

BACKYARD BRAINS

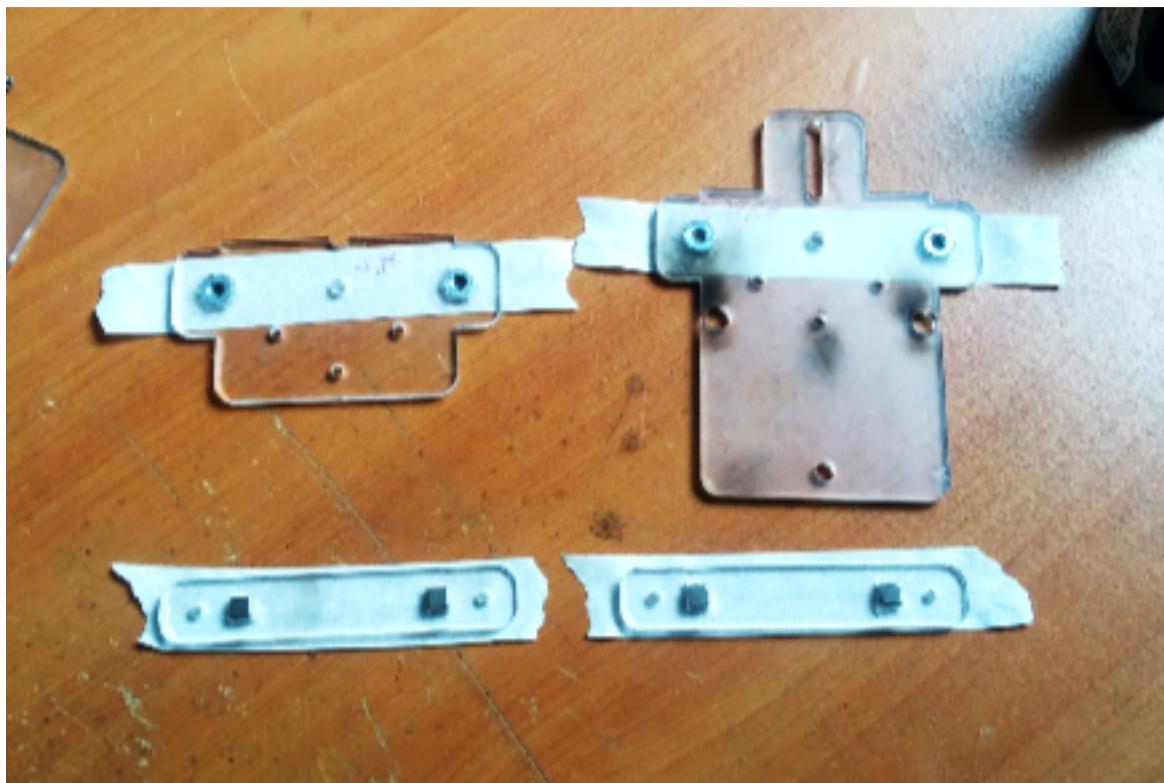
RoachScope Building Instructions

Materials

- 3 screws of 2.5 inches ---- 6-32 size
- seven 6-32 nuts
- 4 cube magnets
- 4 screws of $\frac{5}{8}$ 2-56 screw
- 4 screws of $\frac{1}{2}$ 2-56 screw
- 4 screws of $\frac{3}{4}$ 2-56 screw
- 11 2-56 nuts
- 8 washers for 2-55 screw (number 4) - may not be needed
- Acrylic parts.
- Electrical system.
- High Power Lens - Plastic Aspheric Lens - EFL = 3.30, 0.40 NA (Thorlabs part number CAY033)
- 1 low power lens - 7x - 22 mm - We originally use part MI120LL (it is 22 mm working lens diameter but 25.5 mm full diameter) - We have direct supplier now

Procedure

1. Glue nuts and magnets (use wax paper method)



Put glue on the side of the holes. Just a brush on a couple of sides should be enough. Place some masking tape on the other side so the glue don't spread. The nuts fit snug and require being pushed down straight. Putting the nut on a screw slightly then using the screw to push the nut in level will help. Make sure the nut is flush with the acrylic.



2. Put the base together. Place 2.5 inch screws in base piece and secure with superglue, as per the other BYB products so screw can spend freely.



Make sure the nut is loose enough so you can spin the bolt, but not as loose so you can wobble it too much. Adding drops of oil at metal plastic interfaces after glue has set will ease spin of screw.



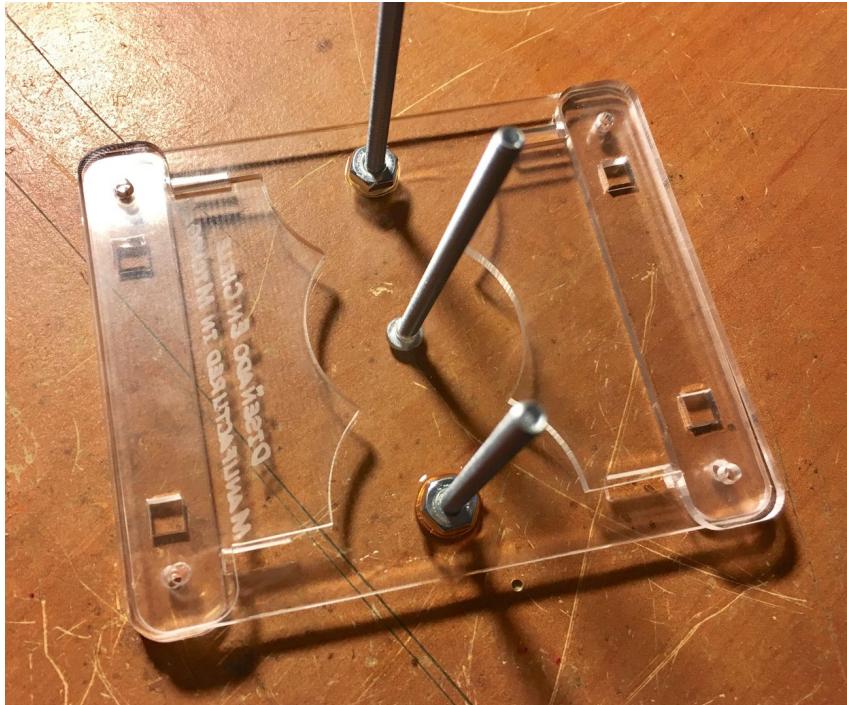
3. Place other 2.5 screw (without nut) in center hole. Note oil added around screws



4. Place Magnet bases under the base plate (note you can glue the magnets in the first step or wait until the microscope is fully assembled. You need to install the acrylic magnet bases now though.



5. Add third layer of two gear housing pieces



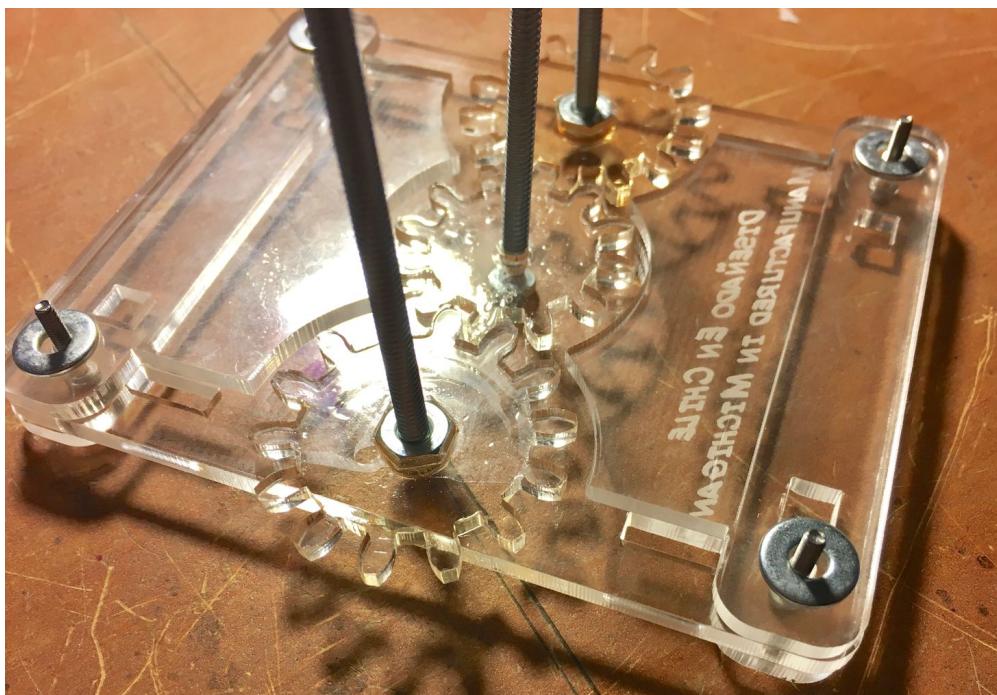
6. Add gears. The outer gears should snap fit into the nuts without the need to use glue. Again, adding oil with improve spinning between acrylic-acrylic surfaces.



7. Add the four $\frac{5}{8}$ screws through through the corners



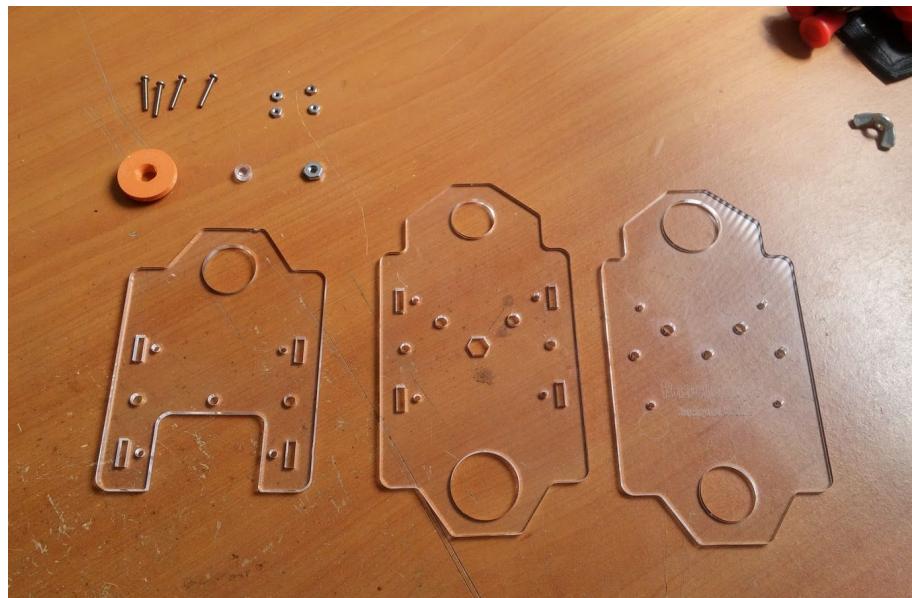
8. Add washers to the screws



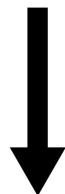
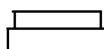
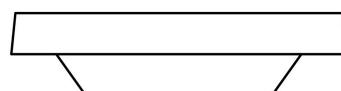
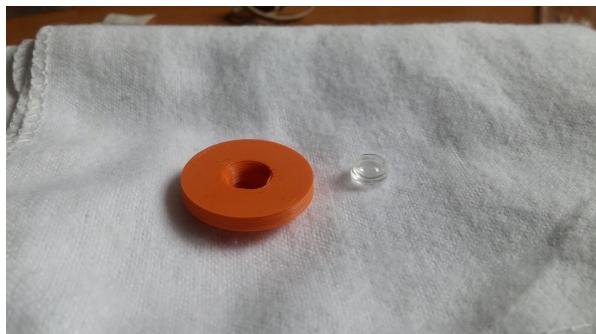
9. First 4th and final layer on (which the ruler marks etched into the acrylic, and fasten everything in place with the four 2-56 nuts. Test operation by ensuring gears move smoothly with finger turning.



10. Put together the top module.



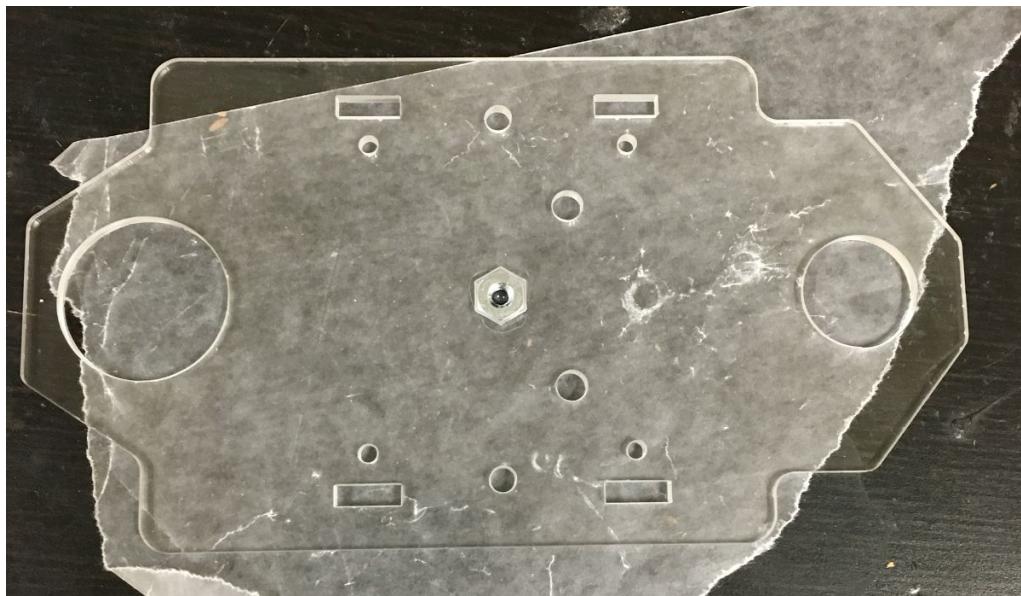
11. First, mount the lense holder. Place the lense in the holder by pushing it down as shown on the picture. Be aware of the side of the lense. You may need to polish the lens holder with acetone to make it shiny and nice looking depending on the print.



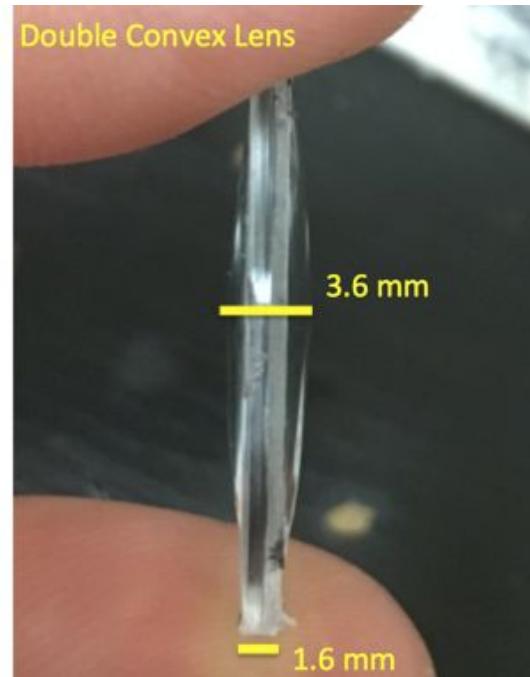
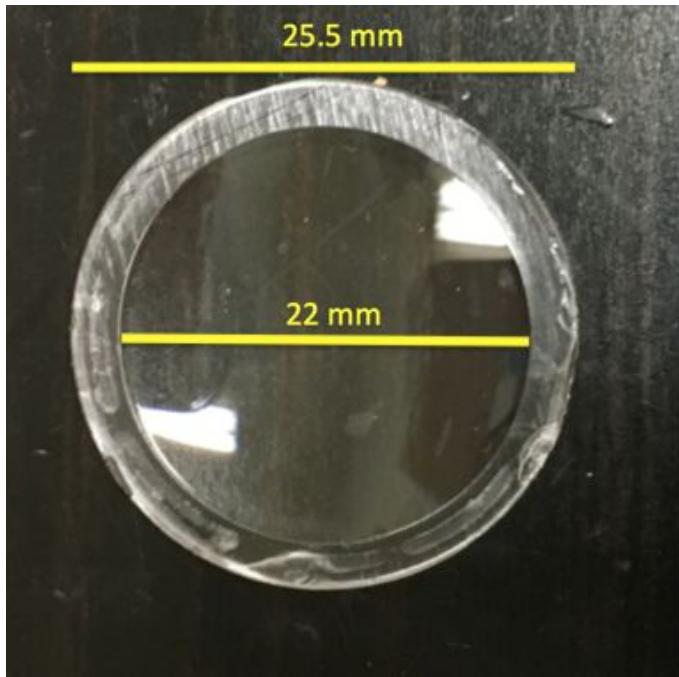
The lense must be flush with the down part of the holder.



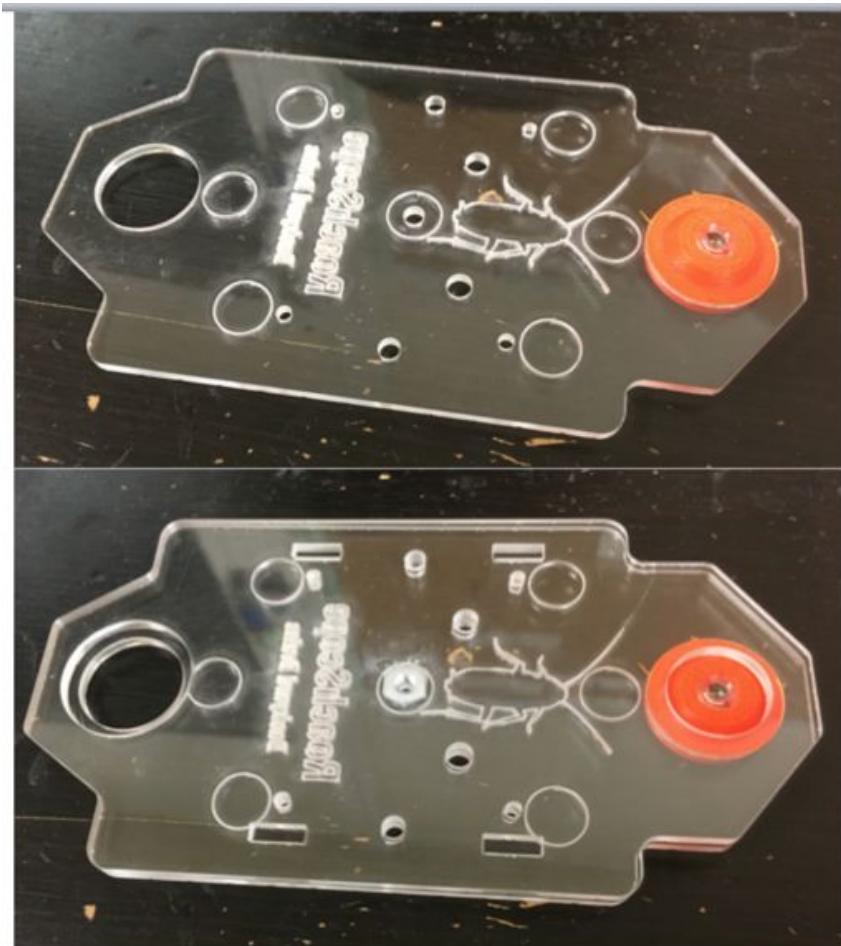
12. Put nut in center (glue is not necessary)



13. Destroy a Loupe to remove the lower power lens or find your own supplier of lenses



14. Now it is time to make the sandwich. Place the high power lens firmly in the top layer. You may need to use a rubber mallet, then, place the second layer on.



15. Insert the low power lens



16. Place the third layer on.



17. Fasten with $\frac{1}{2}$ inch 2-56 fasteners and nuts and the top section is complete.

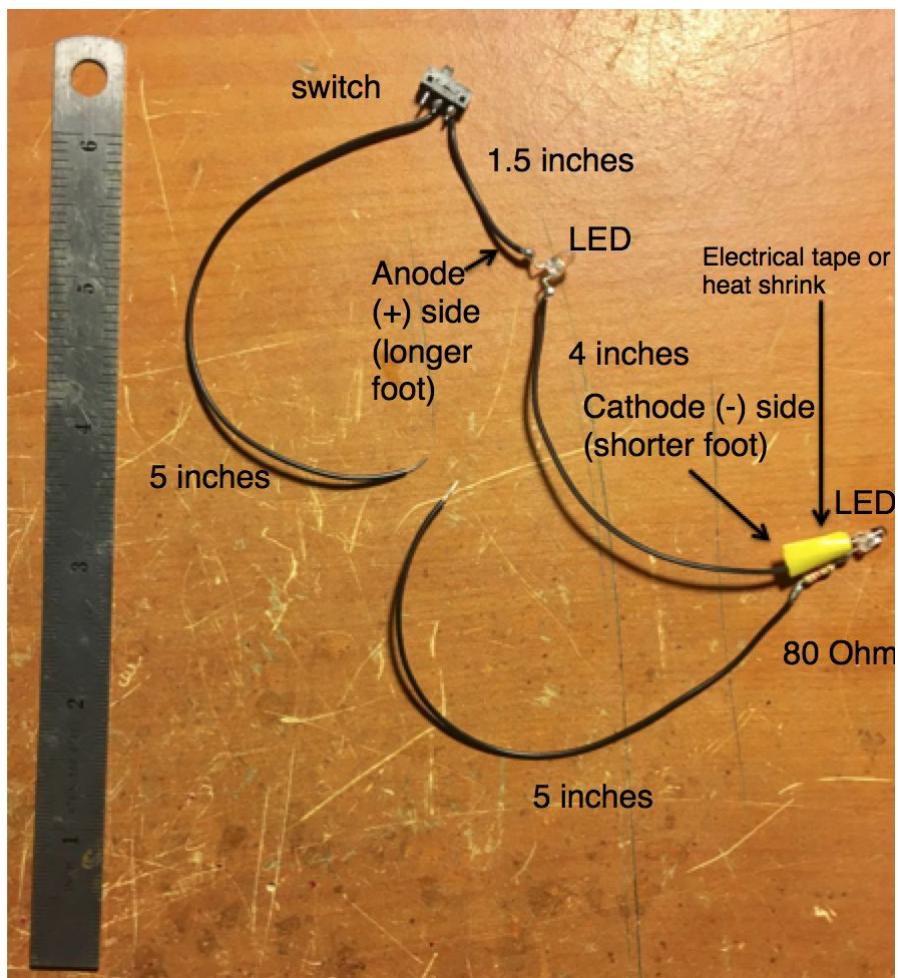


18. Assemble the electric system. (This can also be done ahead of time) You'll need:

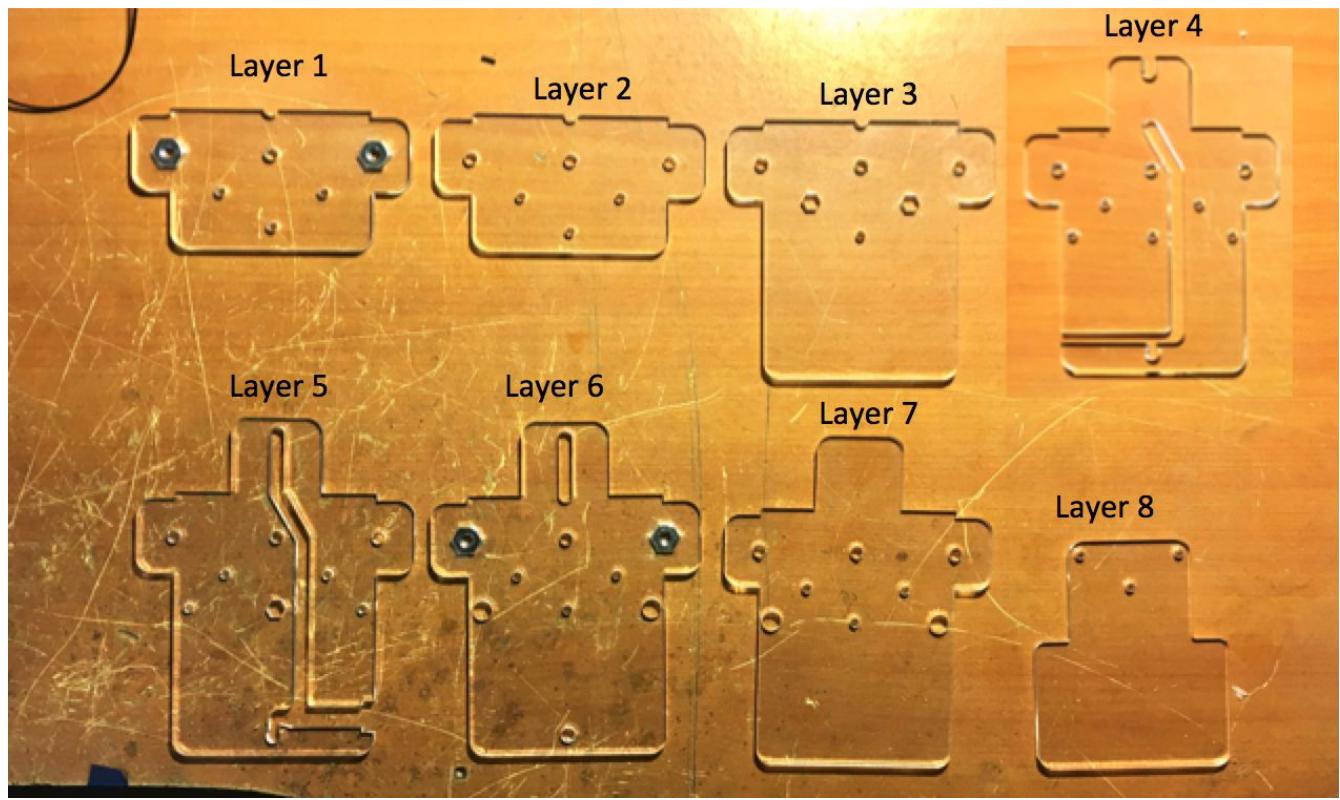
- 80 Ohm resistor.
- 2 LED 3mm white.
- Switch SPDT micro.
- Battery Snap Connector
- Wire.
- Thermo Tube.



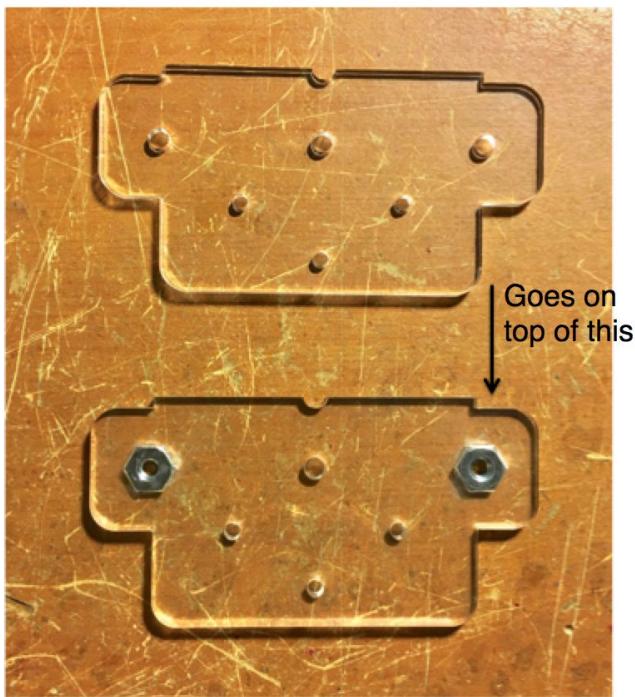
You will be making this:



19. Assemble the middle platform. - This is the most difficult part of the assembly



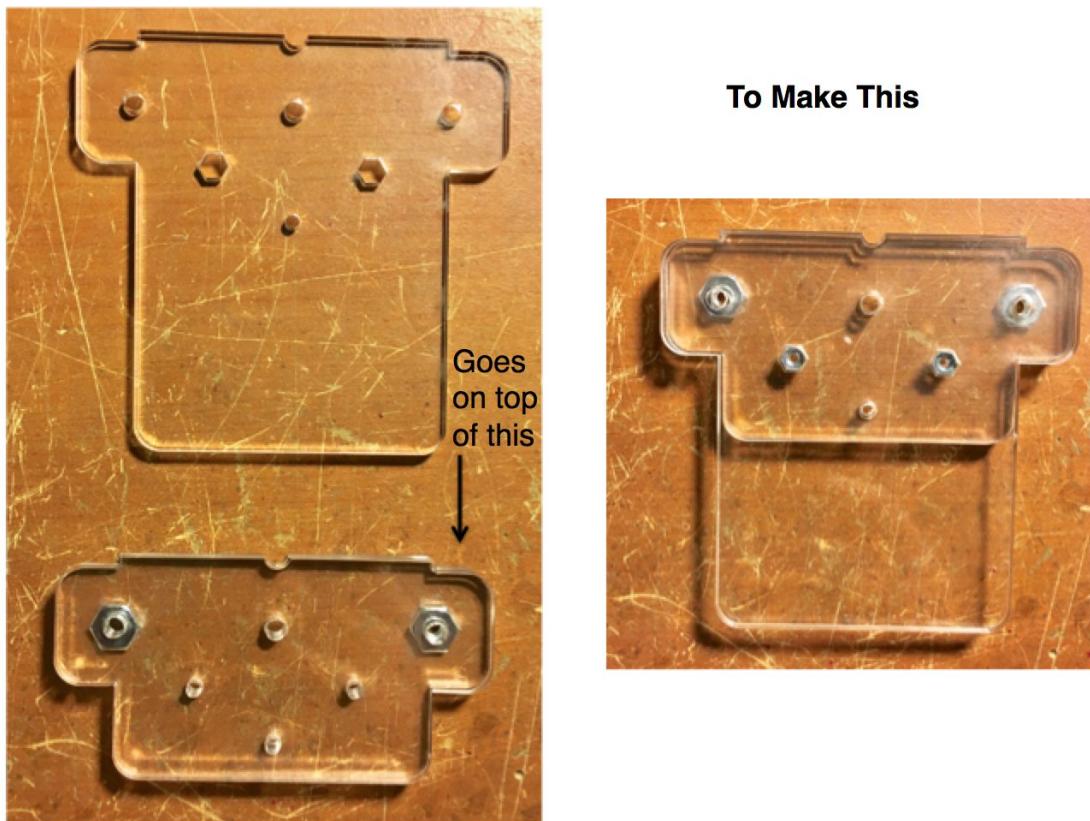
20. Place the first two layers



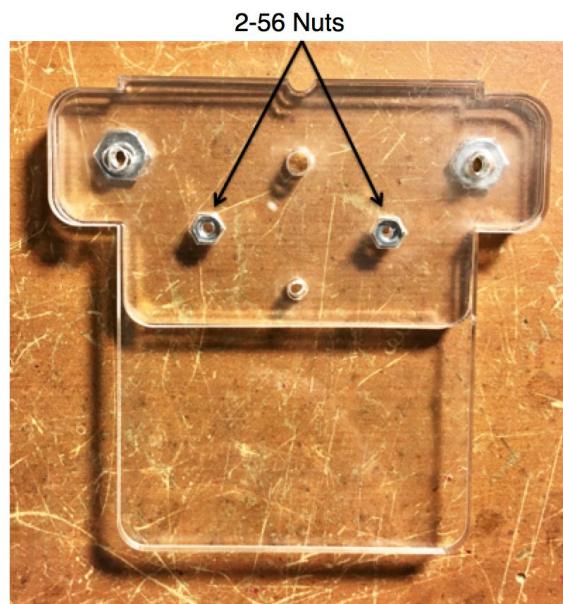
To Make This



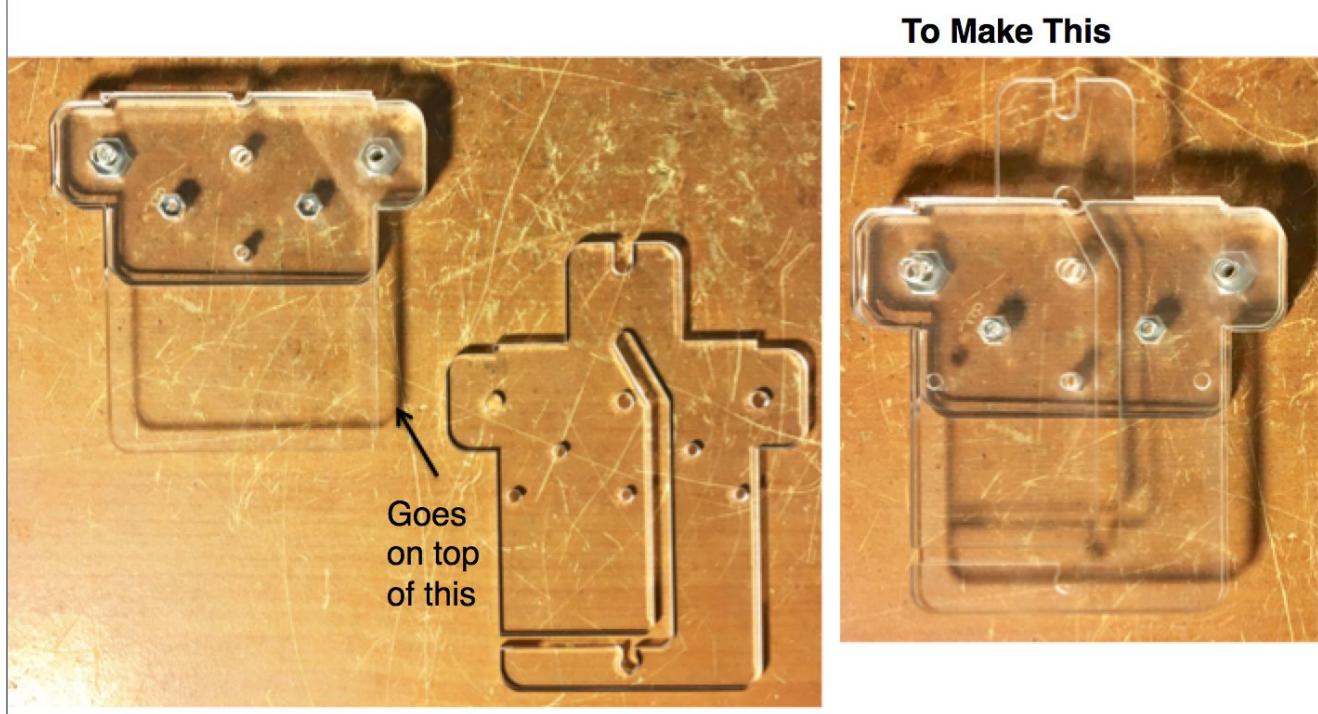
21. Place the third layer



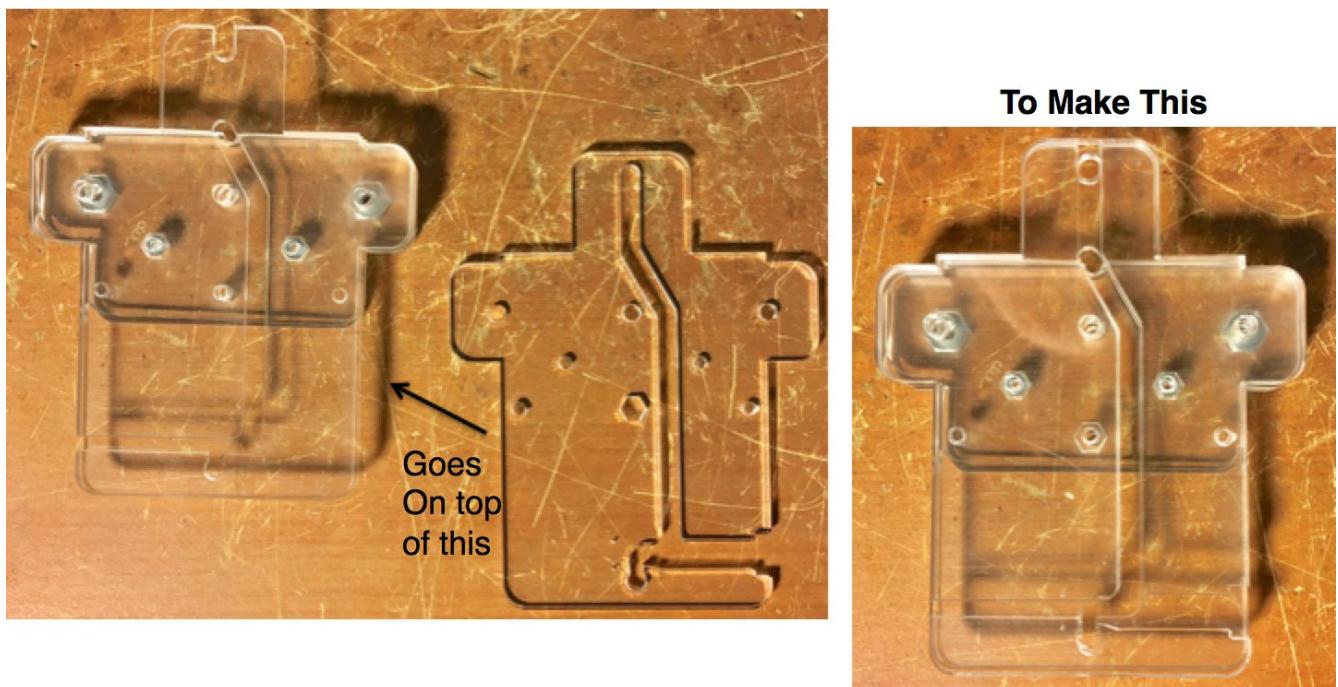
22. Insert 2-56 nuts in the appropriate holes



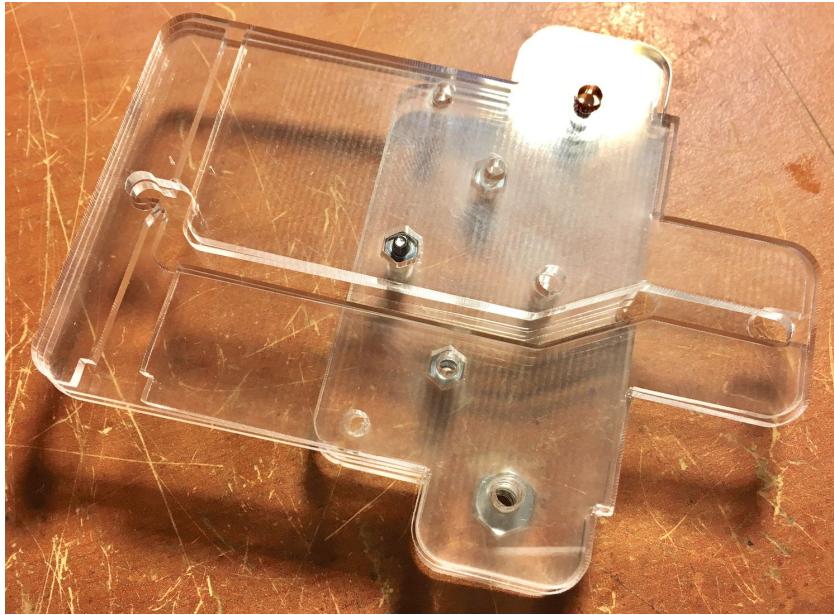
23. Place the 4th Layer



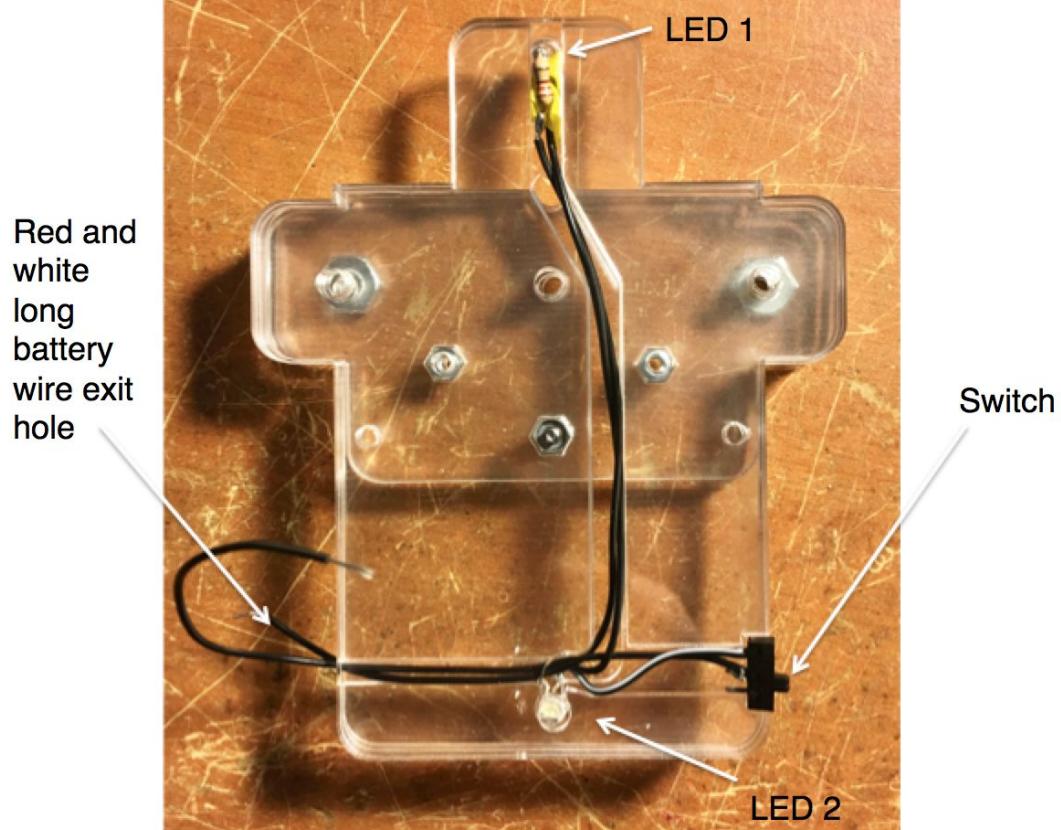
24. Install the 5th layer.



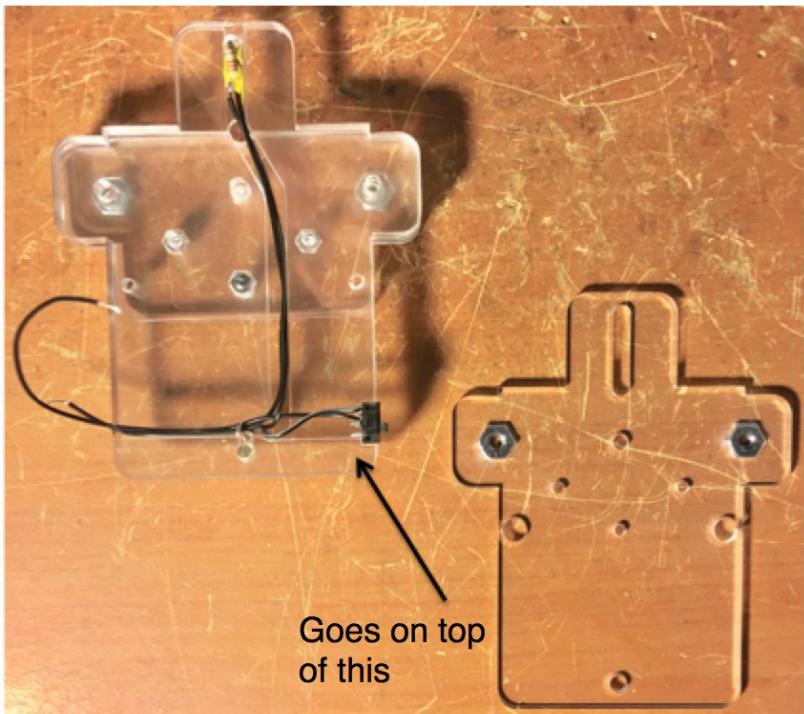
25. also add 2-56 nut to center, and $\frac{5}{8}$ fastener from the bottom



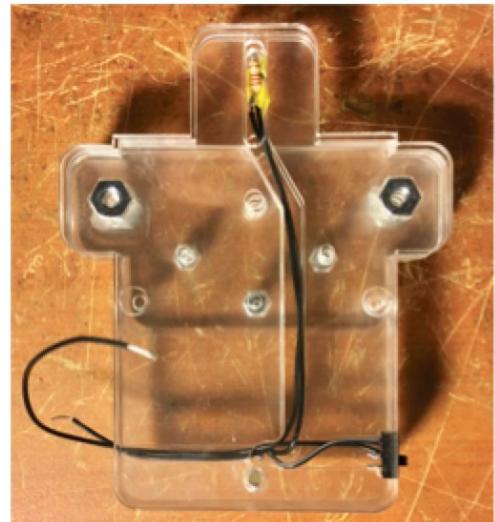
26. Install Wire Harness you built previously. This can be difficult at first but becomes easier after 2 times you have built the microscope. Fine tools such as probes and tweezers help.



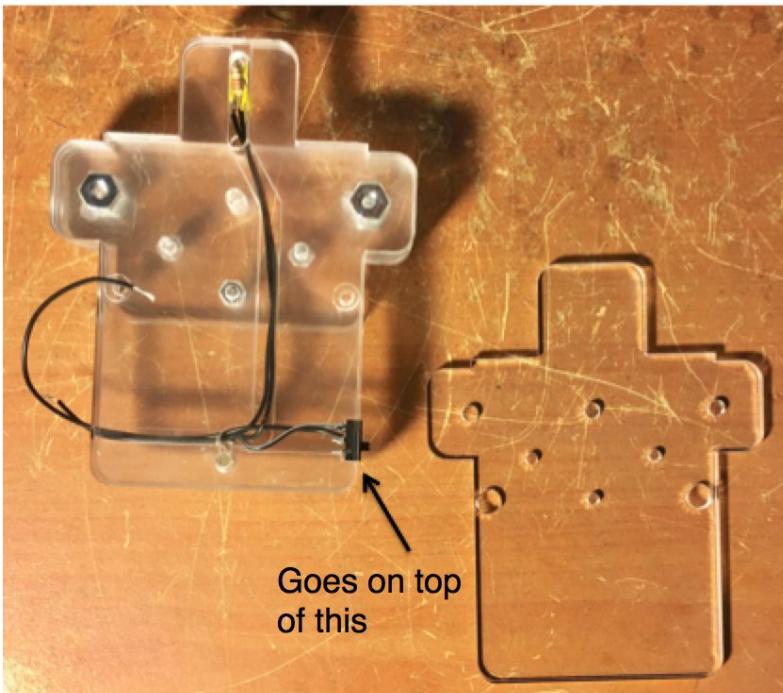
27. Install 6th layer



To Make This



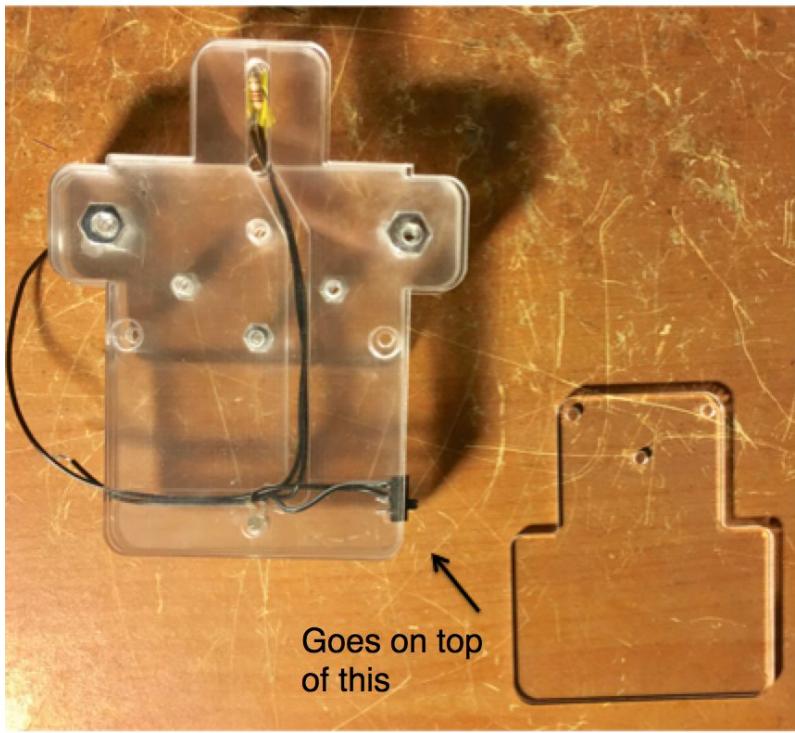
28. Install 7th layer



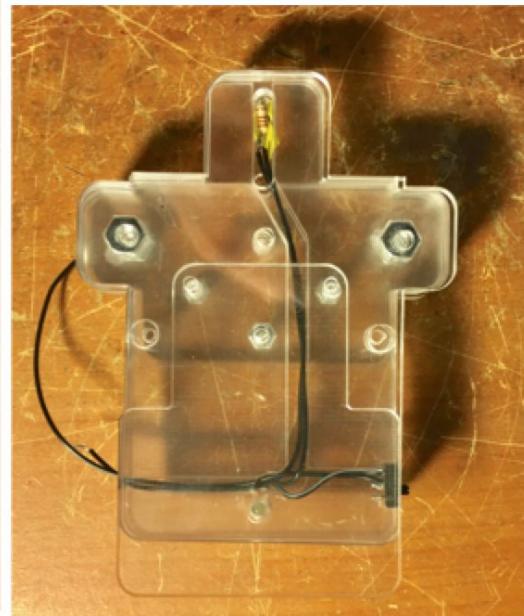
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29. Install 8th and final layer

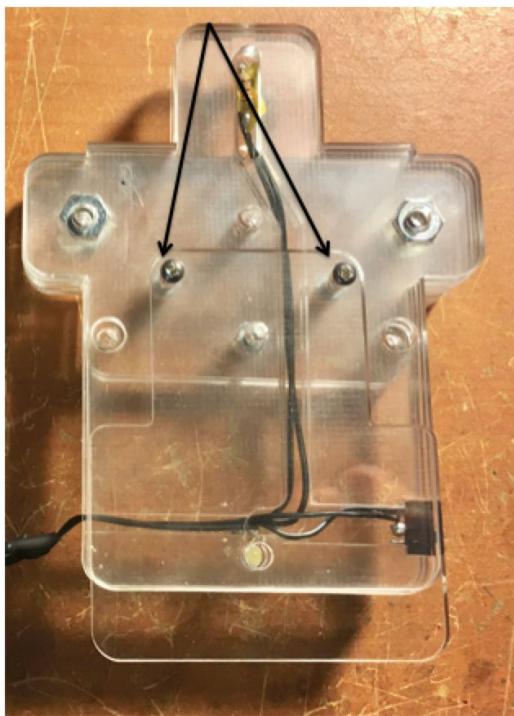


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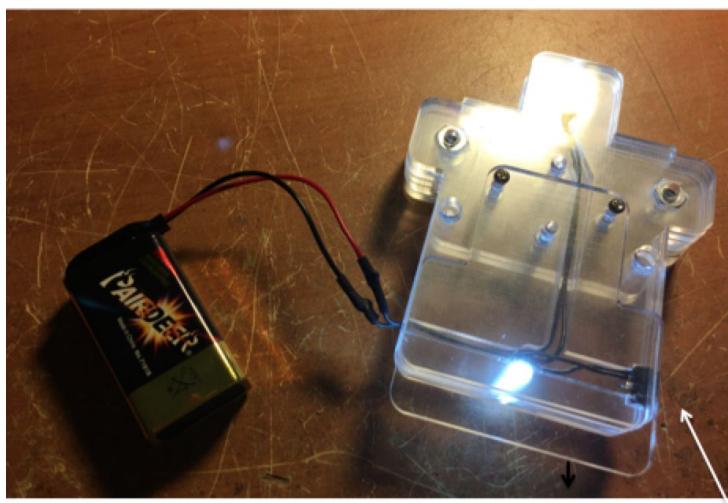
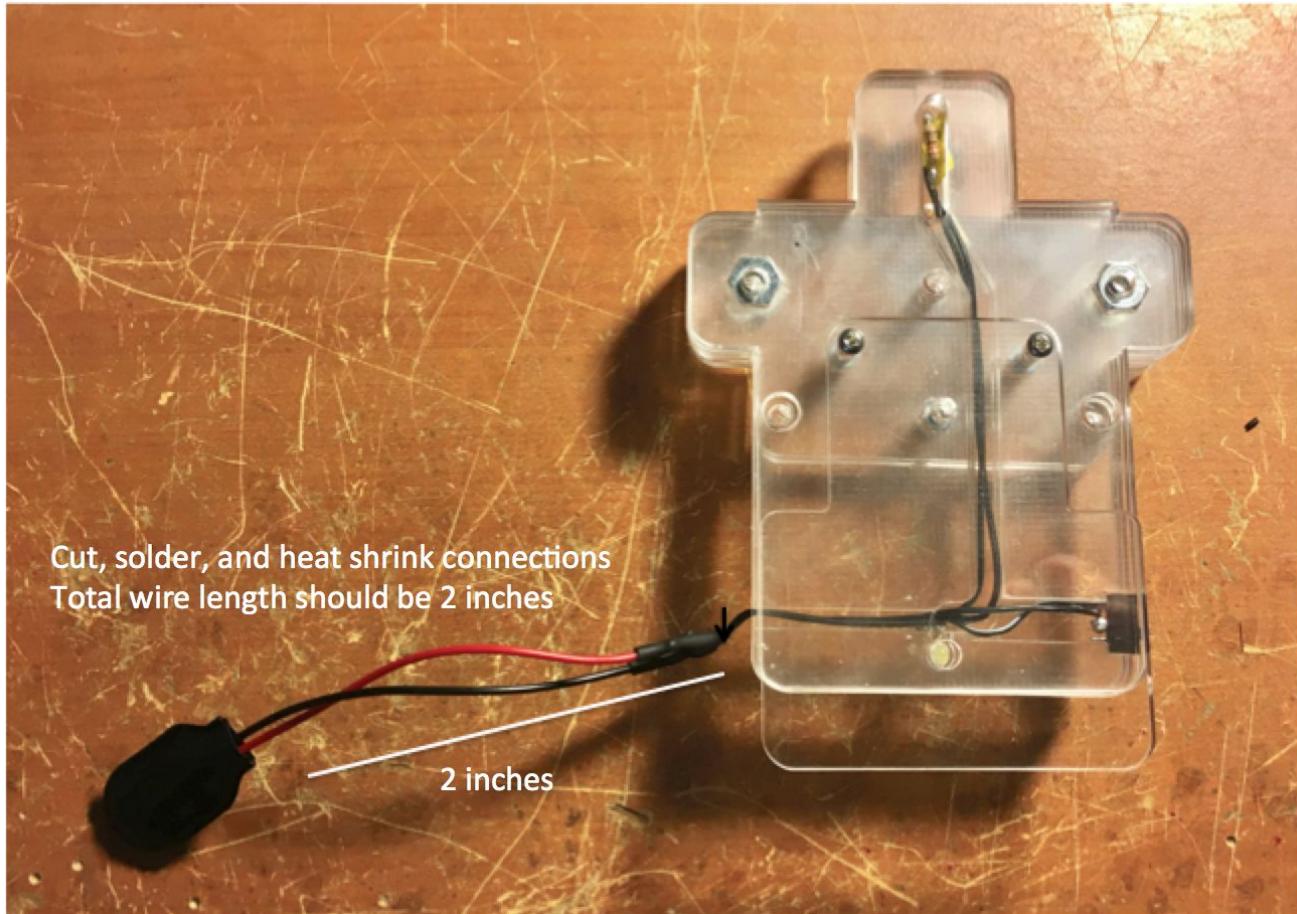


30. Fasten Everything with two $\frac{3}{4}$ inch 2-56 screws

Secure with $\frac{3}{4}$ inch
2-56 screws



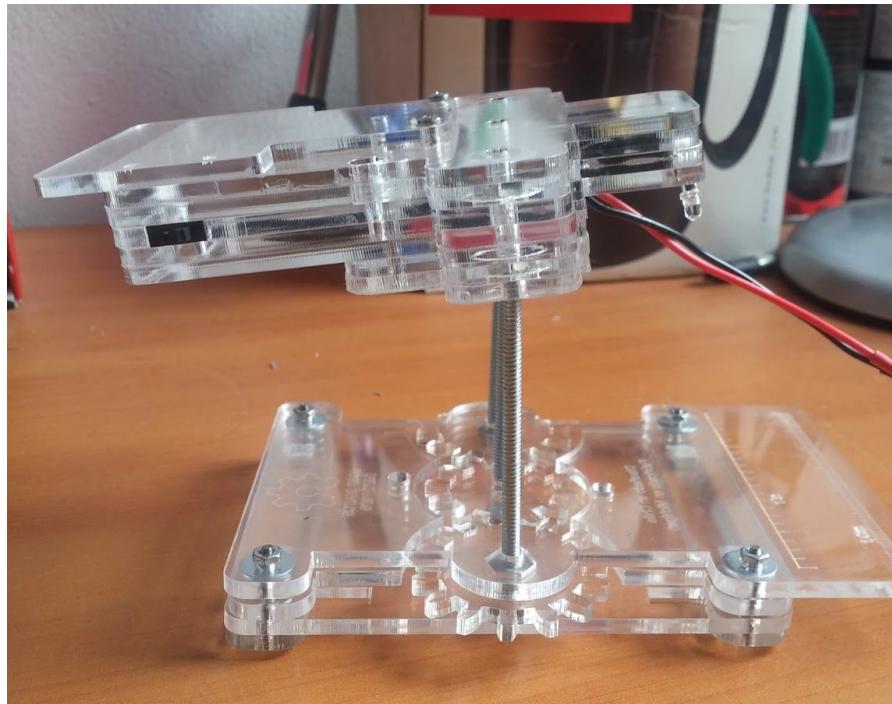
31. Cut, solder, and heat shrink battery connector to wires exiting side port. Cut and trim such that battery cable length is 2 inches. Note: Make sure your battery polarity is correct by trying to switch lights on and off with black switch - twist wires together *but before soldering*. If lights do not turn on, switch wire polarity. All done with Middle part!



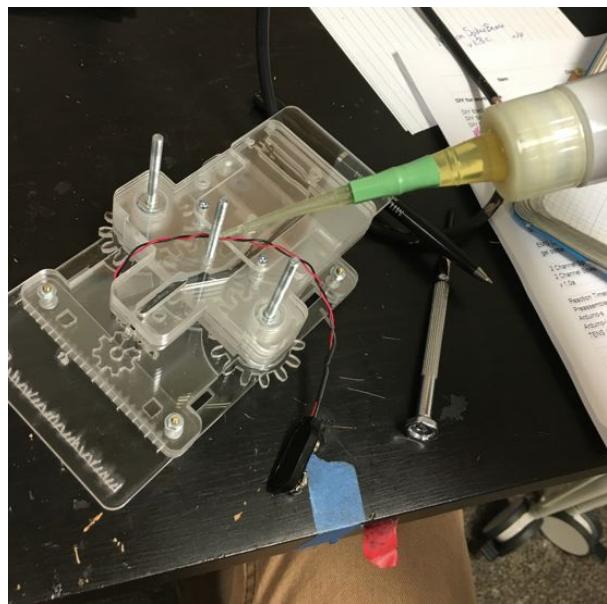
Test LED light operation and correct
Battery polarity by turning lights
on and off with switch

32. Mounting of the platform.

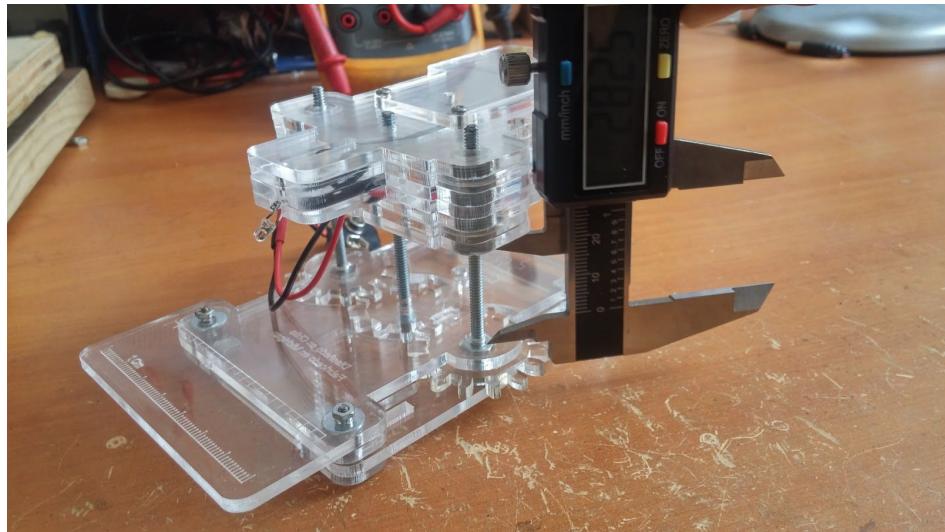
Place the platform on the nuts and turn the gear so the bolt turns into the two nuts on each side inside. Be sure that the center bolt is in place before you do this. Adding light drops off oil to screws helps



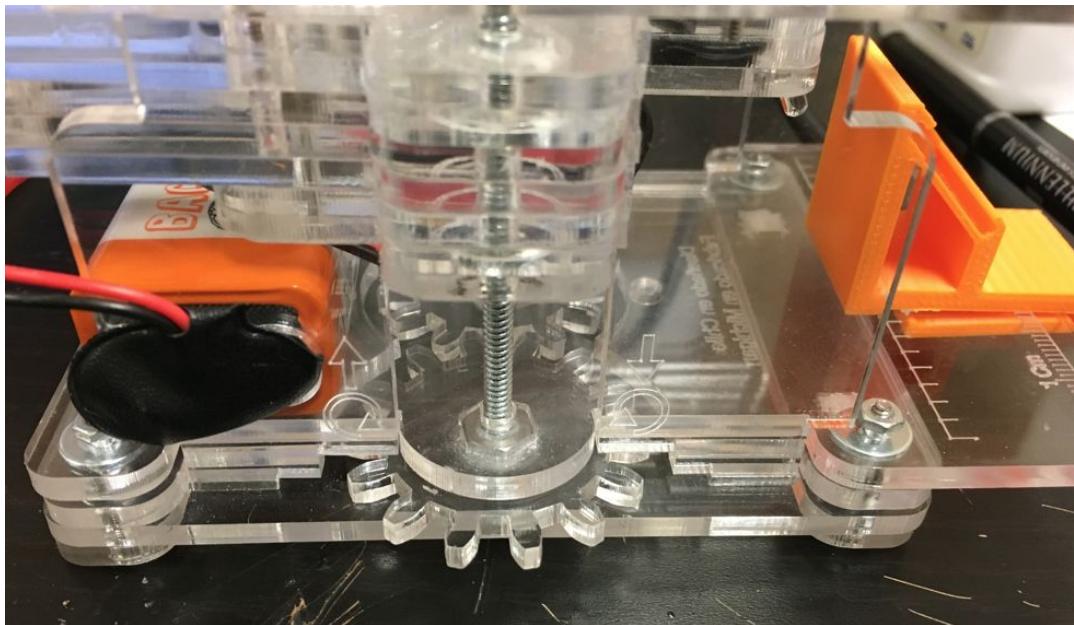
Adding oil to all moving parts with make operation smoother. Avoid adding oil directly to teeth on gears, so users don't get oily fingers during operation.



Keep turning until the end of the bolts comes out the other end. You should measure the distance between the platform and the base of the microscope to make sure the platform is aligned.

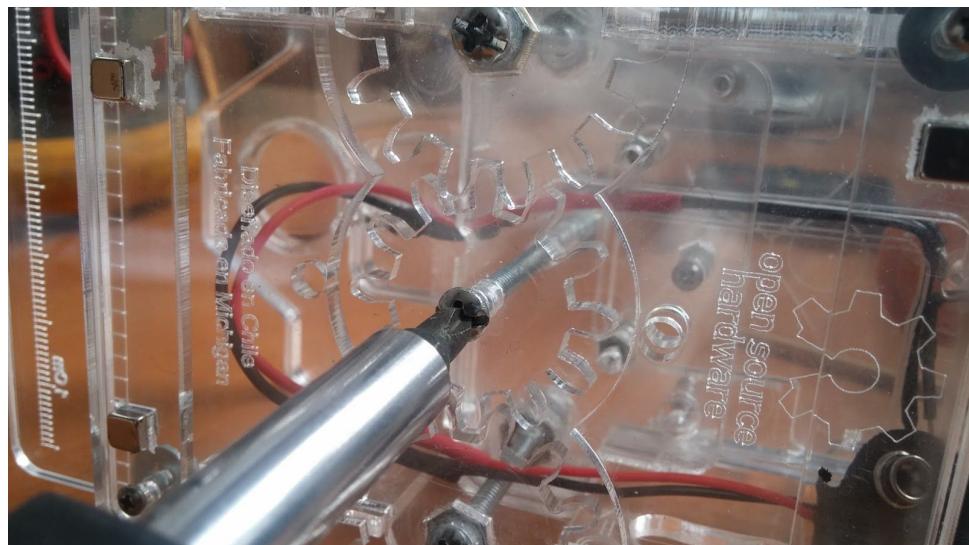


33. Once the platform is on position and aligned, insert the four acrylic side pieces, two on each side

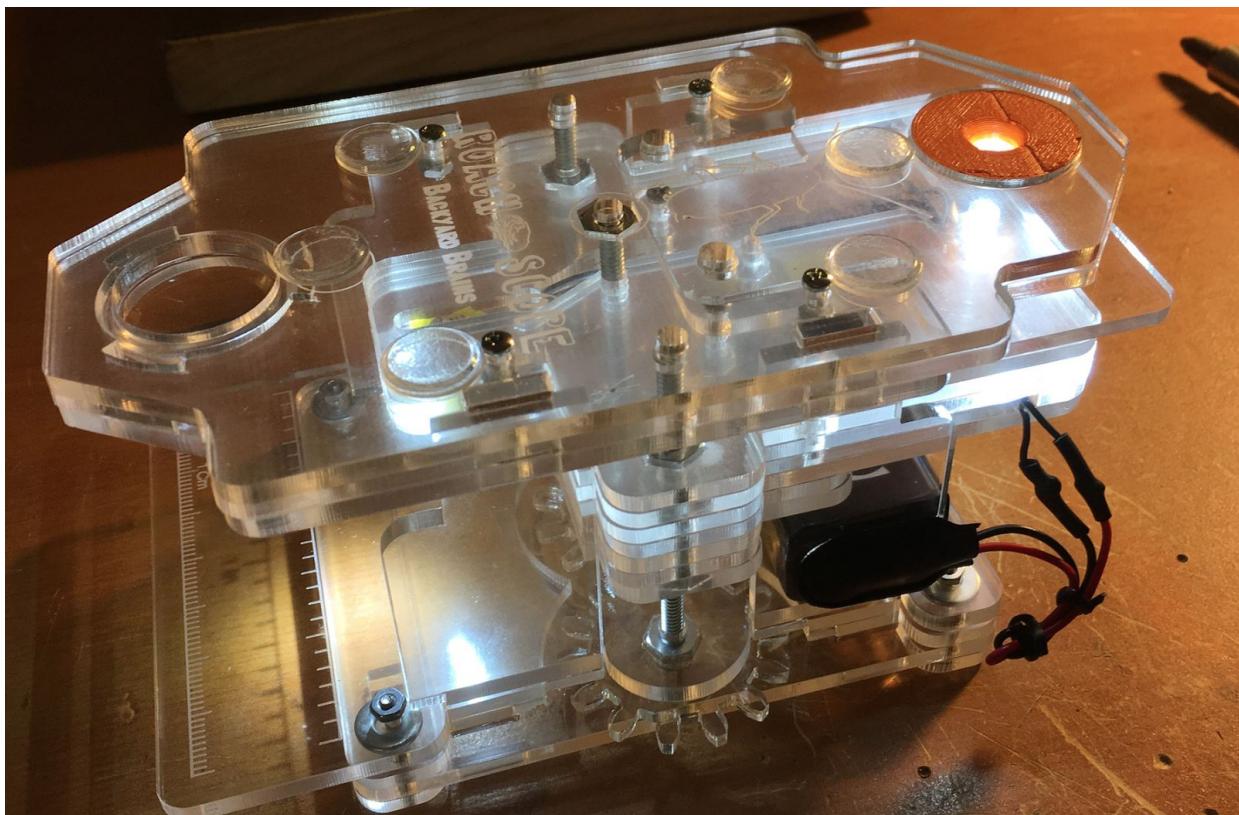
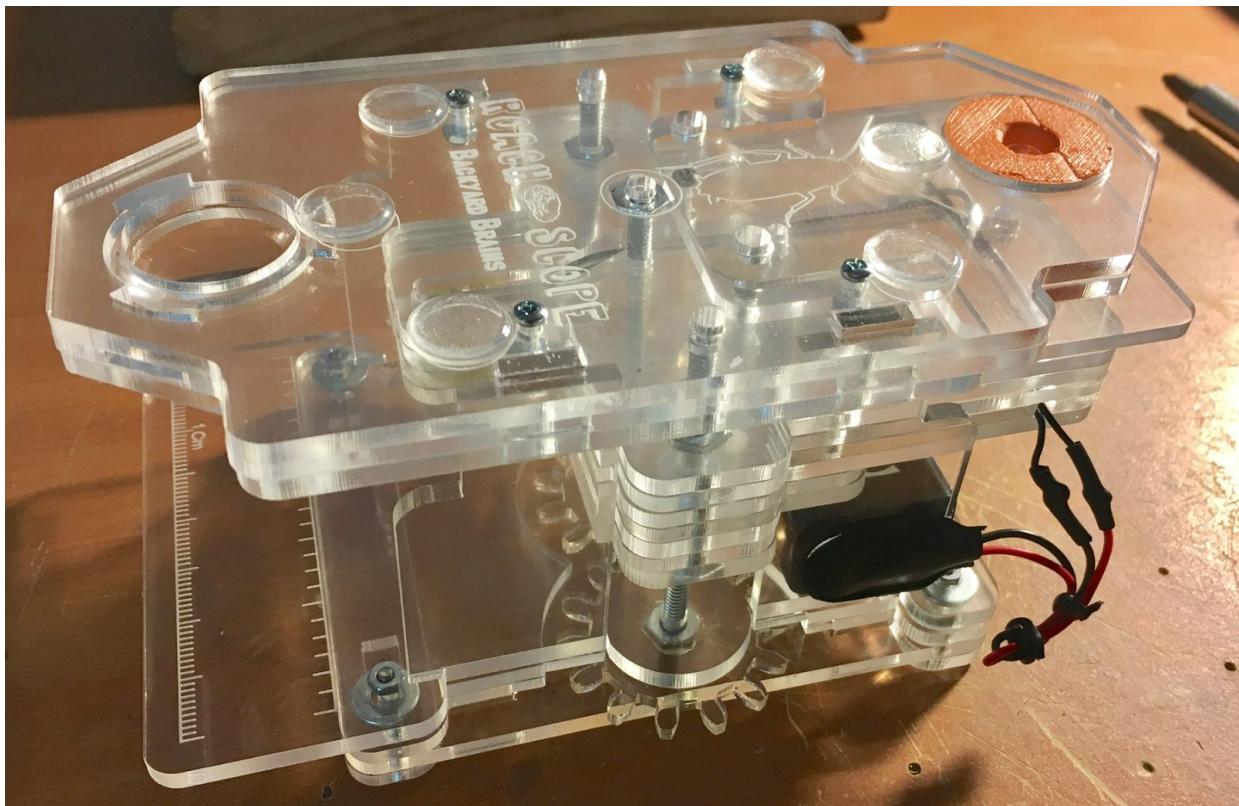




34. Finally, put the top module on and screw all together.



35. Install Rubber bumper stickers on top of microscope, and glue magnets to bottom (if you haven't done it already), and you are done! This is how everything will look like when finished.



Test Image Quality and Focus using Slides

