

STEM

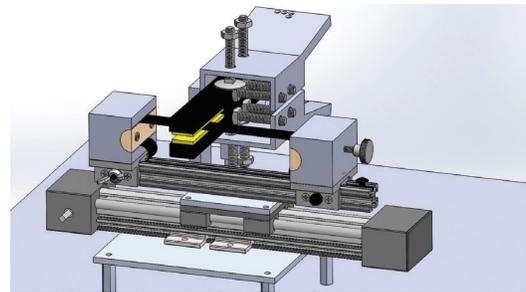
Design of a Modular Fixture That Simultaneously Holds Different Lengths of Hair and Flatirons of Different Sizes

Student researcher: Rishab Mardia, Senior

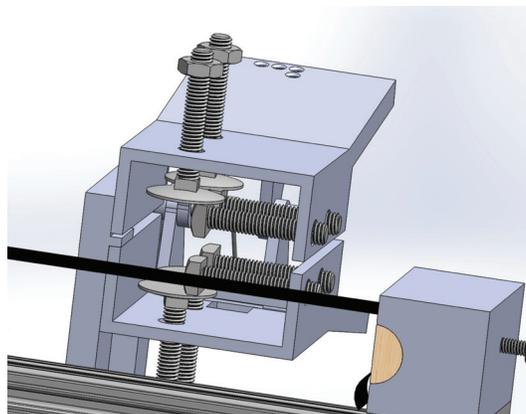
While straightening or curling hair with styling tools, enough heat must be provided to temporarily break the chemical bonds that give the hair its natural texture and shape. However, when excess heat is provided, the chemical bonds are permanently damaged and the hair loses its natural shape. This is a problem for many women, and it is often referred to as heat damage. Although others have conducted research to examine the effects of heat on hair, very little work has been devoted to curly hair types, especially those that are extremely curly, while considering the actual use context of the individuals. The REID Lab at Purdue University created a device for studying the effects of heat from a flatiron on different hair types, especially those that are curly. Using data from this device, the team at the REID Lab can identify temperature ranges at which hair damage is minimized. However, one of the limitations of the device is that the fixture cannot hold flatirons of various sizes. As part of the research project with Professor Tahira Reid and PhD student Jaesik Hahn, I developed a new design for clamps that hold flatirons of different sizes.

First, I determined different mechanisms that would be able to hold flatirons of different sizes. I then narrowed down my choices to using nuts and bolts for holding the flatiron, as this was the most cost-effective and user-friendly option and could be incorporated into the machine with minimal changes. Last, I used a computer-aided design (CAD) program called SOLIDWORKS to create my design. After many iterations, I developed a system of clamps that hold the flatirons using bolts. The bolts are arranged in such a way that flatirons varying from ½- to 2-inch thickness will be compatible with the mechanism. This replaces the need for having different clamps and machines for different flatirons and allows the machine to test different hair lengths. I also created a new design for pivots and spring supports to make the mechanism sturdier, and I developed the fabrication plan for manufacturing the new clamps.

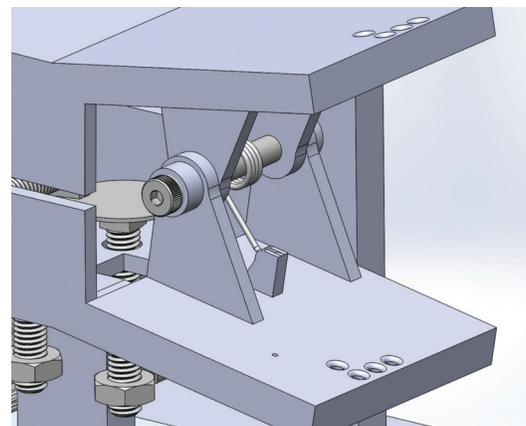
Research advisor Tahira Reid writes: "One of the challenges with this work is accessing hair samples that are long enough to mount and test. Rishab's project provides a starting point for designing a system that can hold heating devices of various sizes and allow testing of hair samples as short as 2 inches. The realization of such a device will provide flexibility in data collection activities."



■ Image of the machine testing hair samples.



■ Front view of the clamps.



■ Back view of the clamps.