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## Prosthetic Knee for CURE Kenya

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# Prosthetic Knee for CURE Kenya



2021 School of Science,  
Engineering and Health  
Symposium

Ike Bryner, Sarah Kelchner,  
Carter Urich

## Introduction & Problem Statement

Partner: CURE Kenya Orthopedic Hospital in Kijabe, Kenya

- There are many lower-limb amputees in the region due to infection and disease
- Through-knee prostheses are very expensive (\$2,500 USD)
- Through-knee amputees often undergo a more invasive trans-femoral surgery out of financial necessity
- There is a great need for affordable through-knee prostheses



## Group Mission

This project aims to serve individuals with lower-limb amputations by providing a knee-disarticulation prosthesis that is fully functional, low cost, aesthetically pleasing, and locally manufacturable.



Pictured from left to right: Kay Laura Sindabizera, Ike Bryner, Sarah Kelchner, Nate Jaloszynski, Sam Burgess, Josiah Moyer, Carter Urich

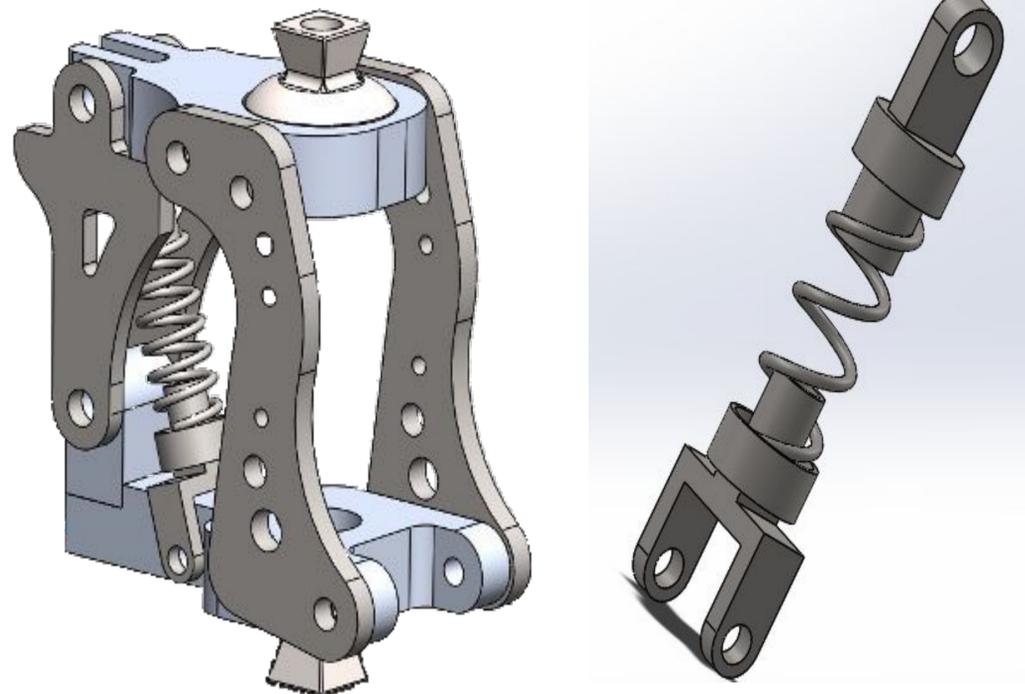
## Prosthetic Knee Design

Our design features:

- Polycentric four bar linkage design
- Spring-based passive damping mechanism
- Strategic proportioning to minimize thigh lengthening and closely imitate anatomical knee
- Weight-reducing features

Our damping mechanism features:

- Spring-loaded design validated by SOLIDWORKS motion analysis
- Sleek, seamless integration into interior of knee
- Source of potential energy buildup to hold knee in extended position



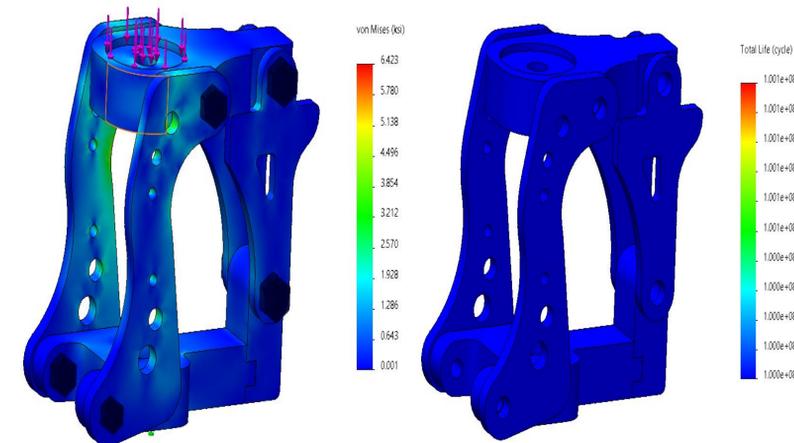
## Progress on Manufacturing

We have begun the manufacturing a metal prototype of the main body of the knee.

- The top and bottom platform components will be made of aluminum in the CNC milling machine
- The side bars will be made of stainless steel in the plasma cutter

## Initial Testing

We completed SOLIDWORKS static and fatigue testing (below left and right, respectively) on the body of the knee:



The design exhibited sufficient static and fatigue strength to undergo 4 years of cyclic loading with minimal stress concentrations.

## Conclusion and Future Plans

We are currently manufacturing a physical prototype and will begin physical testing on the metal prototype next semester. We aim to deliver a functional knee with a manufacturing protocol by May 2022.

## Acknowledgments

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- Sam Burgess, Kay Sindabizera, Josiah Moyer - Team Members
- Dr. Jamie Williams - Project Manager and Consultant
- Dr. Emily Farrar - Project Founder and Consultant
- Eric Shoemaker (MS, CPO) - Professional Consultant
- Tim Howell - Project Consultant
- John Meyer - Manufacturing Consultant



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