



SELECTED PROJECTS

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August 2015

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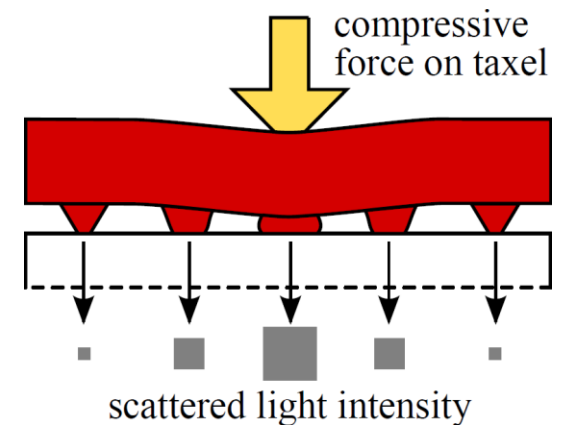
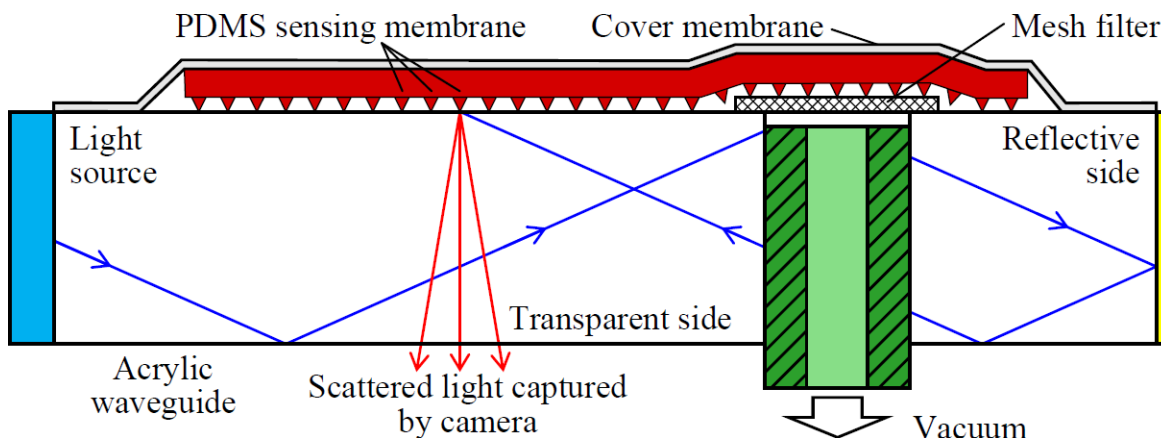
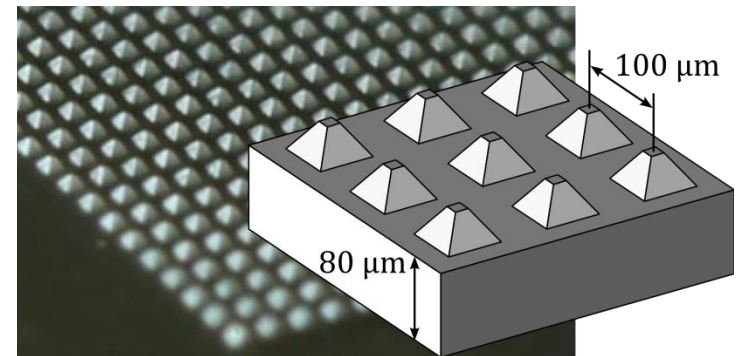
Gecko Tactile Sensor: Design

Built optical tactile sensor to measure stress distribution on a gecko's toe

- Uses frustrated total internal reflection
- 100 μm spatial resolution
- Vacuum enables measurement of compressive and tensile normal stress

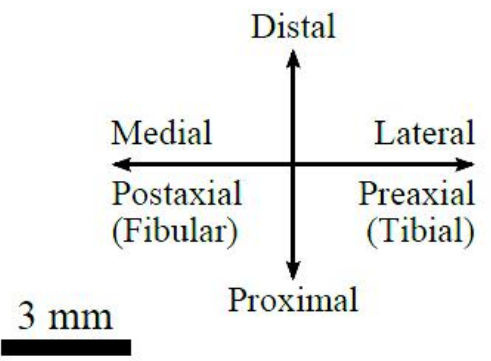
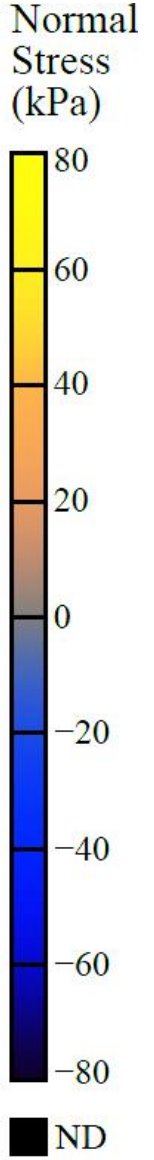
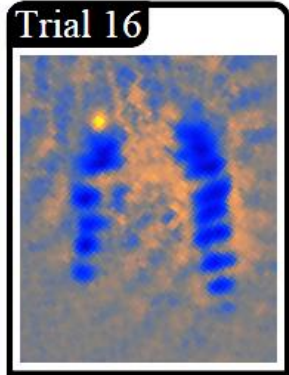
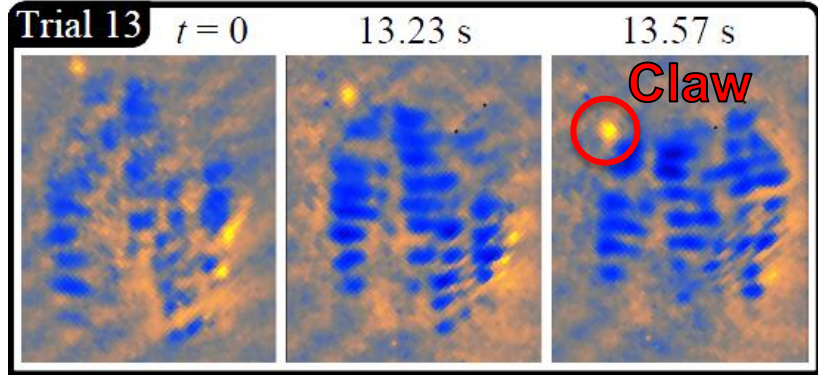
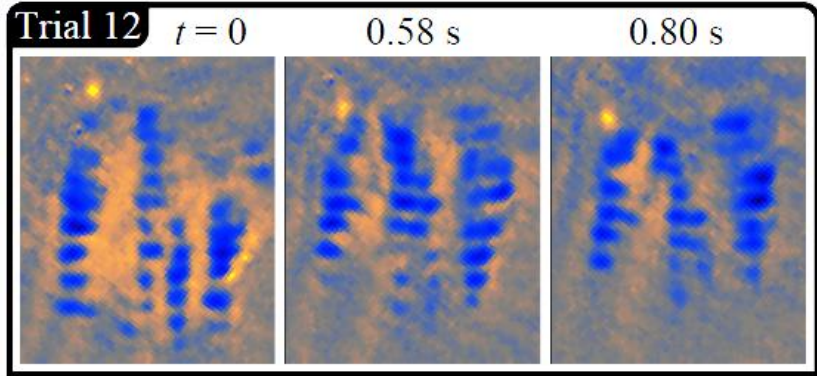
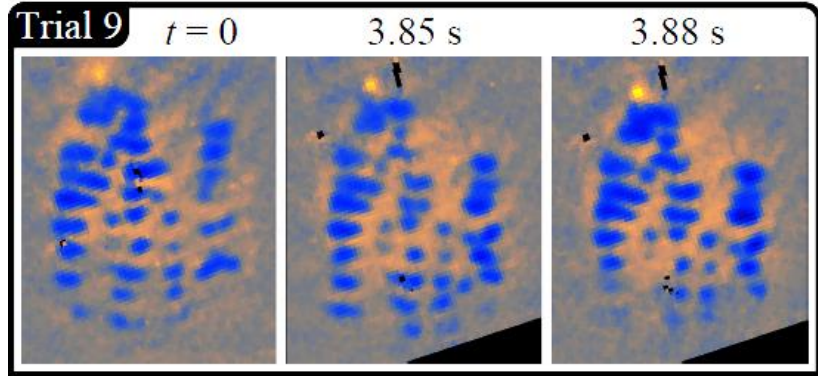
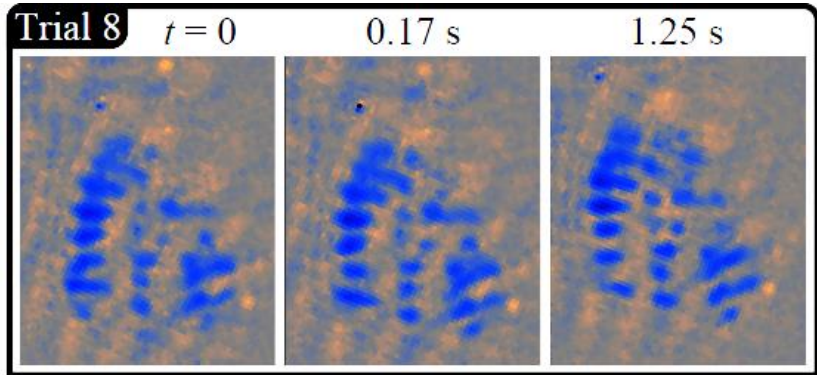
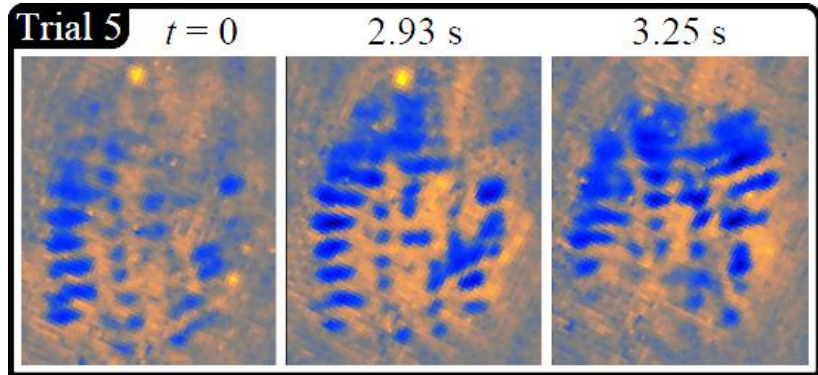
Microtextured sensing membrane produces light signals proportional to normal stress

More details:
<http://stanford.io/1D5satZ>





Gecko Tactile Sensor: Results



3 mm



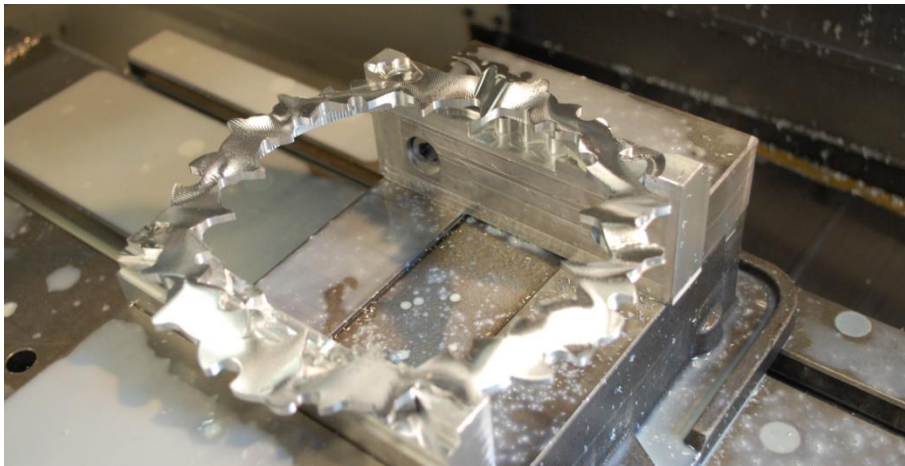
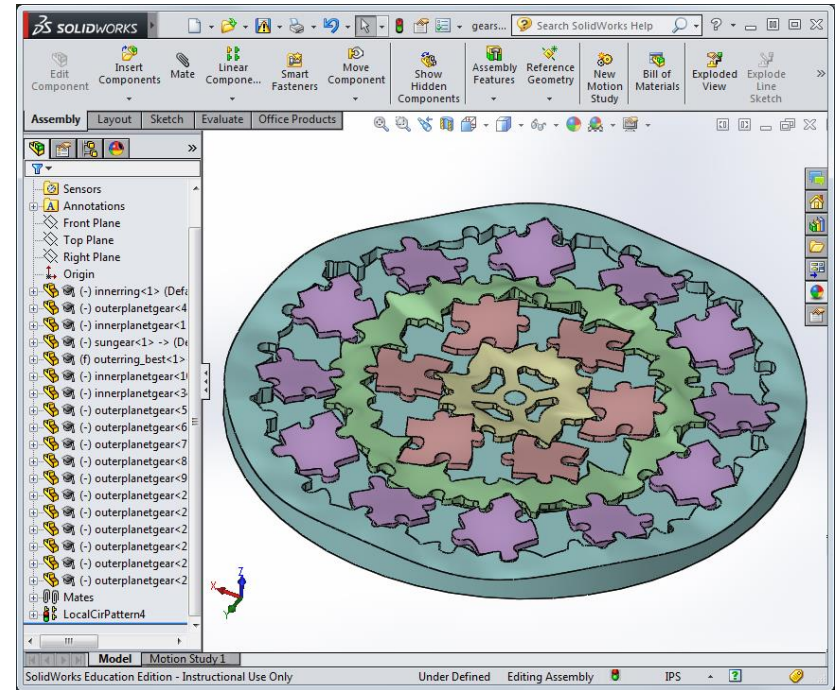
Puzzle Piece Planetary Gears

Designed in SolidWorks

Sun, ring, and planet gears shaped like puzzle pieces

3D-contoured top and bottom surfaces

Designed multiple fixtures to support parts during machining



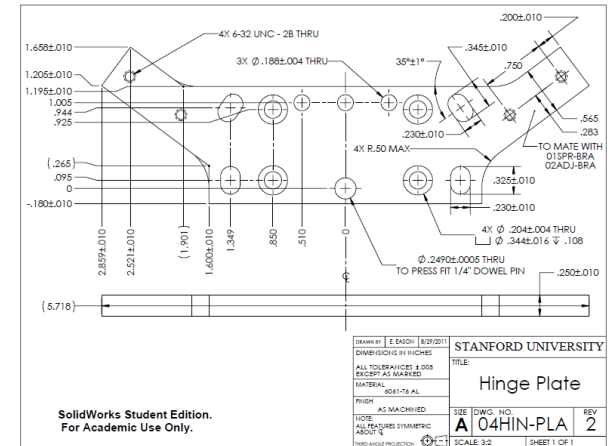
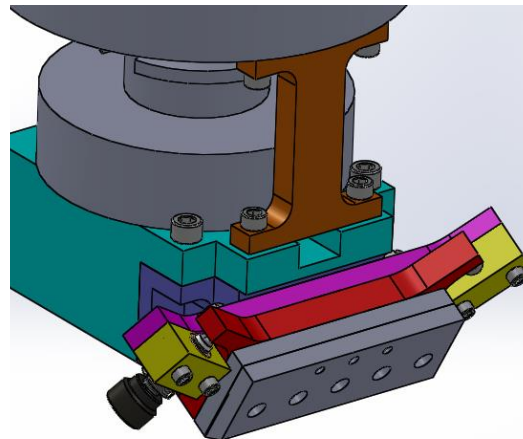
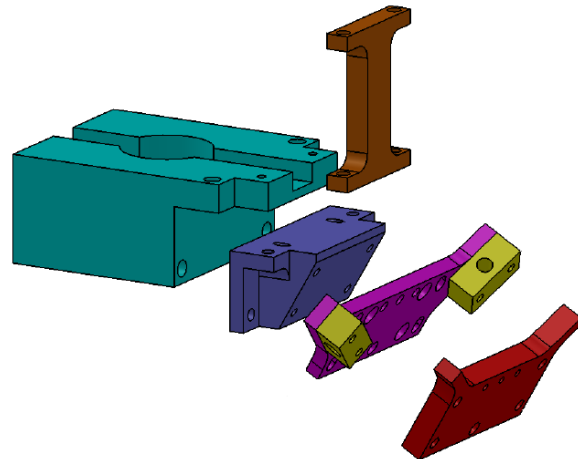
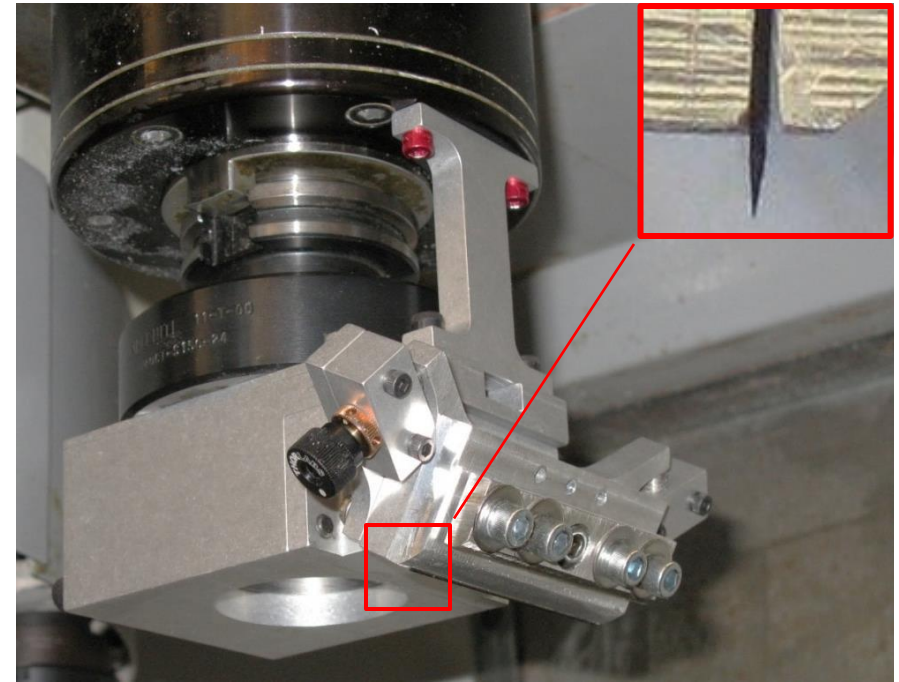


Adhesive Micromachining: Fixture

Designed fixture to hold micro-indenting tool in CNC machine

Created engineering drawings sent to commercial shops

Designed parts to fit correctly with tolerance stack-up



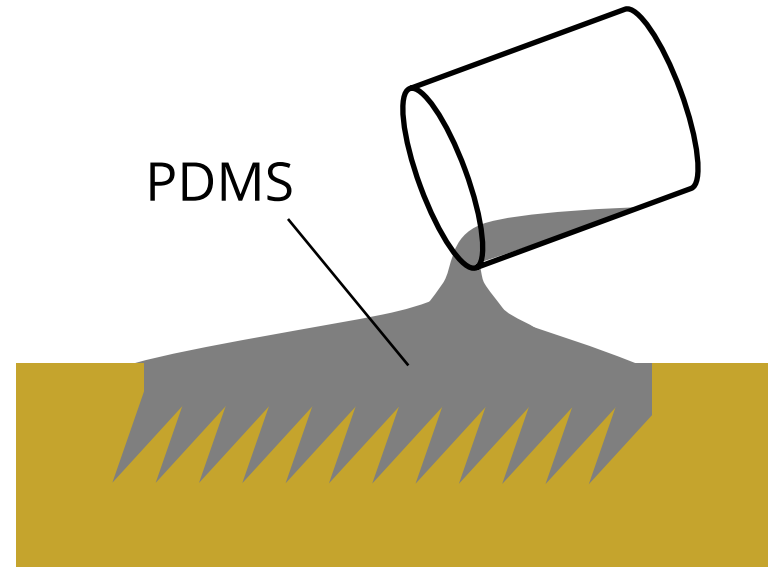
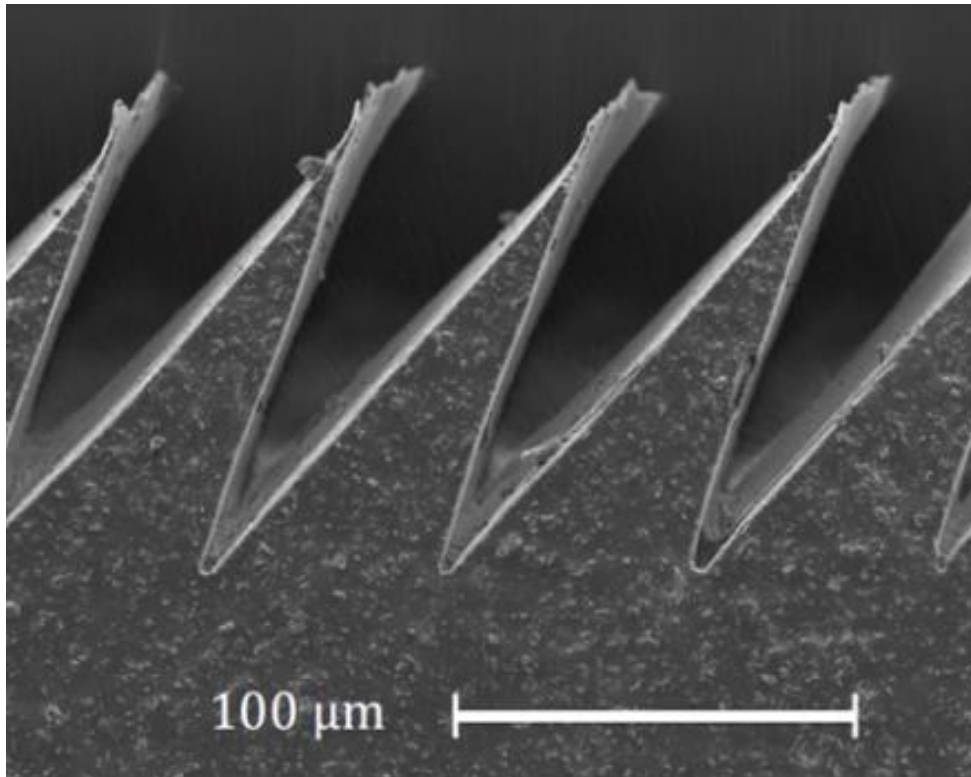
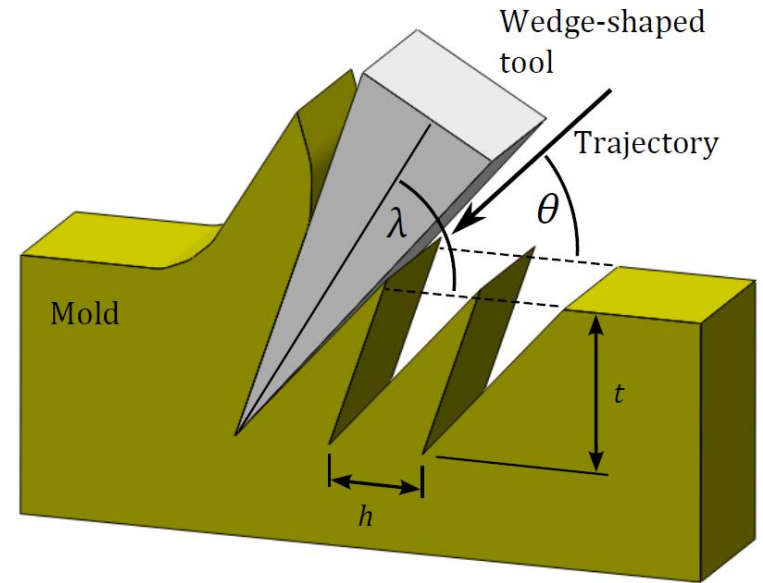
SolidWorks Student Edition.
For Academic Use Only.



Adhesive Micromachining: Process

Step 1: Drive micro-indenting tool into wax mold along specified trajectory

Step 2: Cast PDMS to form wedge-shaped adhesive microstructures





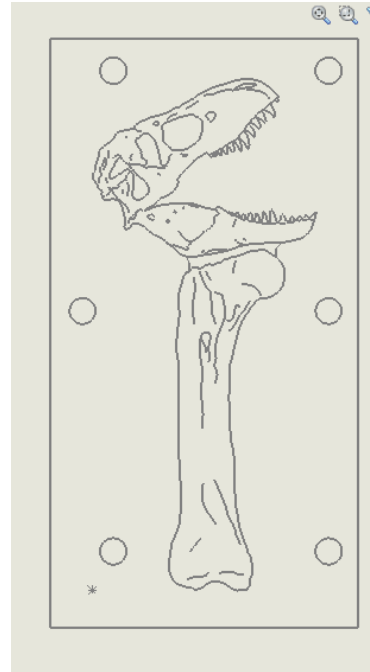
T-Rex Bottle Opener

Drawn in SolidWorks

Designed to open twist-off
and pry-off caps

CNC machined out of 1/4"
303 stainless steel

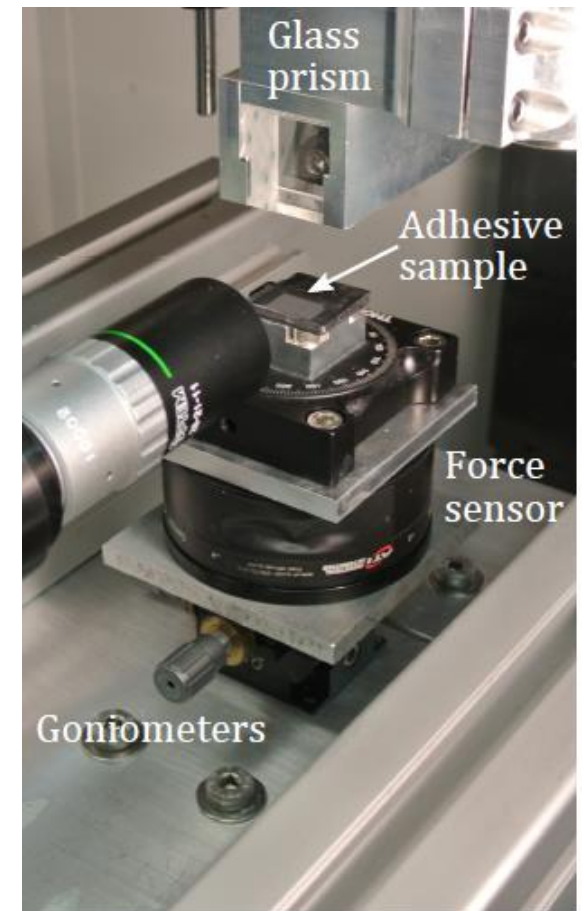
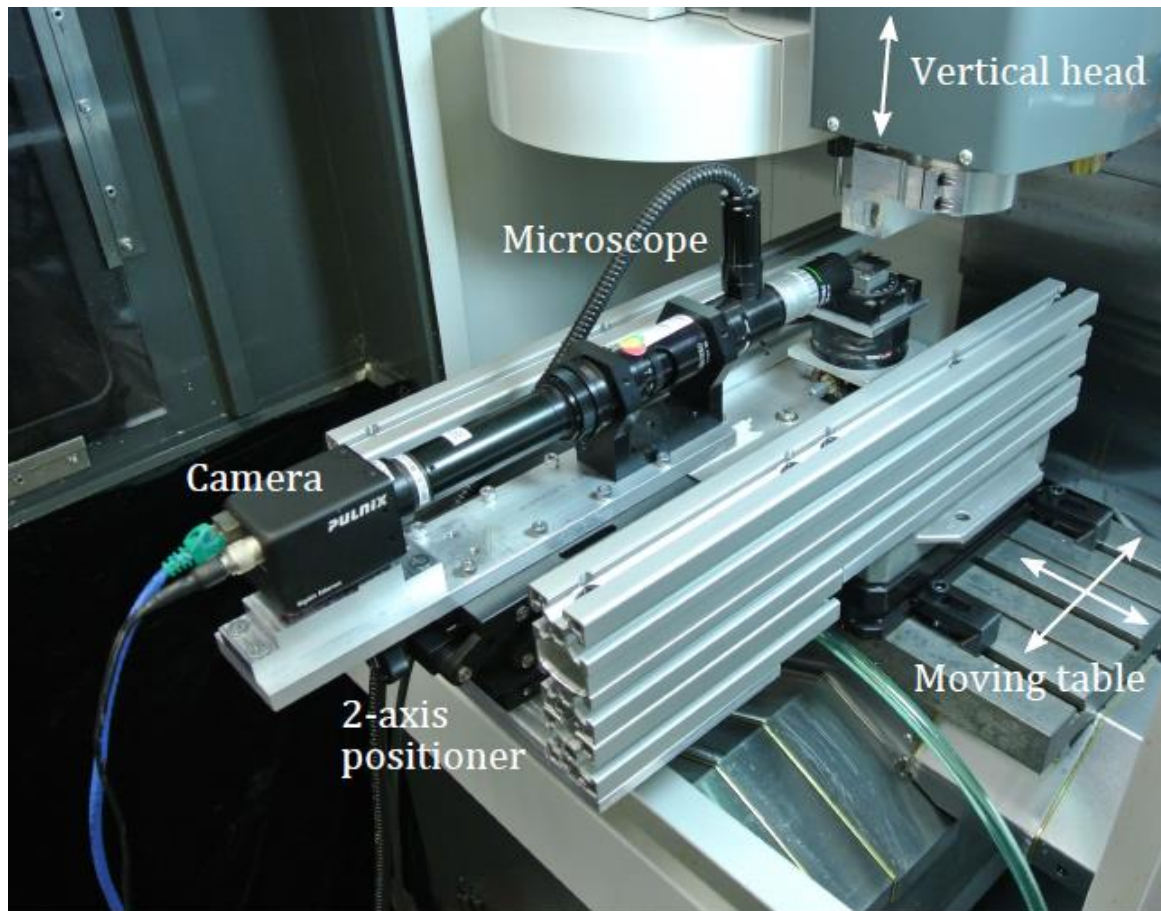
Prototypes made of
laser-cut acrylic to verify fit





Wedge Deformation: Microscope

Built microscope system into a CNC to measure deformation of adhesive wedges contacting a glass surface



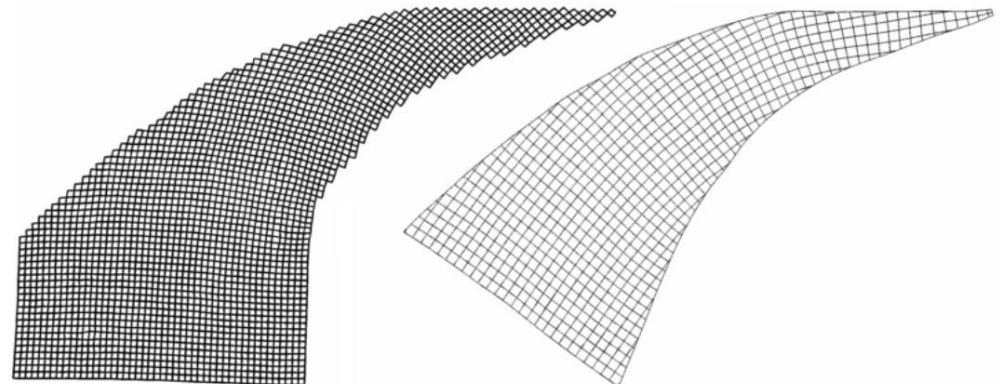
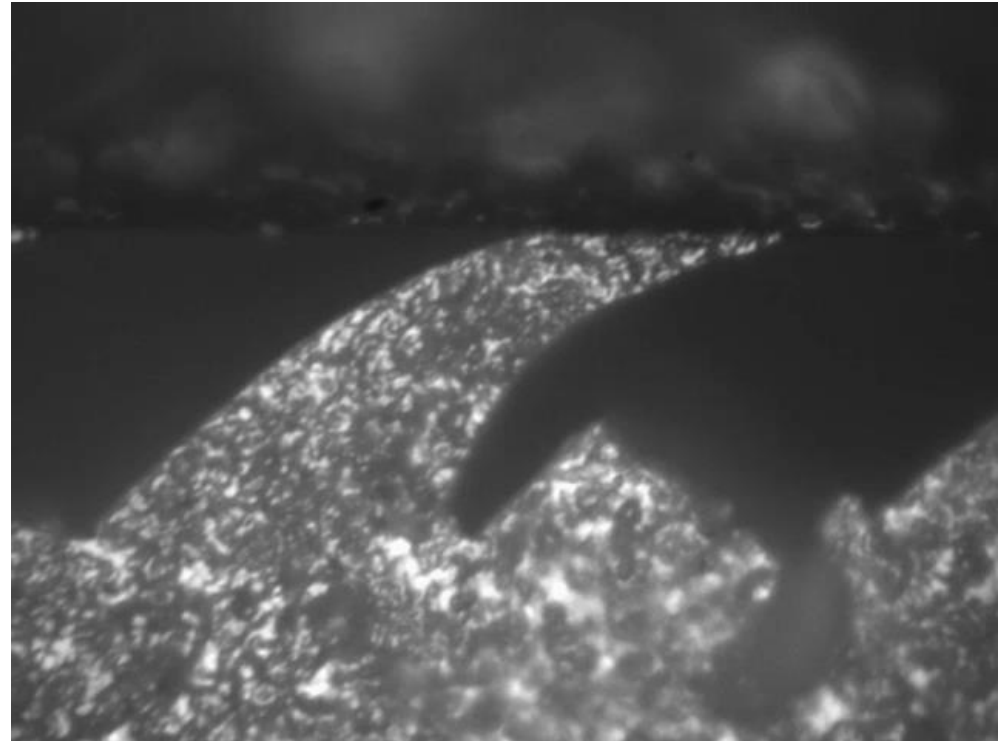


Wedge Deformation: Analysis

Recorded wedge deformation using high-speed camera

Analyzed camera images using custom MATLAB code

Measured displacements and strains within the wedge





Ring Project: Overview

Designed wedding ring for fiancée in SolidWorks

- Interlocked loops with heart silhouette
- Complex geometry with smooth curves
- Used SolidWorks surface modeling features (Boundary Surface, Surface Offset)

Machined out of wax with 4-axis CNC machine

Planned toolpaths to minimize workpiece deflection

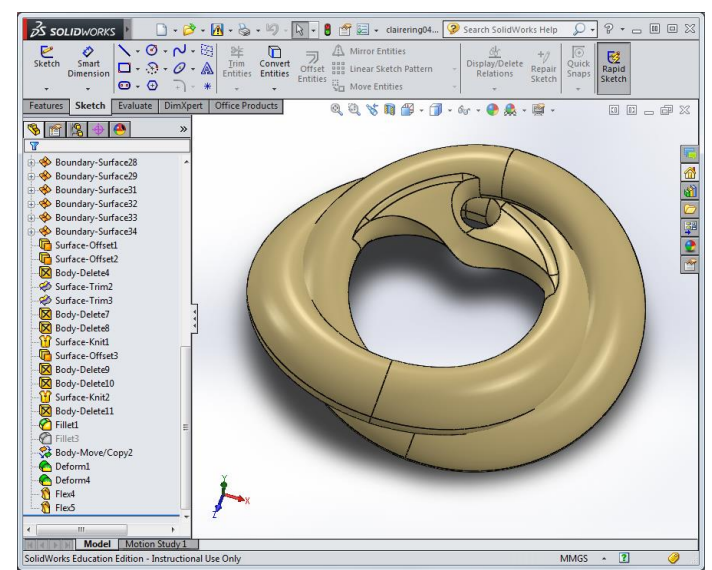
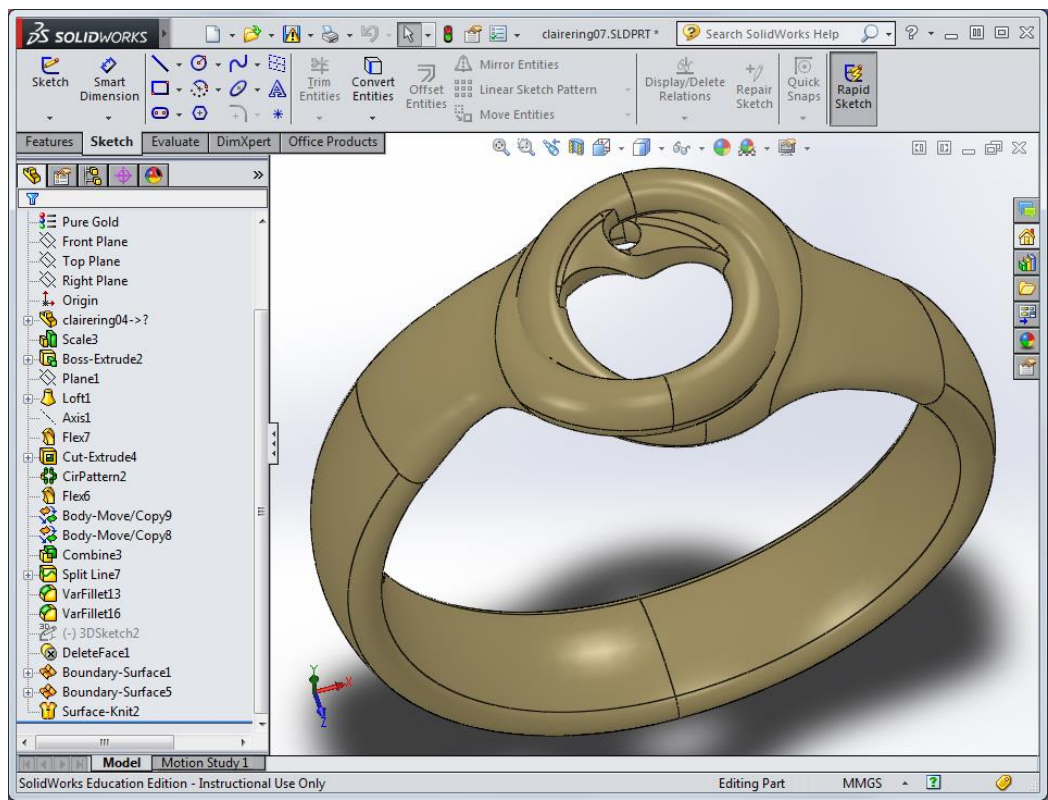
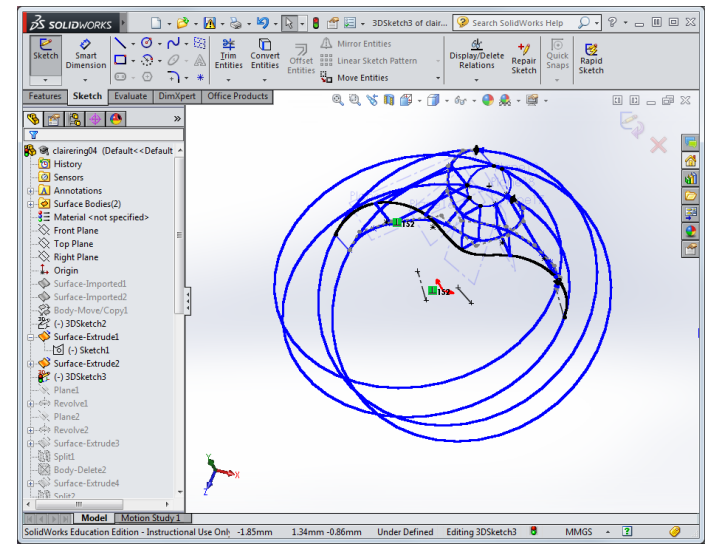




Ring Project: CAD

Guide curves defined using 3D sketch

Ring centerpiece smoothly attached to band using fillets and surface features





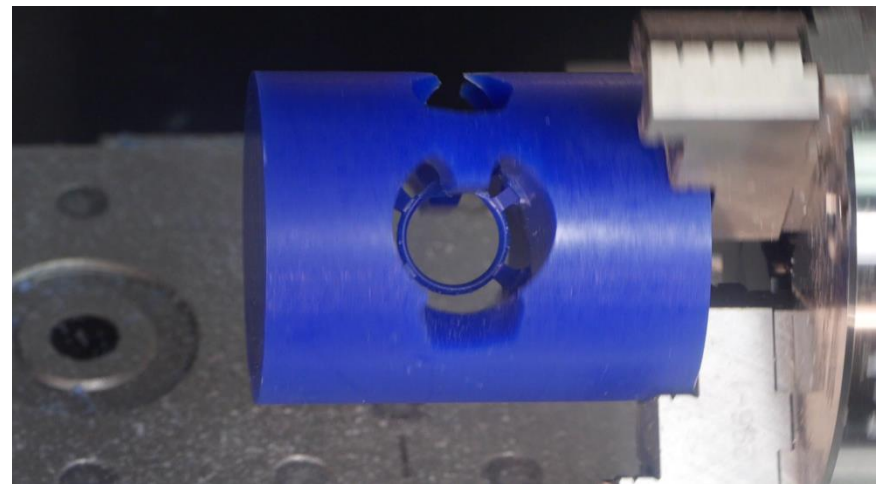
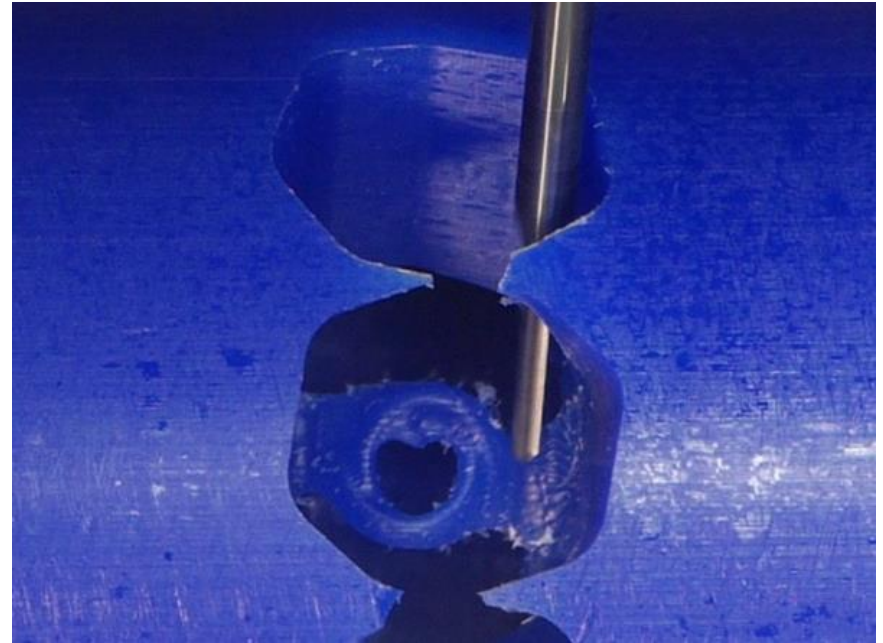
Ring Project: Fabrication

Ring machined on 4-axis CNC

Machining performed from
7 different angles

Centerpiece is machined before
band to minimize workpiece
deflection

Investment cast in 14 kt gold





BLINKY.SHOES Kickstarter Project

LED strips with accelerometers that are attached to shoes and react to steps

- Raised \$22,087 on Kickstarter (442%)
- Worked with global manufacturers for PCBs, LEDs, batteries, soft goods

Designed PCB layout using EAGLE

Prototyped hardware & software

