Objective
The objective of this research is to see how the length of mesoscale polymer ribbons impacts the bundling process especially looking at the percent decrease in length after bundling and the number of ribbons in each bundle.

Background
- Mesoscale Polymers (MSP) → Hierarchical polymer structures inspired by collagen
- The bundling process occurs due to the hinges in the MSPs, allowing for spaces for interaction on the ribbons

Hypotheses
- Longer lengths will contain more ribbons per bundle
- Longer lengths will have a higher percent decrease in length after bundling
- Shorter lengths will contain less ribbons per a bundle
- Shorter lengths will have a higher percent decrease in length
  - Note: previous research used a length of 4mm as standard length

Discussion
- The average number of ribbons per bundle increases from 4mm to 20mm in Figure 1
  - As the length of the ribbon increases, the prospects of bundling increase due to length of the ribbon and scope for more bundling interaction
  - In Figure 2, the percent decrease in length increases over the lengths of 4mm to 20mm
  - Longer lengths may increase the amount of ribbon bundling and can lead us to more experimentation with understanding ribbon defects

Results

![Figure 1: The Average Number of Ribbons As a Function of Length](image1.png)

The average number of ribbons per bundle increases from 4mm to 20mm lengths from an average of 3.75 ribbons per a bundle to 13 ribbons per a bundle.

![Figure 2: The Percent Decrease in Length Before and After Bundling](image2.png)

The percent decrease increases with length going from a 46.9% decrease for the 4mm length to a 94.3% decrease for the 20mm length.

Methods
- UV exposure exposes photosensitive groups
  - These photosensitive groups go through a reaction when exposed to light
  - The alternating mass loss pattern generates hinges which aid in helix formation
  - This eventually leads to ribbon bundling

Quantification of Results
- Hinge Angle Formation: Images taken from the scanning electron microscopy with 25x lens
  - Image J is used to measure the angle

Future Steps
- Experimenting with lengths between 10-20mm to see how the defect patterns change (organized vs. disorganized self-assembly)
- Exploring the role of width and thickness in MSP bundling by finding ways to control them in the flow coating process

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If you would like to learn more about my thesis, please watch this video.