Materials and Methods

Materials List

- Electronics
    - NEMA17 stepper motor
    - Arduino UNO
    - A4988 Motor Driver
    - DRV8825 Stepper Motor Driver Controller
    - 2 Pushbuttons (ON and OFF switch)
    - Breadboard
    - OLED Screen
    - Rotary Encoder
- Case, Vial Holder and Vial Holder Adaptor
    - PLA
    - Ender3 Pro FDM 3D Printer
- **Wiring**

DRV8825 (w/A4988) Pin	**Arduino Pin**
E (Enable)	D8
D (Direction)	D9
S (Step)	D10

Table 2. Arduino to DRV8825 Stepper Motor Expansion Board Connection. D = digital arduino pin. A = analog arduino pin.

Component	**DRV8825 Connection**
Power Supply (+)	VMOT
Power Supply (-)	GND (power)
NEMA17 Stepper Motor Connector	2B, 2A, 1A, 1B

Table 3. Power Supply and Motor to DRV8825. D = digital arduino pin. A = analog arduino pin.

Rotary Encoder Pin	Arduino Pin
CLK	D2
DT	D3
SW	D4

Table 4. Arduino to Rotary Encoder. D = digital arduino pin. A = analog arduino pin.

Pushbutton Pin	Arduino Pin	Notes
Button (ON)	D5	Use a pull-down resistor or set pin to INPUT_PULLUP mode
Button (OFF)	D6	Use a pull-down resistor or set pin to INPUT_PULLUP mode

Table 5. Arduino to Pushbuttons. D = digital arduino pin. A = analog arduino pin.

OLED Pin	Arduino Pin
SDA	A4
SCL	A5
VCC	3.3V or 5V (check OLED specs***)
GND	Ground

Table 6. Arduino to OLED Display. D = digital arduino pin. A = analog arduino pin.

Manufacturing

All parts (fig. 31), except for the electronics, were printed in PLA using a Ender3 Pro Fused Deposition Modelling printer at 220C (nozzle temperature) and 60C (bed temperature). Electronics were sourced from online retailers. Further adjustments to the dimensions of all the parts depicted in figure **5** will be needed to accommodate the unique tolerances of other 3D printers, materials and printing environment.

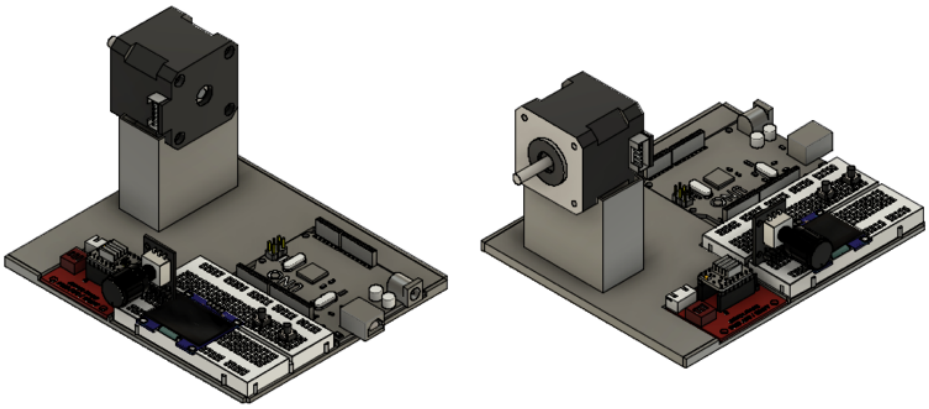


Figure 1. TranLab Peptoid Nanosheet Factory Device Renderings.

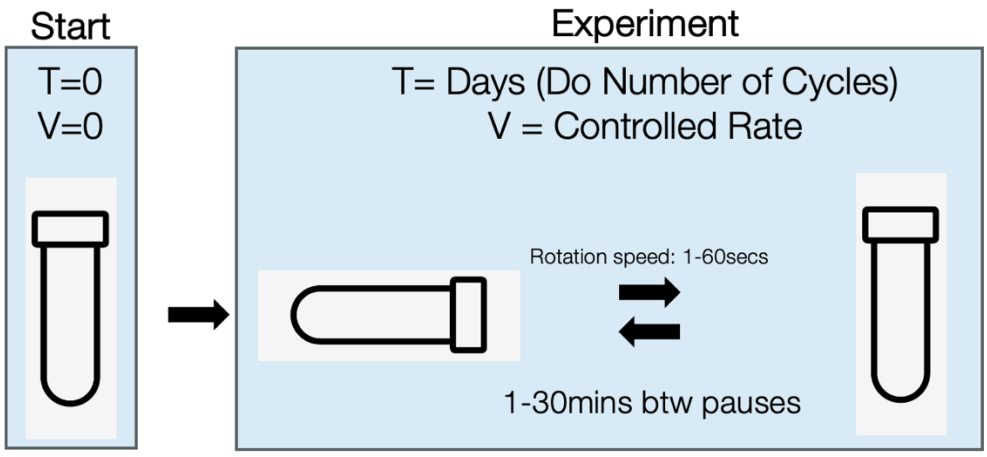
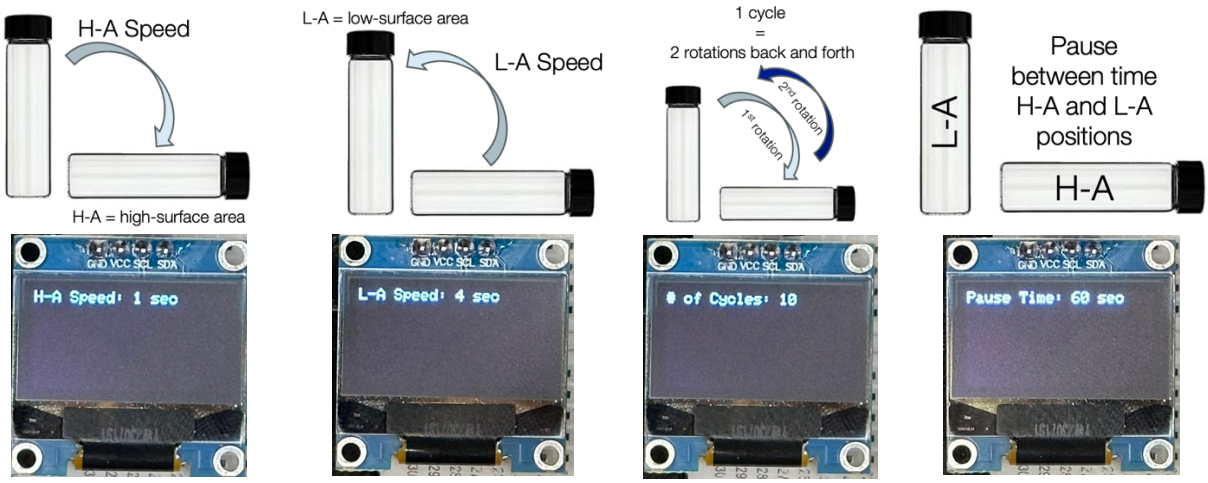


Figure 2. TranLab Peptoid Nanosheet Program Overview.



'H-A Speed' the time it takes to turn the NEMA17 90 degrees clockwise (between 1-60 seconds).

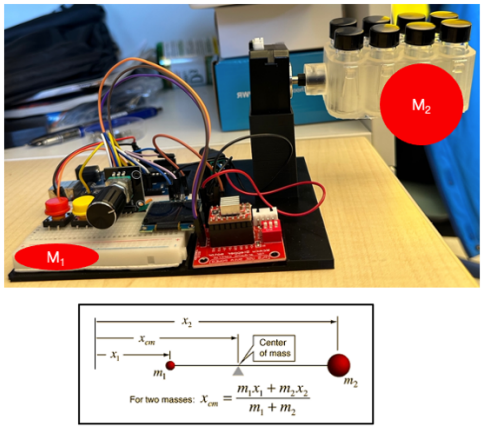
'L-A Speed' rotation speed is the time it takes to turn the NEMA17 90 degrees counter-clockwise (between 1-60 seconds)

'# of Cycles' is the number of times the motor rotates from H-A to L-A.

'Pause Time' is the time lag between clockwise and counter-clockwise rotations (between 1-30minutes)

Figure 3. TranLab Peptoid Nanosheet Menu Design Adapted and Modified from [20].

A)



B)

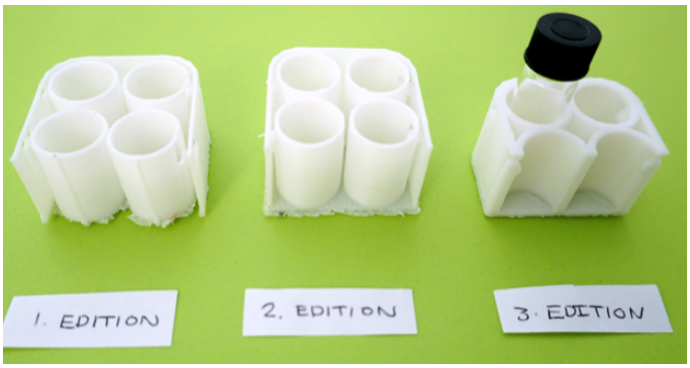
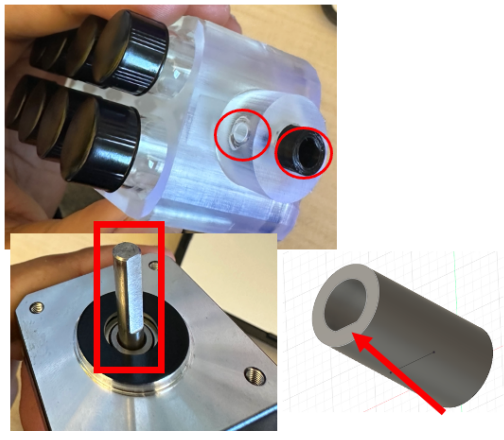


Figure 4. Vial Vibration Minimization Strategies Adapted and Modified from [17]. A) Wide case design to case movement during rapid vial rotation. B) Vial holder from RUC device to prevent vial movement within vial holder.

A)



B)

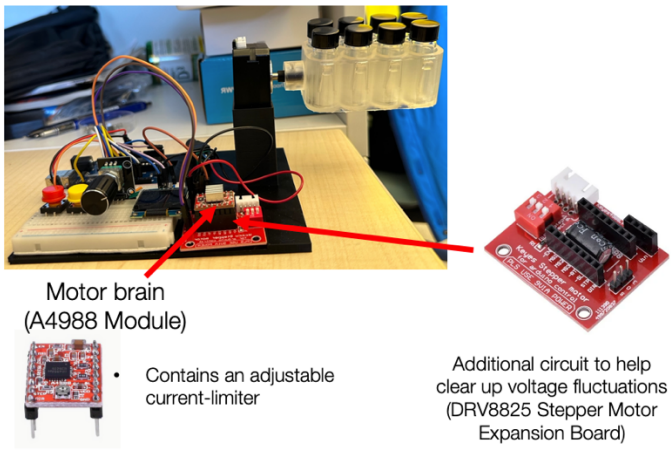


Figure 5. User-friendly features and Electrical Safety Considerations. A) Vial holder shaft adaptor to allow for effortless removal and attachment of vial holder. B) Current limiter adjustment on A4988 module and in-built capacitor within DRV8825 stepper motor expansion board to improve electrical safety and noise reduction.

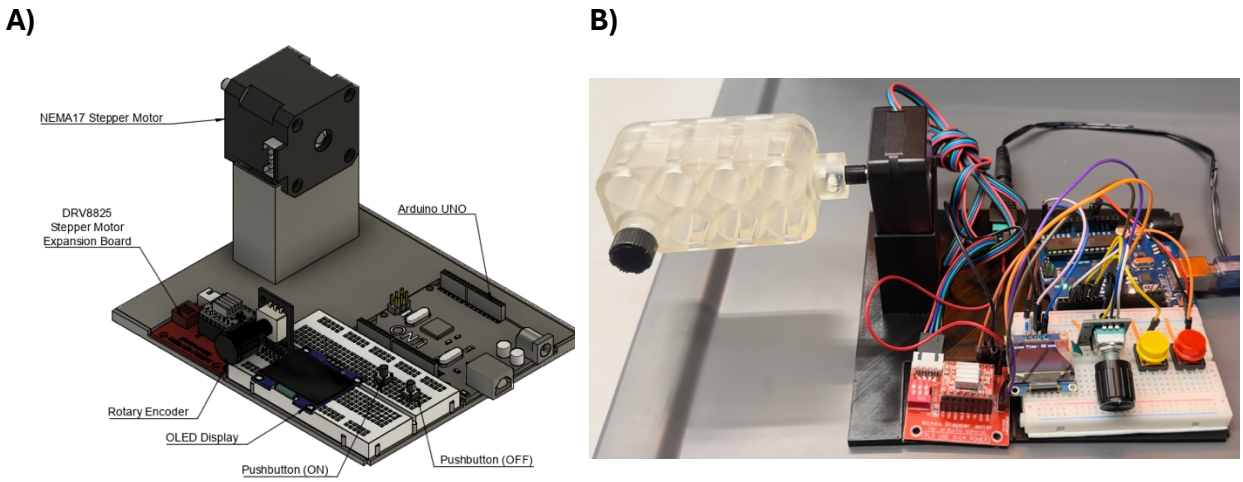


Figure 6. Final TranLab Peptoid Nanosheet Factory Design. A) Peptoid nanosheet device and all part names. B) Nanosheet device and open-case prototype.

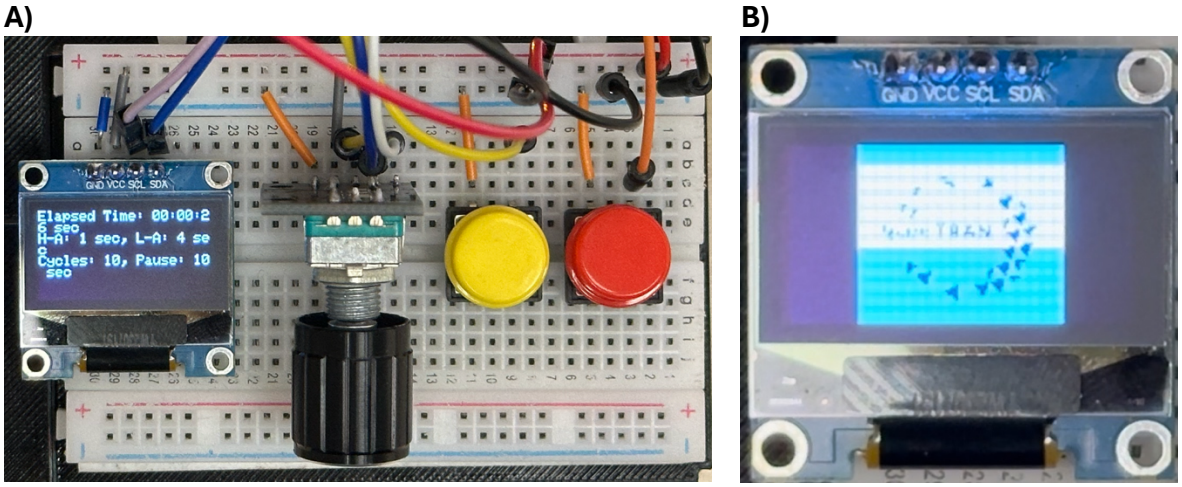


Figure 7. Extra Display Features. A) A status screen displaying experimental settings and elapsed time of the experiment. B) TeamTran logo upon bootup of device.

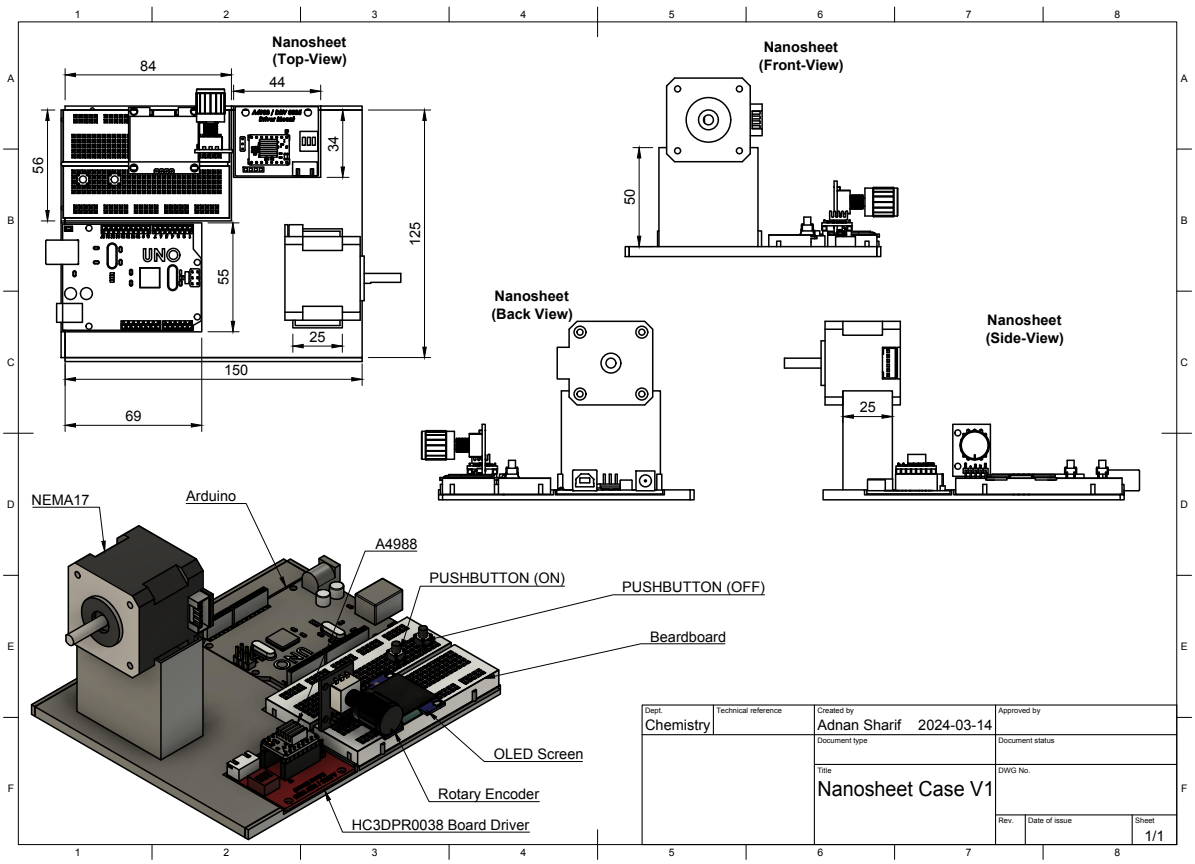


Figure 8. Peptoid Nanosheet Factory 2D Drawings. All dimensions are listed in millimeters (mm).