

Build your own Hydrophone!

This project is far more like an elementary school craft project than a typical university-level assignment. Please treat it as such and enjoy the physical aspect of constructing a hydrophone. Soldering takes time to master and if you have never done it before, have patience with yourself.

Gather the materials:

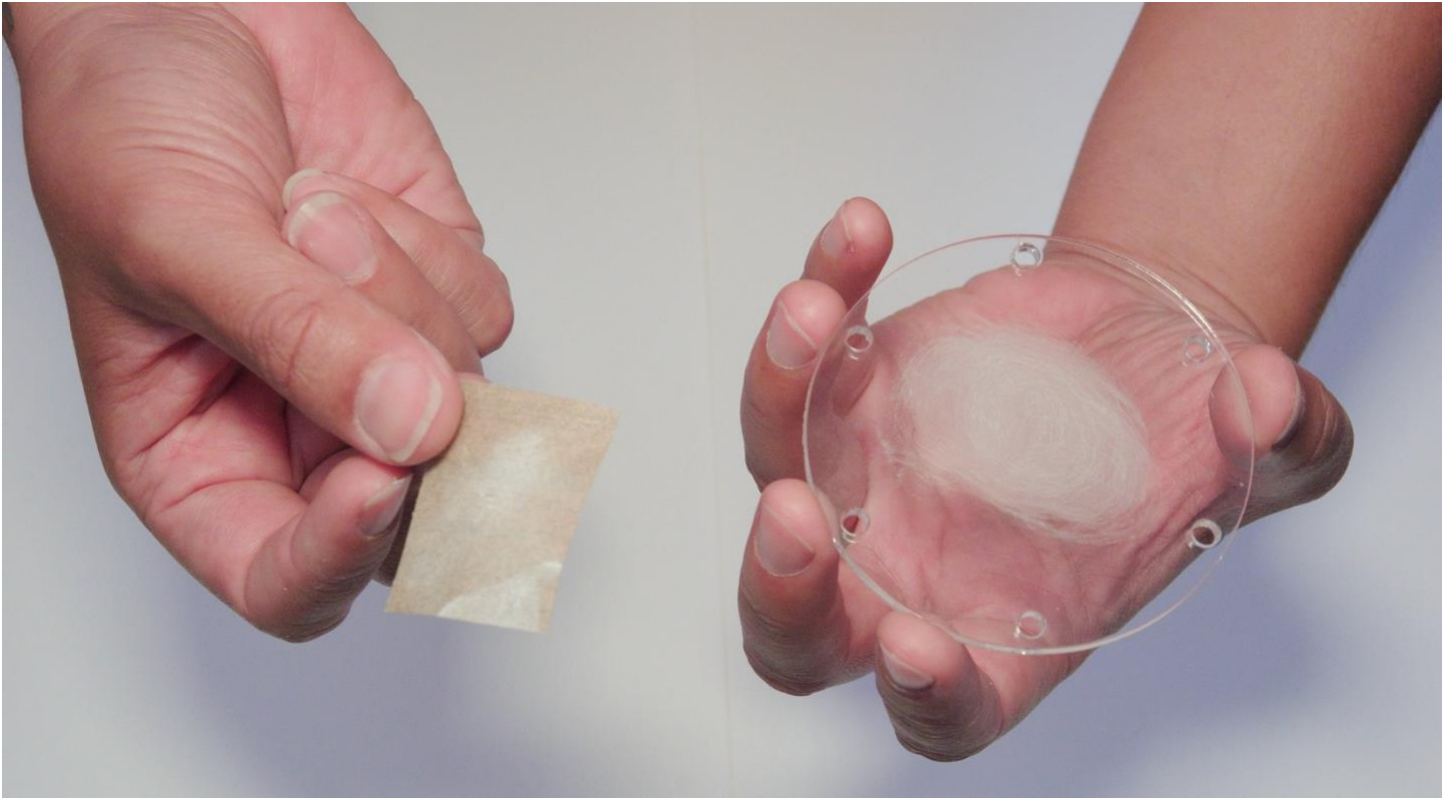


i **Piezo discs** are sometimes called Piezo benders. They can be used as contact microphones and are also frequently used in electronic buzzers. The white portion are piezo crystals crushed up and blended with adhesive. When piezoelectric crystals are compressed, they release electricity. By measuring the voltage difference between the brass part of the disc (the "ground"), and the white part (the "signal") you can tell how the object to which the disc is attached is vibrating. The key with piezo discs is that the bond between the brass part of the disc and the object that you are picking up needs to be very rigid. For example, if you superglue one of these discs to a guitar it will make a nice pickup, but if you tape it on it will not work well.

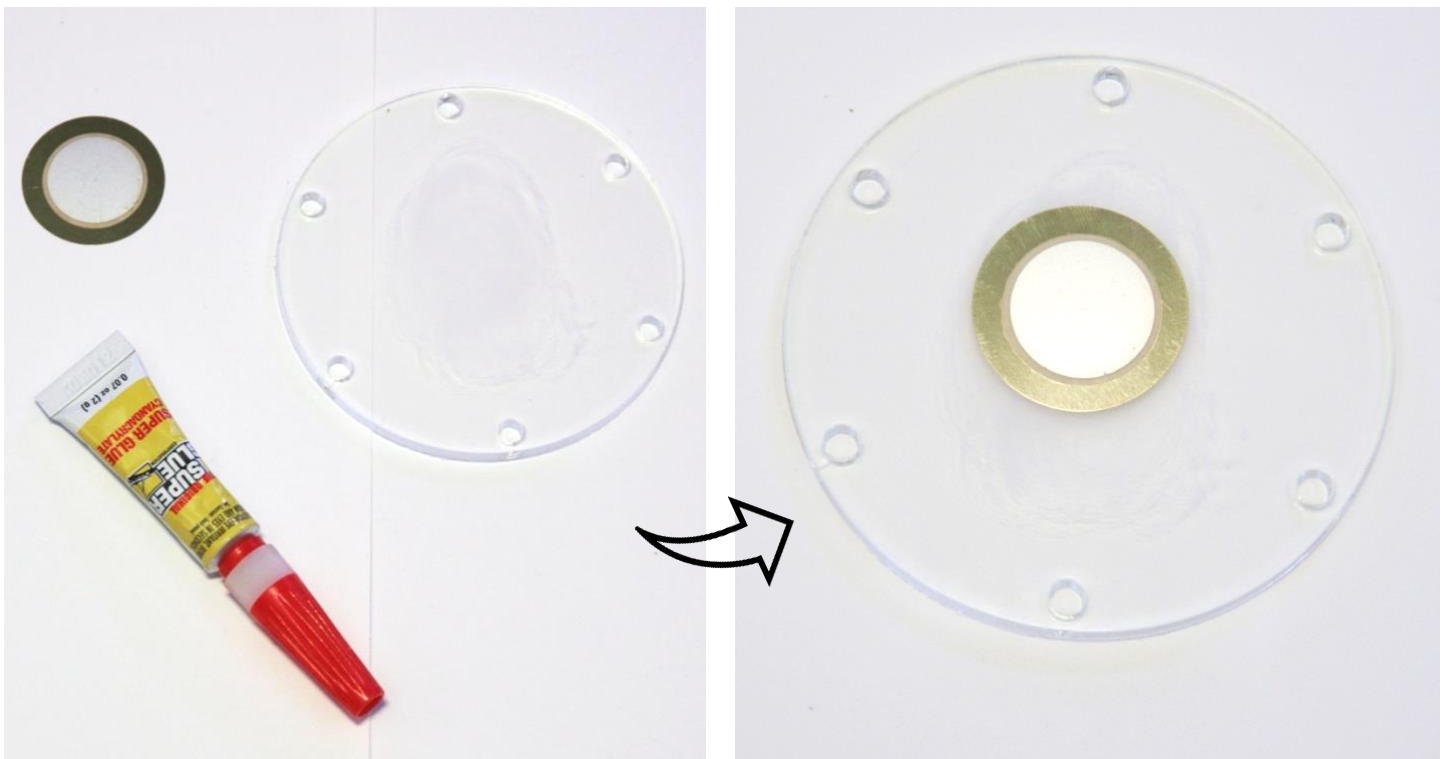
Let's build the Hydrophone!

Let's start with the Piezo.

- Use sandpaper to roughen the center of the disc (the one that **does not have a hole** at the center).



- Superglue the Piezo disc to the roughened area of the acrylic disc.

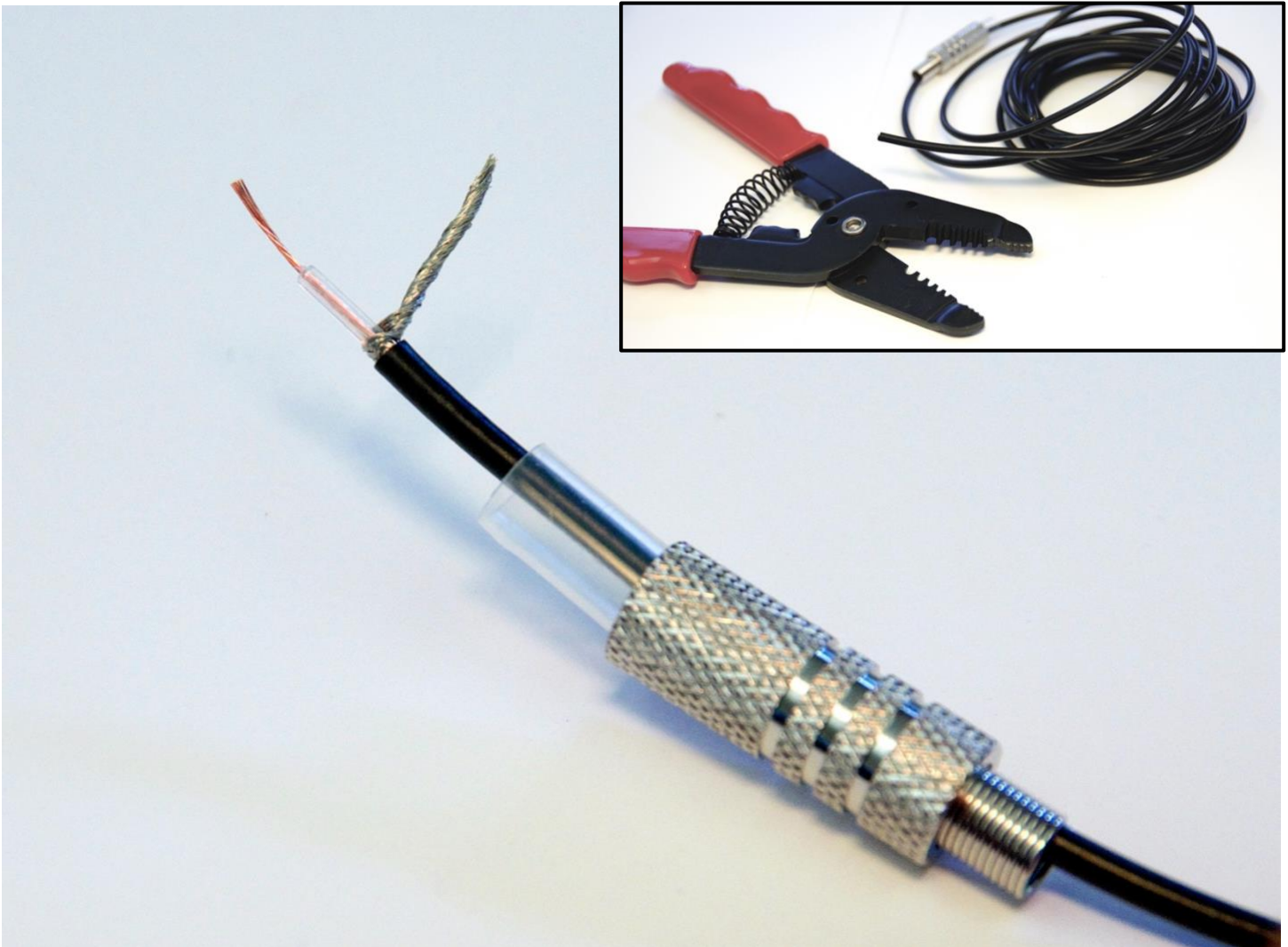


Now let's work on the 1/8" plug.

- Unscrew it to separate the plug, the plastic shield and the metal casing.

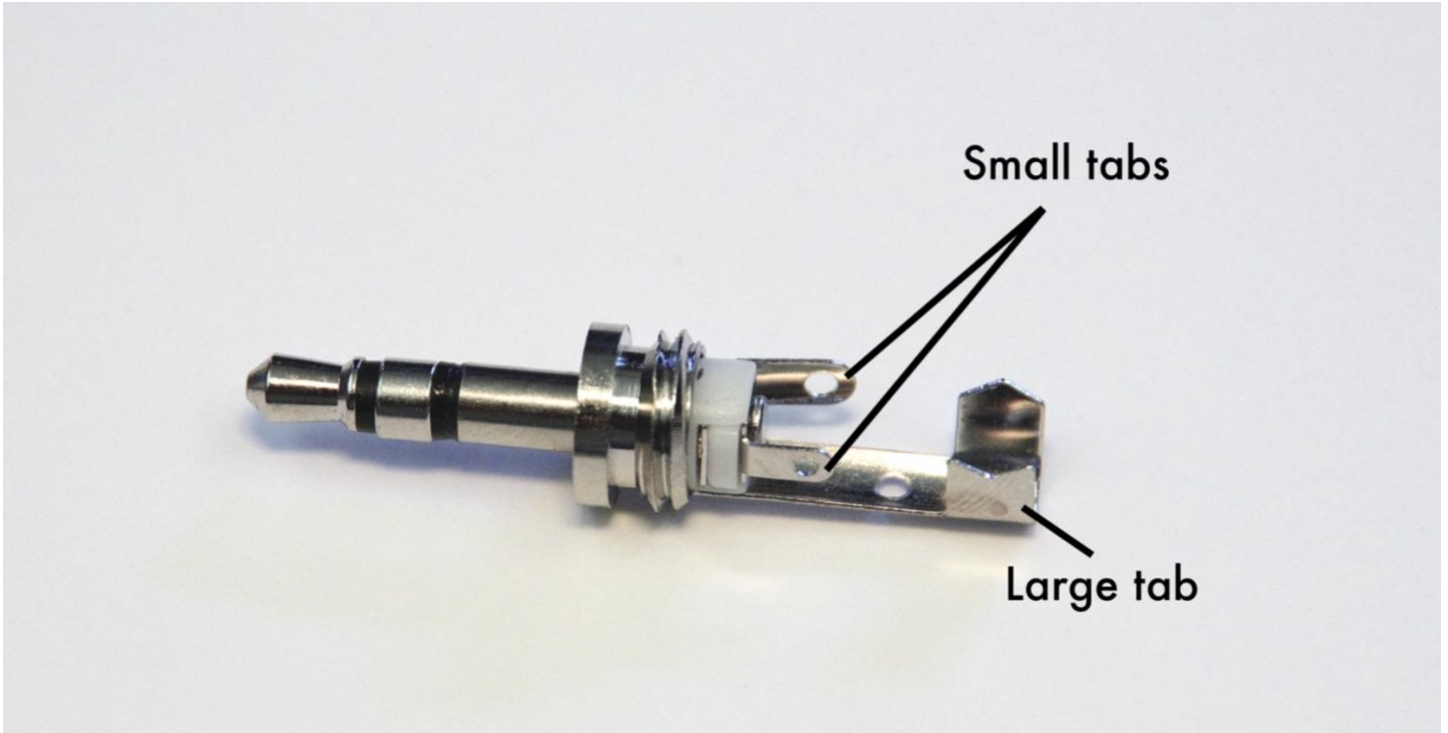


- Slide the two parts of the metal casing and the clear plastic tube over one end of the coax cable.
- Strip the outer black shielding of the coax cable back 1" to unravel the outer shielding and stretch it to the side of the inner core.
- Strip the clear plastic from the inner core back 1/4".

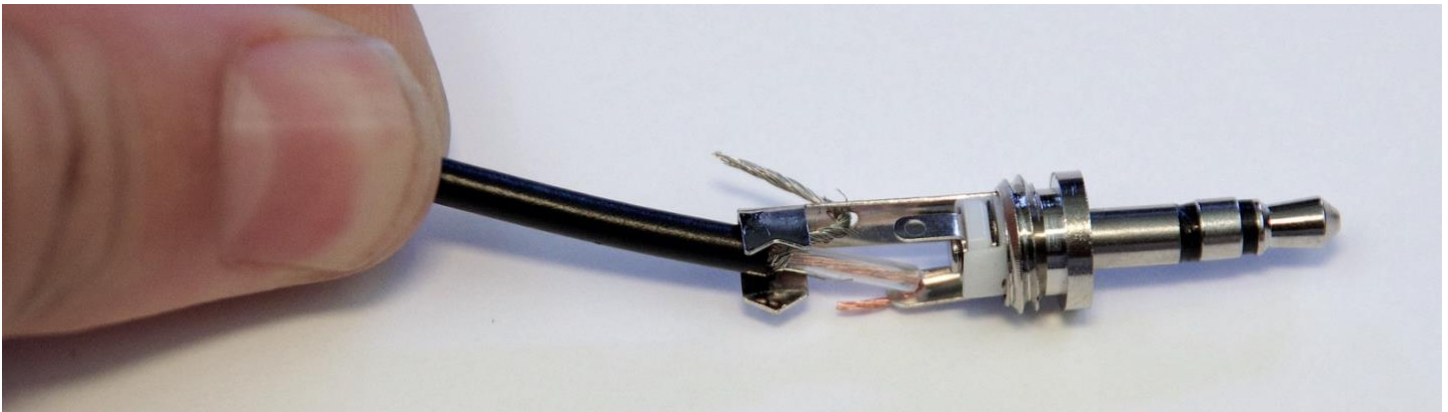




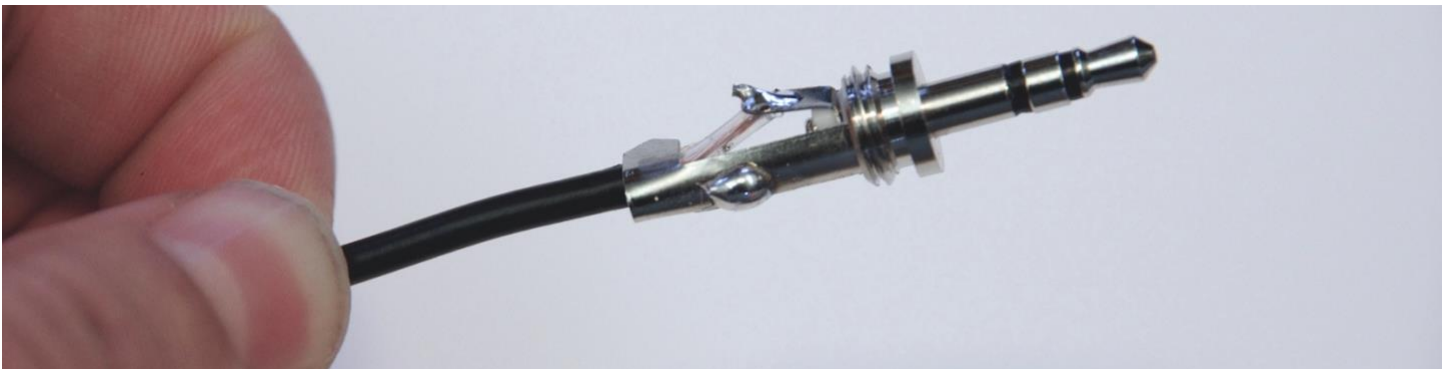
The **1/8" Audio Plug** has two small tabs and one large tab. The two tabs are for the left and right channels of a stereo signal. The Larger tab is for the ground portion of an audio signal.



- Thread the outer shielding through the hole in the larger tab. Thread the inner core of the coax cable through the two smaller tabs.



- It is time to solder! <https://ccrma.stanford.edu/~sleitman/Soldering/>

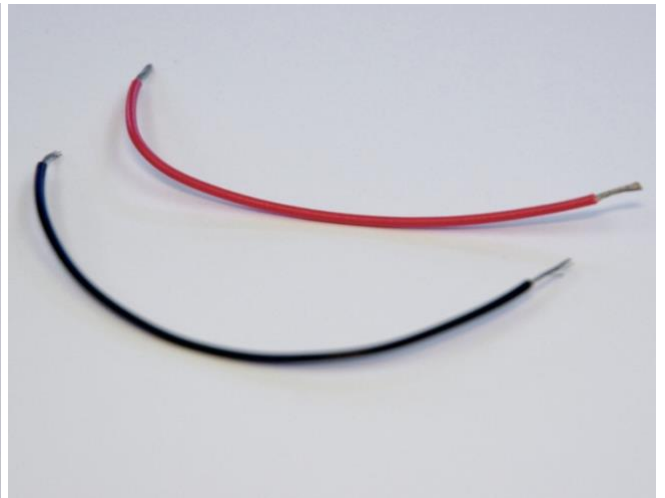
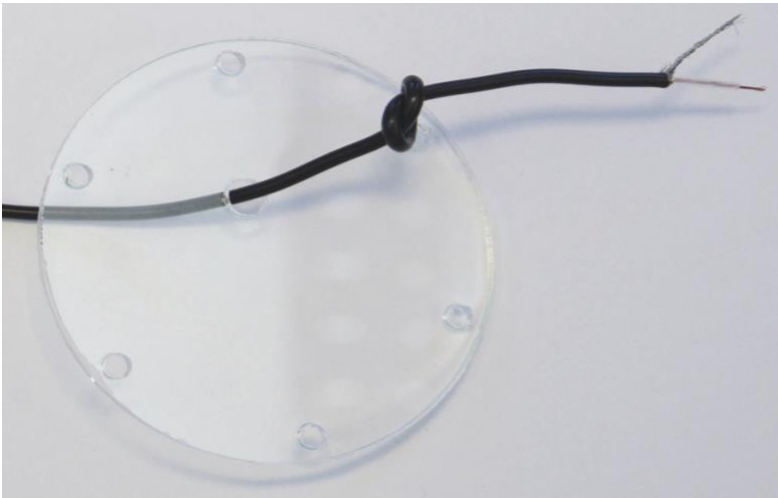


- Use the clear plastic tube to isolate the solders. Screw the metal casing to the Audio Plug.

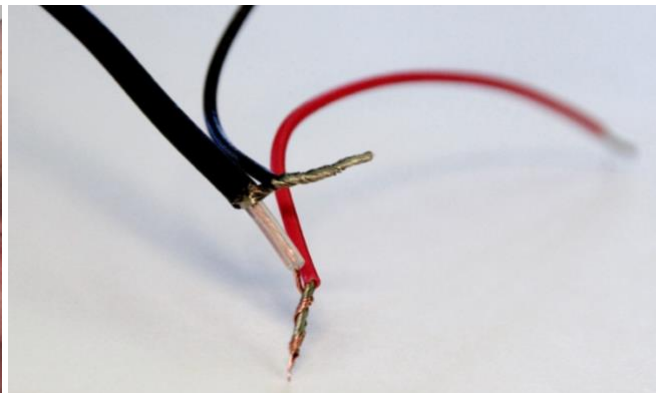
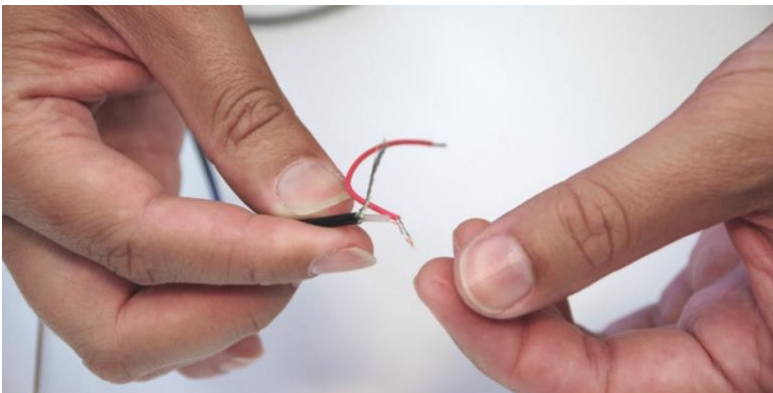


We will now connect the cable to the Piezo.

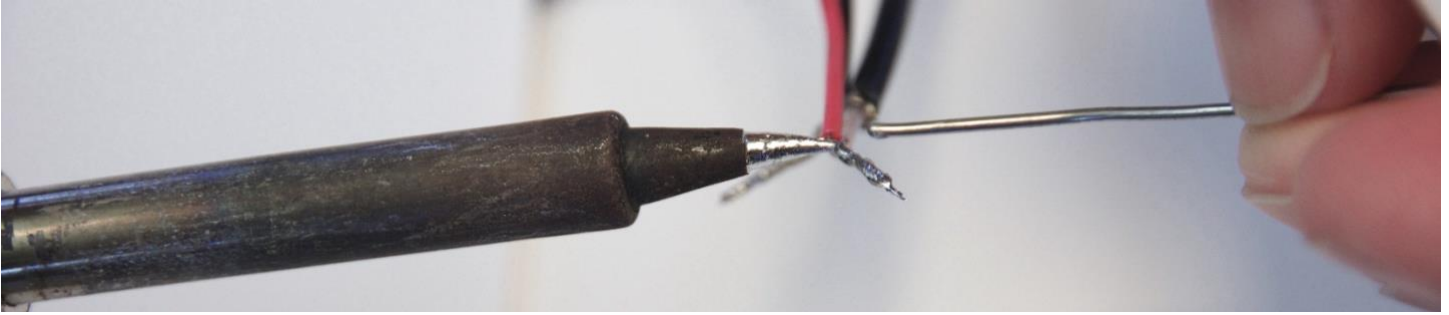
- Slide the other end of the coax cable through the off-center hole in the other acrylic disc. Tie a knot in the coax cable. This knot will prevent the solder joints from being stressed when the hydrophone is pulled along in the current.
- Strip the outer black shielding of the coax cable back 1" to unravel the outer shielding and stretch it to the side of the inner core. Strip the clear plastic from the inner core back 1/4".
- Strip the end of each of 26 AWG jumper back 1/4".



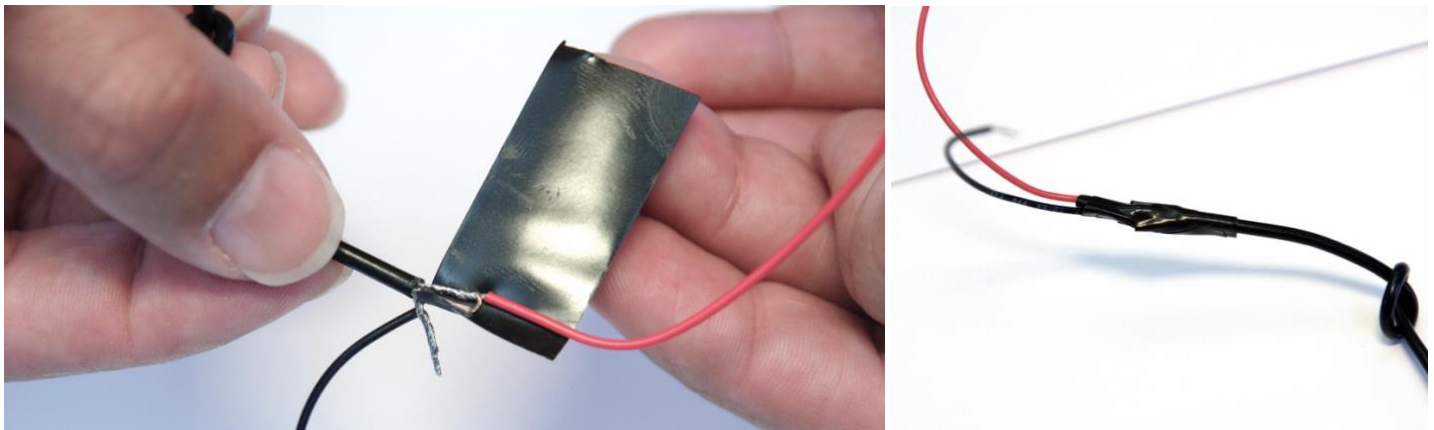
- Hook one end of the red jumper into the center core wire of the coax. You want to make each wire hook around the other. The wires should hold the weight/tension, rather than the solder itself.
- Hook one end of the black jumper into the outer shielding wire of the coax similarly.



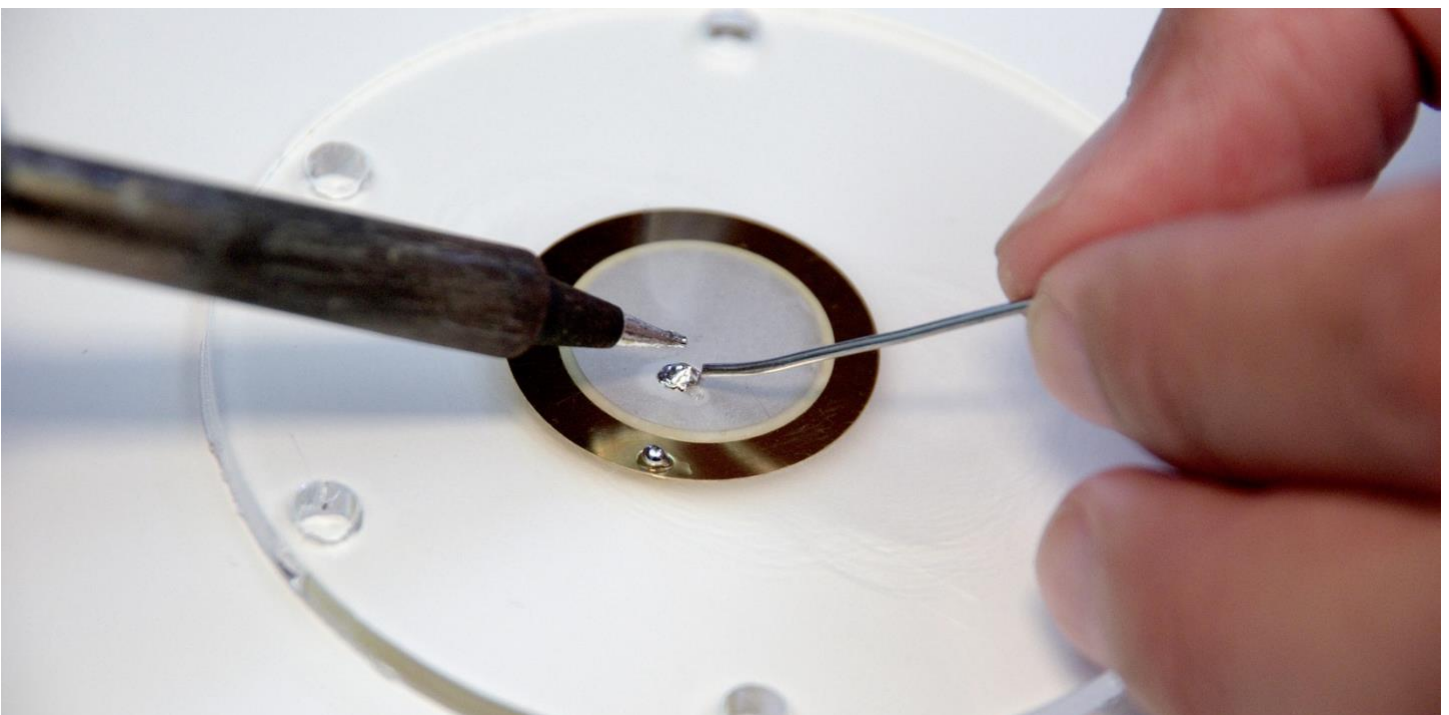
- Solder the connections.



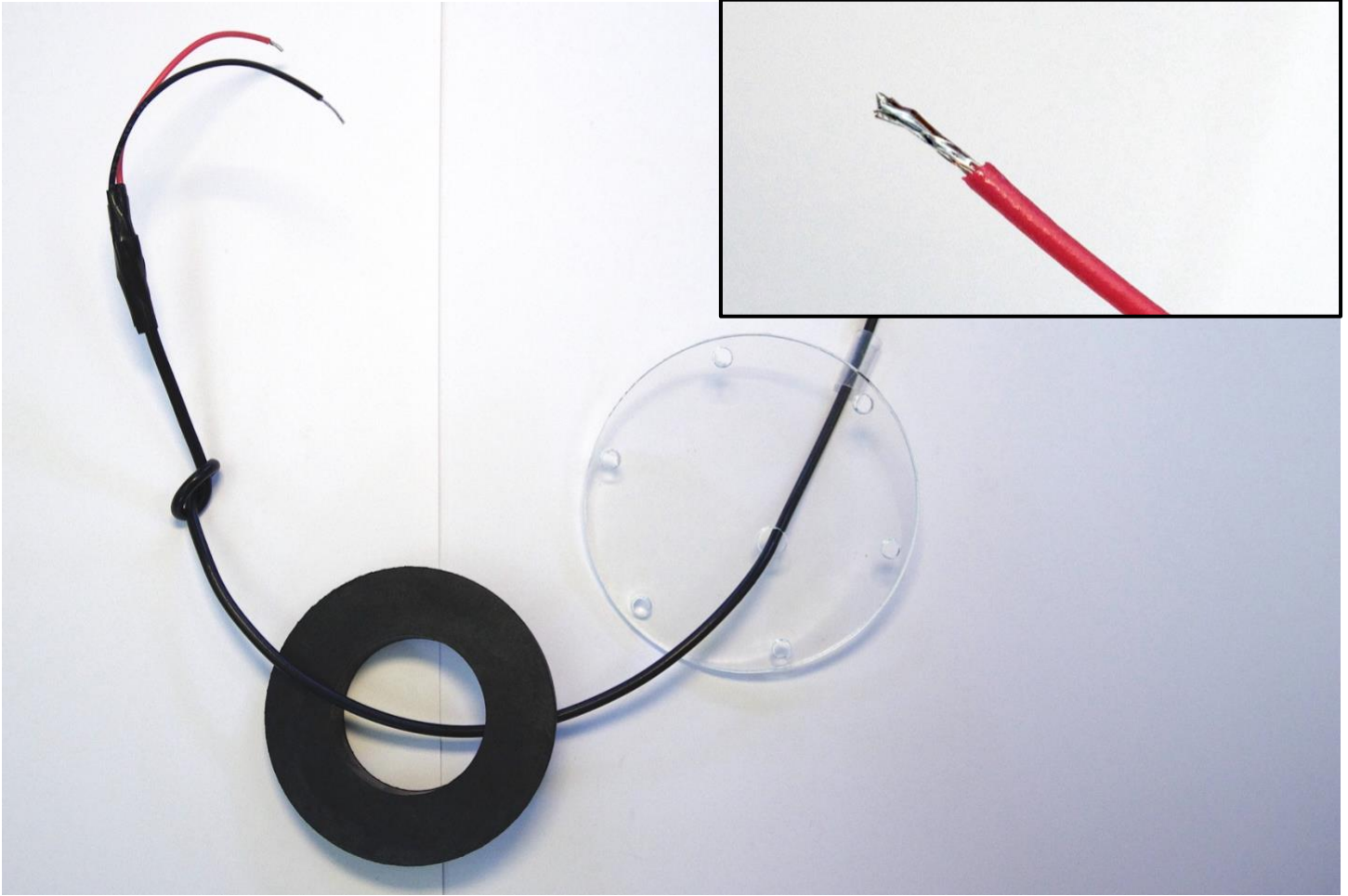
- Tape the solders that you just made. Make sure the two connections are isolated from one another.



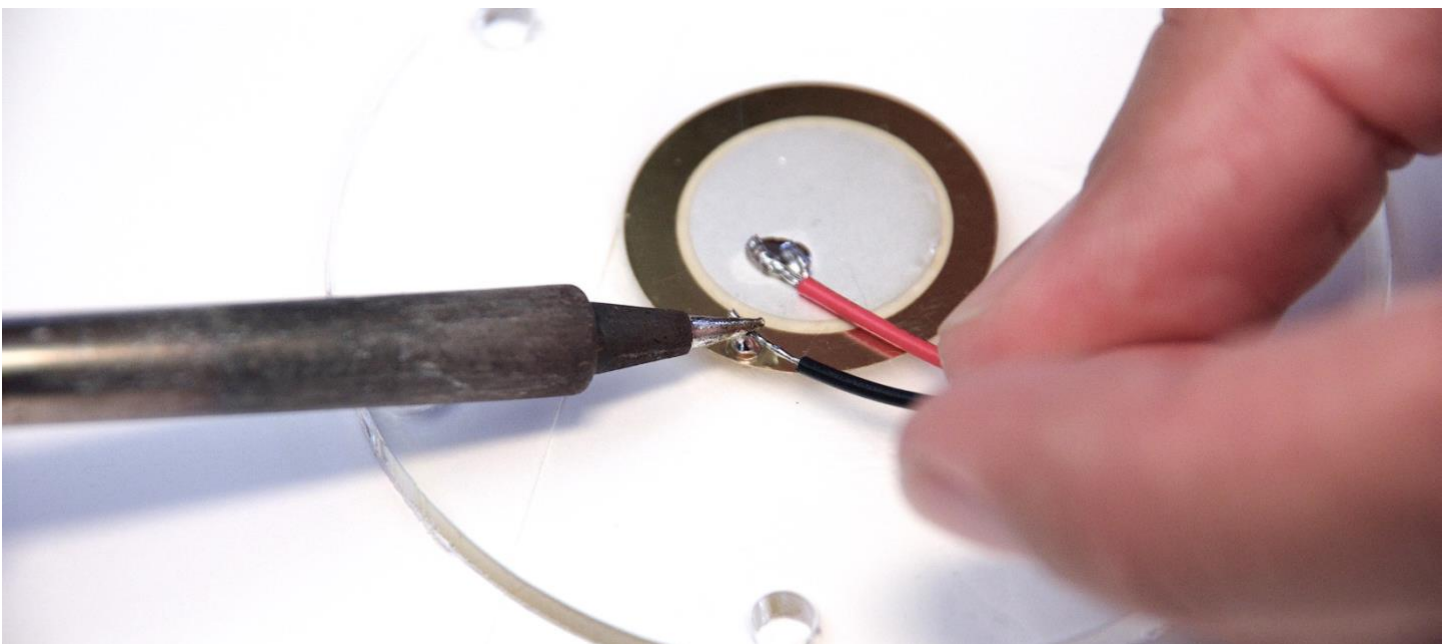
- Drop a blob of solder on the white/signal part of the piezo disc. Drop a blob of solder on the brass/ground part of the piezo disc. Do this as quickly as possible, the longer you linger on this solder point, the more likely you are to burn off the epoxy on the piezoelectric crystals and diminish the effectiveness of the contact points.



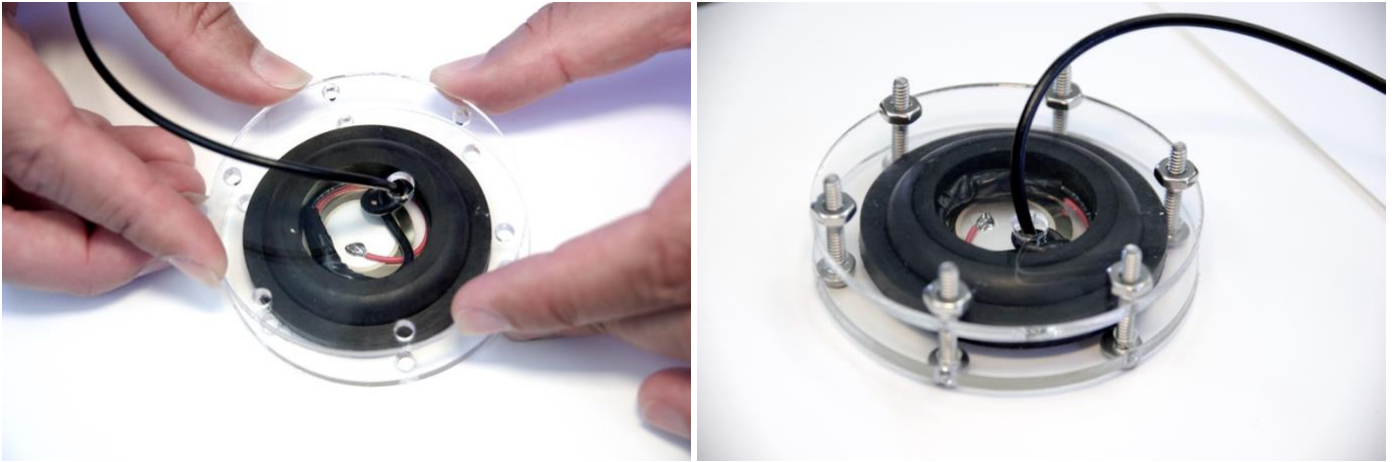
- Put a blob of solder on each of the two jumper wires. This step is called “tinning” the wires.
- String the gasket on the knotted and tinned wires.



- Solder the jumper wires to the Piezo disc. For that, place the tinned wire onto the blob of solder and rest the soldering iron on the top of the tinned wire. The solder on the two points should conduct heat and meld into one nice, flat blob.



- Make a sandwich of the two acrylic discs with the gasket in between and use the bolts, washers and nuts to secure them together. Finger-tighten the bolts before using a screwdriver. Be gentle and tighten each bolt a little at a time.



- Test the hydrophone to make sure it works by plugging it into your laptop or one of the small amplifiers at your disposal.
- When you are satisfied that it works, take a section of the plumber's epoxy and rub it together for about 60 seconds until the black and grey have completely combined. The epoxy should start to feel kind of warm in your hands. Now use it to seal the area where the wire enters the acrylic disc.



Congratulations, you have a hydrophone!