of the intake release. The robot jumps once the intake is deployed. To combat issues with autonomous encoder readings, the collection pan will be stored above the intake, and the autonomous routine completed prior to deploying the intake. This should prevent the intake deployment from ruining an autonomous run.

Autonomous Navigation	Joseph had some trouble today with the motor powers and servo positions. He didn't get that long to work on it, as robot hardware was being worked on.

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Date	Location	Start Time	End Time	Week #
January 28, 2018	AvaLAN Wireless	1:00 pm	5:00 pm	21
Meeting Goals: Glyph Collection System				

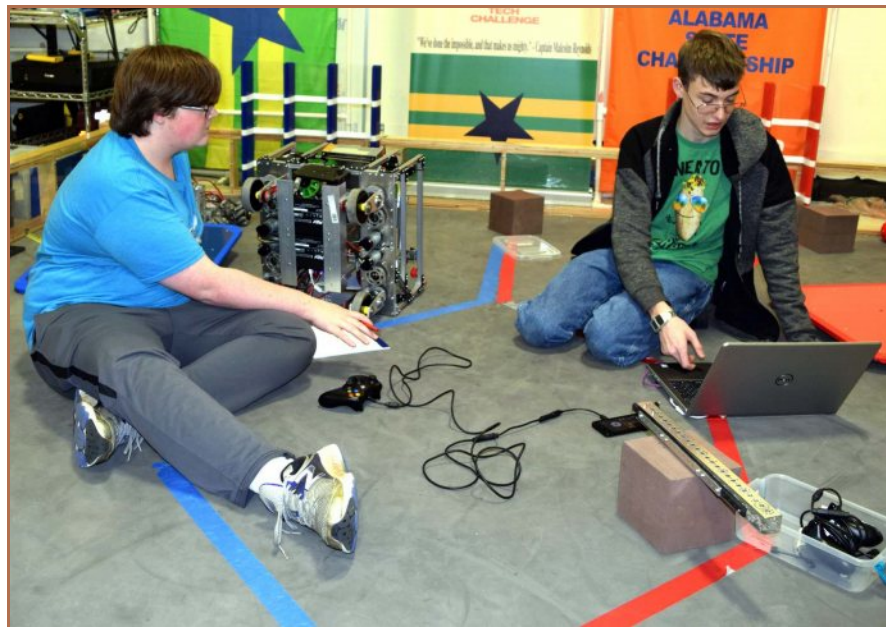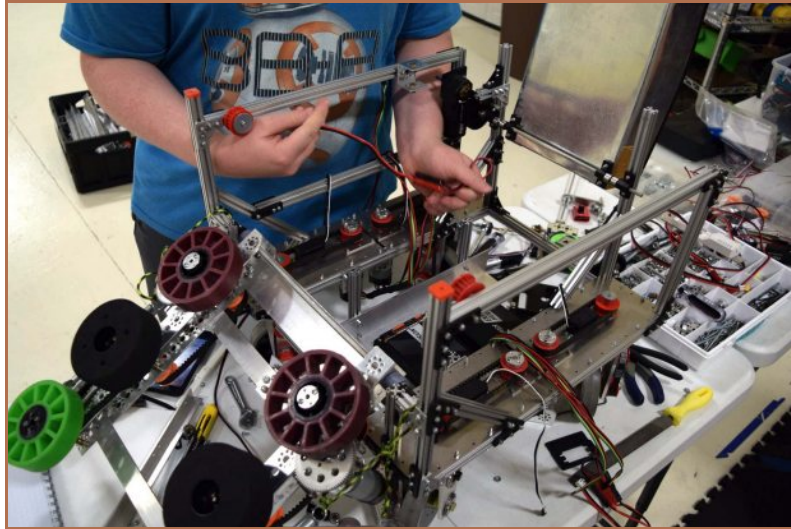| Team Members in Attendance: |
|------------------------------|
| Ian, Joseph |

Tasks	Reflections
Glyph Collection System	Ian worked on the latch for the glyph intake today. While doing this, it was discovered that the previous plan for mounting the latch servo wouldn't work. It was to mount to the swerve plates, but the holes didn't line up. Instead, a piece of extrusion was cut with a 90 degree flat on one end and a 45 degree angle on the other. This allowed mounting to a 45 degree support beam on one side, and a vertical support beam on the other end. After cutting this beam, he learned that he didn't have anymore 45 degree brackets. As a solution (since the beam isn't structural, it just needs to be mounted), 120 degree brackets were cut. Once this was all done, the latch was mounted. Unfortunately, this was not finished before work on the autonomous software was begun.
Autonomous Navigation	Today Joseph tested his code on Vera and had to make several modifications to try and make it drive in a straight line with less drift.

BROWNCOATS
Team 7842 Engineering Notebook - *FIRST* Relic Recovery

Date	Location	Start Time	End Time	Week #
January 31, 2018	AvaLAN Wireless	1:00 pm	5:00 pm	22

Meeting Goals: Glyph Collection System

Team Members in Attendance:
Ian, Megan, Patrick

Tasks	Reflections
Glyph Collection System	The team met on Wednesday with the hopes of finishing the glyph collection intake system, so they could focus on code and driving practice before the Alabama State Championship. On the intake, Ian and Megan discovered that one of the 3D printed pulleys had fallen off of the hub that connected it to the motor, causing the first compliant wheel and foam wheel to stay still instead of spinning when motorized. Once the pulley was put back on and a few of the other positions were adjusted, it was tested and found that it worked very well and consistently to send the glyphs to the pan. The intake bottom plate was recut to make it larger, and with the corrugations of the plastic running up the intake, so that the plate wouldn't bend. They also added corrugated plastic strips under pan to increase the reach of the pan. This helps prevent an issue they were having with the glyphs getting stuck between the intake and the pan. The intake latch was then finished and found to work very well. On the motor to tip the collection pan, the gears weren't meshing properly, and the smaller gear kept slipping, so Ian and Megan added shaft collars to keep it in place. After that the whole system was tested on the field with the Teleop code.

Glyph Collection System (continued)	The wheels on the intake system weren't rotating as fast as they usually did, so it wasn't picking up the glyphs like it should, and it didn't send the glyph far enough back on the collection pan to be scored. Ian and Megan thought it was because driving on the field was different than just feeding a glyph into the system; however, when they attempted to test it again with the power switches that were plugged into the motors, the wheels spun much faster, so they realized they have to fix the issue within the code. On the edge of the collection pan, there was a bent up back that kept the glyphs from falling out, but when they tested scoring the glyphs, they found that the glyphs got stuck on the edge. It needed to be folded down to get it out of the way. The only problem with this was that the wheels on the intake system would send the glyphs too far back and right off of the pan. Ian is going to try and fix this with code, but if he can't, a hardware solution will need to be found.