**Laminar gelatin tanks**

Designed by Madeline Frey and Grant Lockridge in 2022, for use in postdoctoral research by Amberle McKee.

Motivation:

Observation of small burrowing animals is very difficult due to the opaque nature of sediment. Thin aquaria (also called "ant farms") are commonly used to restrict animal movement, but rigid aquarium walls modify the physical properties of the sediment inside, with the proportion affected increasing as the width of the tank decreases (Dorgan et al. 2006). Gelatin is a transparent analog for mud, and has been used to observe worm burrowing behavior (Dorgan

et al. 2005). Burrowing worms can be detected from the pressurization of pore water in sediment (Wethey and Woodin 2005). Worms display patterns of pressurization that differ with depth, but those patterns have not been paired with behavioral observations. Gelatin is a homogeneous gel without pores, which prohibits the measurement of pressure patterns. Laminar tanks use gelatin and flexible silicone to reduce wall effects and create a thin area to observe worms in.

Materials:

½” HDPE: McMaster [**8619K474**](https://www.mcmaster.com/8619K474)

3/16” Cast Clear Acrylic: [**8560K214**](https://www.mcmaster.com/8560K214)

2-¼” 10-32 Screws: [**91735A609**](https://www.mcmaster.com/91735A609)

10-32 Nuts: [**90242A333**](https://www.mcmaster.com/90242A333)

Clear Silicone Sheets: [Amazon](https://www.amazon.com/Silicone-Rubber-Sheet-Flexible-12x20x1/dp/B071KQZBVM?pd_rd_w=gvrOs&content-id=amzn1.sym.bc622850-a717-4d94-96c3-7cc183488298&pf_rd_p=bc622850-a717-4d94-96c3-7cc183488298&pf_rd_r=KMZND5BSKY9V6B8F41B6&pd_rd_wg=bCmQk&pd_rd_r=d73e5c94-5218-4b4e-8d25-2a86dfa45a6a&pd_rd_i=B071KQZBVM&psc=1&ref_=pd_bap_d_rp_1_t)

Silicone Sealant: [Amazon](https://www.amazon.com/Clear-Aquarium-Silicone-Sealant-Cartridge/dp/B00EZB1QQ2?pd_rd_w=gvrOs&content-id=amzn1.sym.bc622850-a717-4d94-96c3-7cc183488298&pf_rd_p=bc622850-a717-4d94-96c3-7cc183488298&pf_rd_r=KMZND5BSKY9V6B8F41B6&pd_rd_wg=bCmQk&pd_rd_r=d73e5c94-5218-4b4e-8d25-2a86dfa45a6a&pd_rd_i=B00EZB1QQ2&psc=1&ref_=pd_bap_d_rp_21_t)

Tapered Plugs: [**9545K39**](https://www.mcmaster.com/9545K39)

[Plastic Wrap](https://www.amazon.com/Reynolds-912-Foodservice-Clear-Plastic/dp/B09246S98F/ref=sr_1_5?crid=34EPKJIRA4PQI&keywords=meat+and+deli+saran+wrap&qid=1663345560&sprefix=meat+and+deli+saran+wrap%2Caps%2C76&sr=8-5)

Assembly:

1. Cut out 7x7” pieces of silicone (I find that using an x-acto knife and a ruler is easiest)

Punch holes in the corners. You can either use the “U”s as a guide or measure- holes are ¼” from each side.

1. Add a thin layer of sealant to the center “U” and place the silicone sheet on top. Repeat for the other side, making sure that the silicone doesn’t sag too much. Add another layer of sealant on the other U’s, and place them on top of the silicone. Add more sealant and add the windows, tightening the nuts just enough to be snug. (Too tight and things will warp)
   1. The point of this is just to make a sandwich. If a different assembly order is easier, do that.
2. Leave some time for the sealant to cure, then make jello. Use the HDPE squares as spacers in the mud section to avoid the silicone deforming when you pour jello in. Use aluminum foil to prevent the sheets from getting stuck to your spacer. Let the jello cool thoroughly and fill the outer sections. Cover and refrigerate overnight.
3. Once the jello is set, use the silicone sealant to cover the jello and fill the space between the silicone sheet and acrylic. This should help keep the jello from dissolving or deteriorating over time.
   1. You can also use a flexible rubber cut to size and fill all cracks with silicone.
4. Insert plugs into pressure sensor ports, and fill the inner section with mud!

Literature Cited:

Dorgan, K.M., Jumars, P.A., Johnson, B.D., and Boudreau, B.P. 2006. Macrofaunal burrowing: the medium is the message. *Oceanography and Marine Biology: An Annual Review* 44: 85-121.

Dorgan, K.M., Jumars, P.A., Johnson, B., Boudreau, B.P., and Landis, E. 2005. Burrow extension by crack propagation. *Nature* 433: 475.

Wethey, D.S., and Woodin, S.A. 2005. Infaunal hydraulics generate porewater pressure signals. *Biological Bulletin* 209: 139-145.