**Purpose**
Design and build a lab setup for the creation of stacked 2D materials that is simple to use, precise, and reliable.

2D materials are sheets of two-dimensional crystals stacked in layers to form structures with interesting properties useful in applications such as batteries, semiconductors and much more.

**Transfer Process**
- Flakes are transferred onto the stamp by exfoliation with tape
- The stamp is turned upside down
- The flake is aligned on top of the target substrate
- The stamp is pressed against the substrate
- The flake is peeled off very slowly
- The flake has been transferred

**Schematic**

- **Glass Slide**
  Carries the stamp used to transfer the flakes of one 2D material onto the substrate 2D material

- **Sample Stage**
  A heating element and a temperature sensor are used to control the sample's temperature

- **Goniometer**
  Dual-axis tilt stage allows users to adjust the angle of the slide

- **XYZ Micromanipulator**
  Vertical movement of the glass slide is controlled by a motor actuator for increased precision

- **Force Sensor**
  By measuring the force applied to the sample stage, the stress acting on the 2D materials can be calculated

- **Microscope**
  A camera outputs the image from the microscope to a computer monitor. A motor controls the fine adjustment of the microscope height

**Current Progress**
- Test
- Build
- Finish setting up temperature control
- Test setup and create 2D layered structure
- Integrate force sensor feedback into micromanipulator actuator control

**References**

- [1]
- [2]
- [3]

**Design Process**
- Most parts in setup are from Thorlabs
- A SolidWorks model of the setup was created first to check compatibility of all components
- The sample stage, slide holder, and L-bracket were designed on SolidWorks and then either 3D printed or manufactured by the machine shop

**Next Steps**
- Finish setting up temperature control
- Test setup and create 2D layered structure
- Integrate force sensor feedback into micromanipulator actuator control

**Progress**
- Design
- Build
- Test