# Give Me a Hand: The Comparison and Application of Lightweight Methods of Actuation in Prosthetics

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The project used the memory shape and super elastic properties of nickel titanium alloy wire to move the fingers on a 3D printed hand. When nitinol heats to 500°C, the molecules set in that position and that becomes its austenite position. After that, when the nitinol heats up to 115°F, the wire moved to that position from whatever position it was in. This is due to the unique lattice structure that the molecules of this alloy form. While most metals can only stretch up to 5% greater than their original length, nitinol can stretch up to 8% greater than its original length. This makes nitinol the optimal choice for lightweight prosthetics. A control was then tested to get base data. The data was compared to the data gathered on nylon linear actuators to determine the superior method of actuating prosthetic fingers. Results showed that both the nitinol wire and the nylon linear actuators were successful in actuating the finger. The superior method of actuation was determined by the time it takes for the actuator to make a full actuation of the finger, the amount of power each method takes over the course of the trial, and the consistency of the actuator throughout the trial. Using this criteria, the nitinol wire was determined to be the superior method of actuation. An idea for further research is seeing how different these methods of actuation could be applied to different limbs on the body.

**Awards Won:**