This project aims to aid individuals with physical disabilities by providing a solution to their limitations through the production of a fully functional, low cost ($20) prosthetic knee that will eventually be integrated to a readily available transfemoral prosthetic leg available in Mahadaga, Burkina Faso.

**Testing with Volunteer Amputee**

With the help of Eric Shoemaker (MS, CPO) and Ability Prosthetics & Orthotics we were able to test our prototype with an amputee (Andrew) in November of 2017.

We collected Accelerometer Data and Slow Motion 2D Video for the following 3 setups:

- **Andrew’s Current Prosthetic Knee ($115,000 X3 Ottobock Microprocessor Knee)**
- Our Low-Cost Knee in the Unlocked Position
- Our Low-Cost Knee in the Locked Position

### Testing:

- Testing was a success as Andrew was able to walk without fail for about an hour and our knee data compared well to his advanced microprocessor knee
- Andrew even said that our knee felt similar to prosthetic knees that he has used in the past
- Our only drawback was that Andrew is stronger and a more experienced prosthetic user than our future patient in Burkina Faso

### Moving Forward (Main Goals for Next Year):

- Write a rehabilitation protocol for amputees in Burkina Faso that will increase their strength and range of motion
- Strength and fatigue test the adapter design
- Reduce amount of noise the knee makes upon extension

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**Prosthetic Adapters**

The Pyramid Adapters (right) are universally used to connect prosthetic limbs together. They connect to both the top and bottom of our knee design. These cost about $50/adapter used on Ebay.

This is not practical for a prosthetic knee that costs less than $20. Our project has taken on the task of designing adapters (left) that could be made locally in Mahadaga for very cheap. We hope that this design would have a widespread impact since they could replace the universal pyramidal attachment everywhere.

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**Introduction & Problem Statement**

**Client:** Centre for the Advancement of the Handicapped in Mahadaga, Burkina Faso

- There are many amputees (estimated at about 50 out of a population of 5000) in Mahadaga, Burkina Faso mainly due to infection
- Amputees without a prosthetic cannot provide for themselves
- Terminated supply of donated prosthetic knees created a need for a locally manufacturable prosthetic knee
- Challenges
  - Lack of materials
  - Not enough highly-trained prosthetists
  - Need to tailor prosthetics to cultural factors

**Group Mission**

This project aims to aid individuals with physical disabilities by providing a solution to their limitations through the production of a fully functional, low cost ($20) prosthetic knee that will eventually be integrated to a readily available transfemoral prosthetic leg available in Mahadaga, Burkina Faso.

Photographed from Left to Right: Shane Curry, Ashley Hah, Bryson Boettger, Kaleb Burch, Marissa Kuhns, Jenna Kelsey, Vaughn Chambers & Dr. Jamie Williams

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**Current Design**

- Holes for Standard Pyramidal Attachments on Top and Bottom
- Posterior-Shifted Axis for Added Stability
- Made of Steel on using only Cutting, Drilling and Welding
- Magnet for Additional Extension Assist
- Costs Less Than $20 to Manufacture
- Holes for Locking Mechanism on Front for Selectable Added Stability

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- Kaleb Burch, Ashley Hah, & Marissa Kuhns- Team Members
- Dr. Jamie Williams- Project Manager and Consultant
- Dr. Emily Farrar- Project Founder and Consultant
- Eric Shoemaker (MS, CPO)- Professional Consultant
- John Meyer- Manufacturing Assistance
- Dr. Timothy Van Dyke- Finite Element Analysis Assistance

**And an extra special thanks to Andrew for generously volunteering to test with us**