Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M18-255L
Published: 12/3/2019

## Inventors

**Jeffrey LaBelle**

**Courtney Mason**

## Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

# Prosthetic Limb Structures & Fabrication Methods

Congenital limb defects or loss of a limb through an accident can severely impede an individual's mobility and ability to carry out day-to-day tasks. Artificial limbs, or prosthetics, are intended to restore a degree of normal function to amputees or individuals with congenital limb defects. Because of variations in sizes and shapes of individuals and their limbs, or limb segments, prosthetics are typically custom manufactured and complex. This leads to higher manufacturing time and production costs. There is a need for prosthetic devices and fabrication methods that address the limitations of conventional devices and methods.

Below-the-knee prosthetic designs commonly use a titanium post, or pylon, for load bearing. While titanium is strong and light, it is too rigid for proper gait impact absorption. With use, the shock from walking travels up the body, leading to pain and injury in the hips, back, and neck. This often forces amputees to walk with an uneven gait, which further perpetuates discomfort.

Researchers at Arizona State University have developed novel low-cost, easy to assemble prosthetics, methods of fitting, manufacture, and assembly. These prosthetics are fabricated rapidly and then assembled to form the frame of a prosthetic device. Some of the prosthetics are made with inexpensive materials that are lightweight, crush-resistant and are capable of withstanding substantial axial and torsional loads. Others are made in a manner that mimics the shock absorption properties of legs allowing for a sound and strong structure that is still lightweight. The assembled prosthetics may also incorporate functional elements such as actuators, sensors, control mechanisms, energy storage devices, etc. These devices can be custom-built for a specific recipient and measured to match intact limbs if present. Further, the designs can be adapted for use in underdeveloped areas or in emergency medicine/battlefield/job site locations as customizable splints.

These prosthetic designs address and overcome many of the limitations of conventional devices to provide novel, comfortable, custom prosthetics that are quick to produce, cost-effective, strong and highly functional.

Potential Applications

- Upper & lower limb prosthetics
- Robotics
- Custom splint
  - Underdeveloped/remote areas, emergency medicine, battlefields, job sites

Benefits and Advantages

- Low cost, light but strong materials
  - Minimal material requirements
- Easy to manufacture/put together
- Greater shock absorption properties allow for more comfortable wear
  - Reduces additional injury – allows for a more ‘normal’ gait
- Allows for custom built devices
- Can incorporate other functional elements

For more information about this opportunity, please see

Sarah McBryan - PPT Presentation

For more information about the inventor(s) and their research, please see

Dr. Labelle's former laboratory webpage