

# Desktop Bio-Fiber Spinner

Wyatt Hodges, UNC Charlotte  
Jeremy Losaw, Super Fab Lab



UNIVERSITY OF NORTH CAROLINA  
CHARLOTTE

SUPER FAB LAB

## Introduction and Objectives

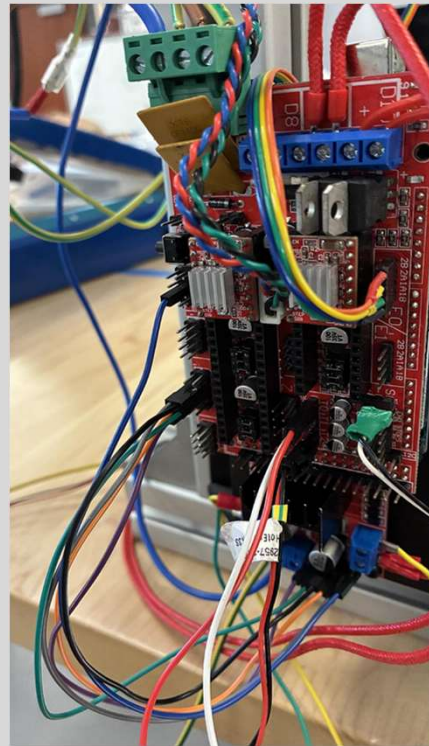
- Biofibers are fibers produced from polymers derived primarily from naturally occurring materials, offering a sustainable alternative to conventional synthetic fibers.
- Biofibers are hard to prototype because the solutions require specific environmental conditions while spinning and machines require large amounts of solution to operate and are designed for one solution.
- This project is based on an open-source design that allows for the spinning of gelatin based biofibers that can be used for sustainably integrating electronics into other textiles
- The goal of this project is to improve upon the design making it capable of spinning multiple solution types improving material innovation.

## Mechanics

- Similar design to a standard 3D printer
- Extruder is another open source design used for extruding liquids out of a syringe
- It is made from a 3D printed syringe pump that can be mounted to a rod and gear assembly that sends the pump down.
- The extruder case is attached to a rolling mount on the gantry that is driven by a stepper motor
- Spindles spin underneath the nozzle to pull and stretch the fibers after they are attached.

## Electronics

- Electronic design was provided in the original design
- Important components include the Ramps 1.4 microcontroller shield for operating the heater wrap and 3D printer tip as well as DC motors and a driver for the spindles, and stepper motors and drivers to extrude the fibers and move the pump.
- Everything other than the Ramps Board, 1 DC motor and the syringe heater and thermistor were harvested from old projects and 3D printers in the lab to improve sustainability
- The 3D printer heating block is a repurposed E3D V6 attached to the syringe needle
- A 12V 30W output power supply is required to power the spinner



RAMPS 1.4 Microcontroller Shield

## Conclusions

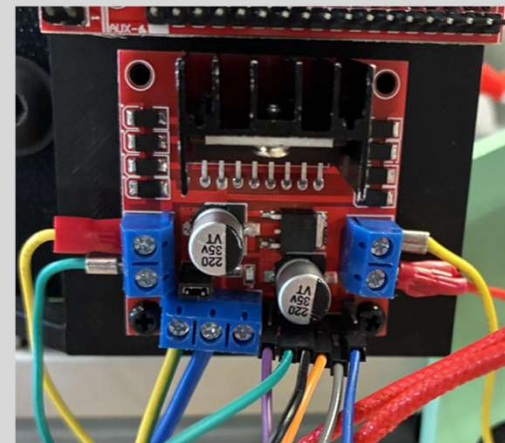
- More experimentation with solutions is necessary for further innovation.
- All the mechanical component and heating components work correctly, test with solutions are yet to happen
- This work demonstrates the feasibility of an accessible, low-volume biofiber spinning platform for research and education.

## References

Lazaro Vasquez, Eldy S., Mirela Alistar, Laura Devendorf, and Michael L. Rivera. "Desktop Biofibers Spinning: An Open-Source Machine for Exploring Biobased Fibers and Their Application Towards Sustainable Smart Textile Design." Pearce, Joshua M. "Large Volume Syringe Pump Extruder for Desktop 3D Printers." *HardwareX* 3 (2018): 49–61.

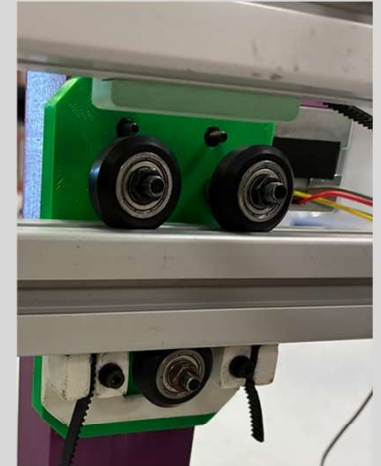


Fully Assembled Bio-Fiber Spinner



L298N Motor Controller

Extruder Mount and Belt Adapter



Large Volume Extruder