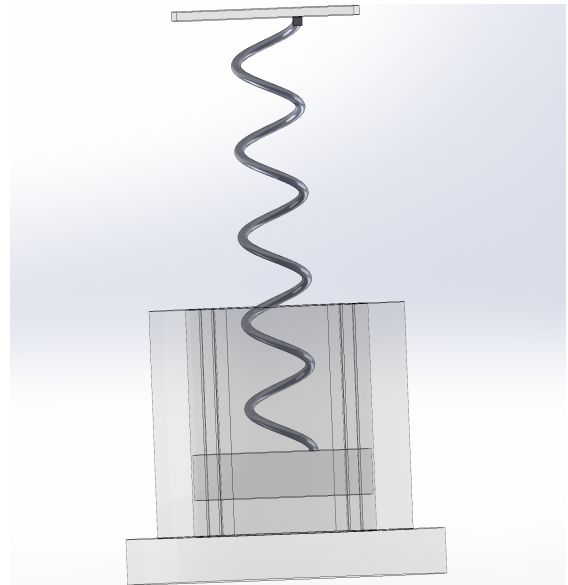
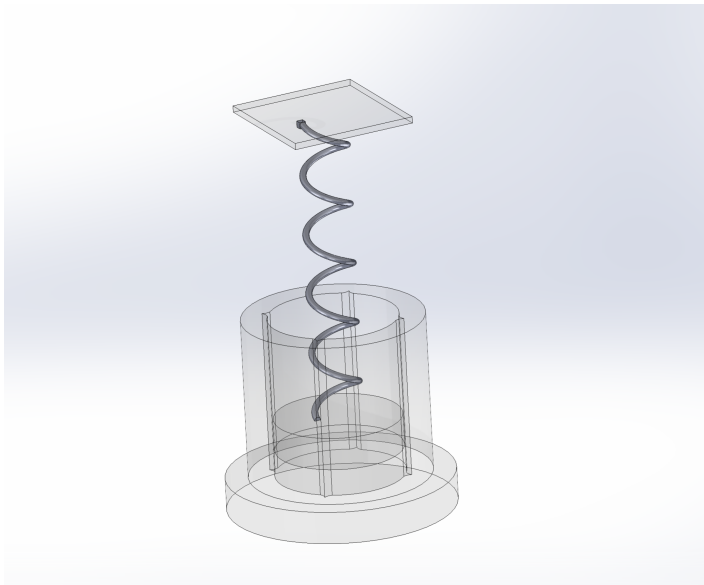


Team Object

Object Description

The team object was inspired by constitutive modeling of the viscoelastic behavior of cartilage, referencing Khajehsaeid 2021 for inspiration - that being the use of a spring-dashpot Maxwell element. To structurally replicate said Maxwell object, the designed object comprises four components: a dashpot, a damper cylinder, a base, and a spring. The spring is repurposed from a pen, while the dashpot, damper cylinder, and base are fabricated through a Form3 3D printer using BioMed Clear resin. Anything attached to the spring will be securely assembled using glue as a permanent assembly technique, while the fitting of the spring-attached damper within the dashpot is obviously temporary. The dashpot's operation will be manually powered by hand, with linear actuation enabled by pushing & pulling of the square base to mimic the element's dynamics, and the star-shaped extrusions on the damper will ensure a precise and snug fit as a mistake-proof technique.

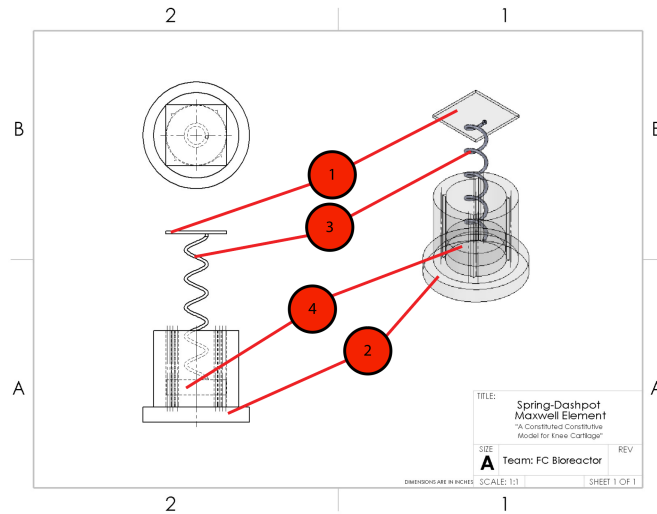
CAD Design



Assembly Process

The dashpot, damper cylinder, and base were individually 3D-printed using BioMed Clear Resin via ME lab facilities. The damper cylinder was securely attached to the dashpot through a small gap on the dashpot. The spring was obtained from a typical ball-point pen, and was permanently joined with the damper using glue on its bottom end. The base is then attached to the top end of the spring, also through glue.

Bill of Materials



Part name	Base	Dashpot	Spring	Damper Cylinder
Part number	1	2	3	4
Quantity	1	1	1	1
Part Description	A small square of plastic on the top of the spring, which the part is to rest on	A cylindrical structure which housed the damper	A small metal coil produced from the inside of a ballpoint pen and attached to the dashpot	A small cylinder of plastic attached to the lower portion of the spring within the dashpot
Raw stock	3.70 mL	34.30 mL	N/A	2.63 mL
Cost	3D Summed below	—	1 pen	—
Manufacturing method	3D printing (BioMed Clear)	—	Pen deconstruction	—
Total Cost	~\$14			

Responsibilities

Chanul: Object description

Griffin: Team object idea, CAD design, fabrication & assembly, bill of materials drawing & labeling, proof-reading

Emilio: Assembly process, document formatting

Jeffery: Assembly process

Sydney: Bill of materials, edits to CAD, general formatting

References

- 1) Khajehsaeid, H.; Abdollahpour, Z.; Farahmandpour, H. Effect of Degradation and Osteoarthritis on the Viscoelastic Properties of Human Knee Articular Cartilage: An Experimental Study and Constitutive Modeling. *Biomechanics* **2021**, *1*, 225-238. <https://doi.org/10.3390/biomechanics1020019>