Plato Design Environment

plato

for crafting optimized designs

... a man need examine nothing but what is best and most excellent ...
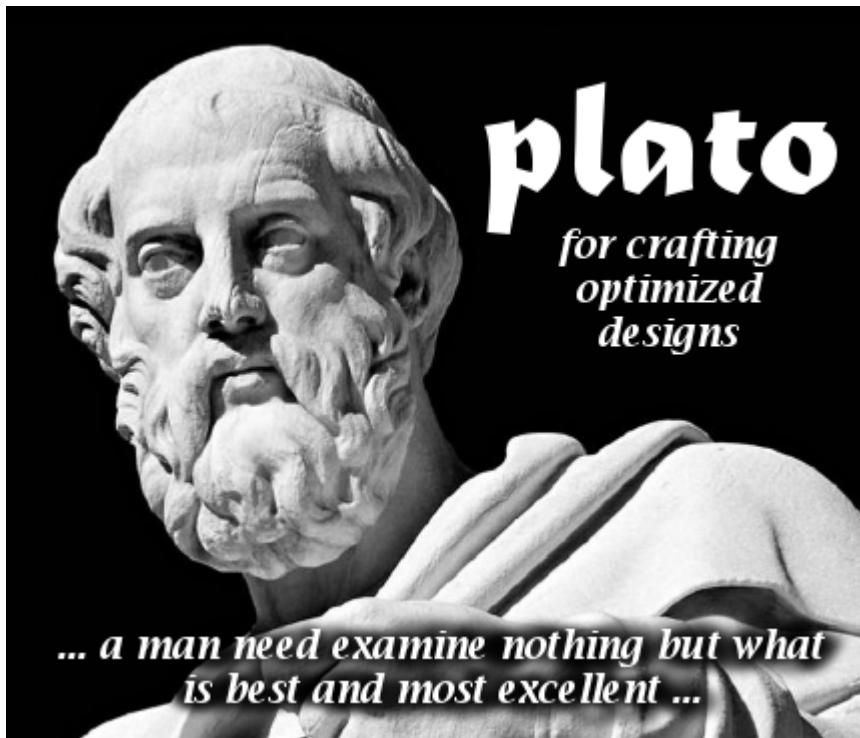
Additive Manufacturing IMOG at Y12
8/24/2016
Brett Clark

Plato 1.0

- Released end of May internally

- Sorting out final licensing for external gov. use
  - Visit **www.sandia.gov/plato3D** to sign up for a license

- Features
  - Volume constrained compliance minimization using Sandia's Sierra physics codes
  - Smooth, print-ready designs
  - HPC-enabled
  - Real-time emerging design feedback
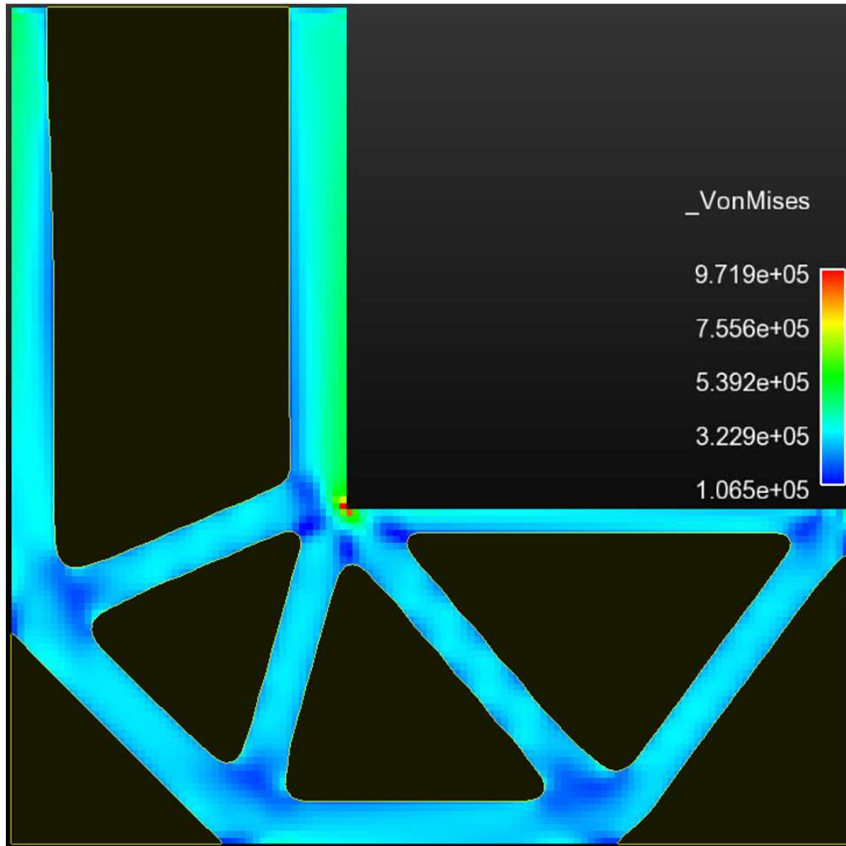 - Stop/restart capability
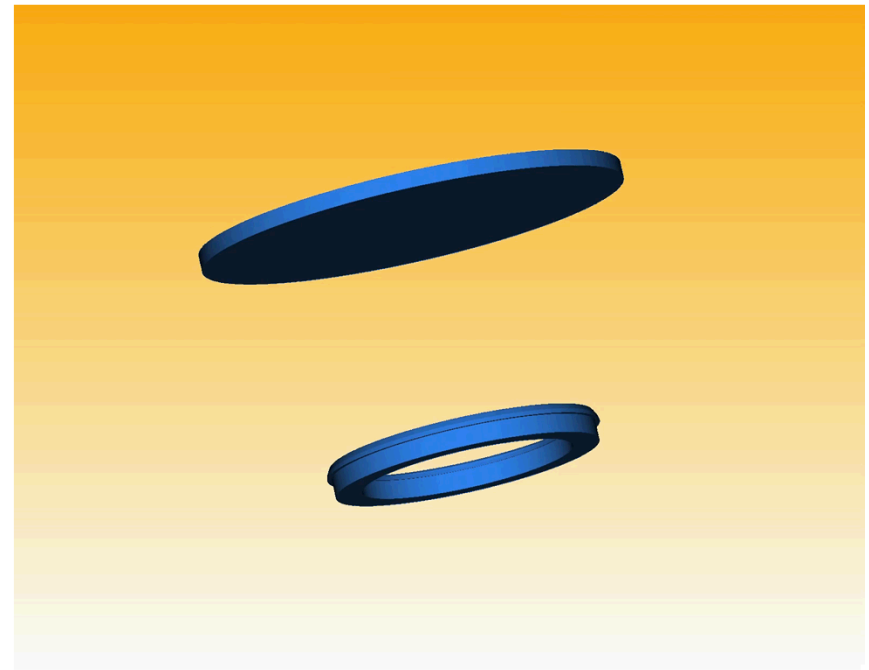
Next release

- October, 2016

- Features
  - Multi-load scenario support
  - Von Mises stress minimization
  - Auto mesh prune/refine on restart
  - Center of Gravity constrained compliance minimization
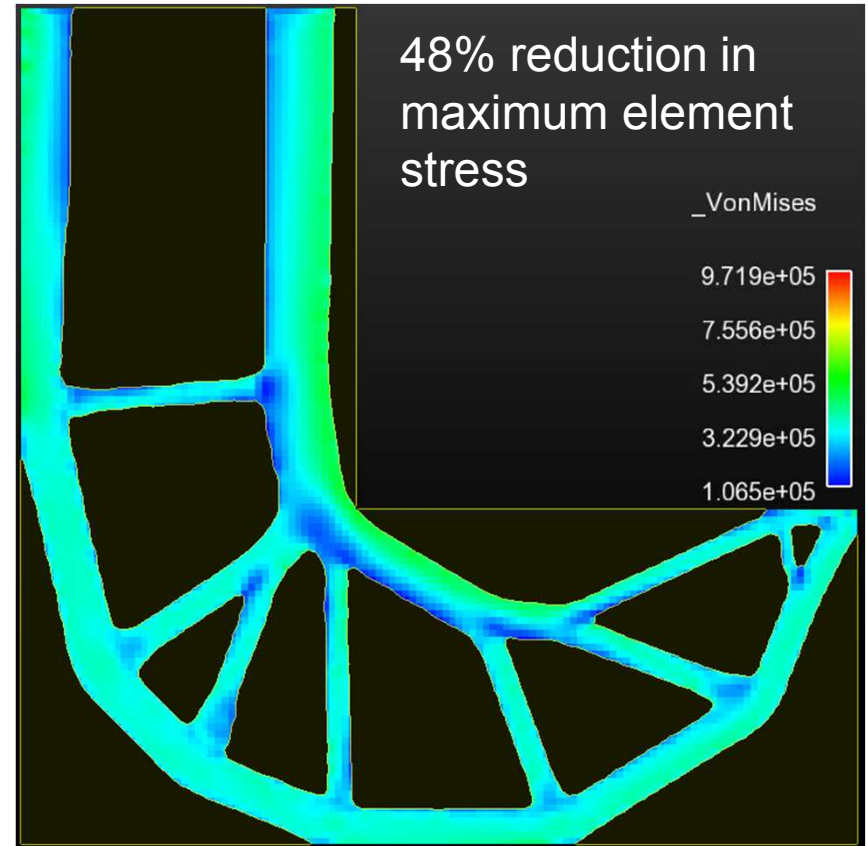 - Body loads

Multi-load

2 loads, 1 load case

2 loads, 2 load cases

+
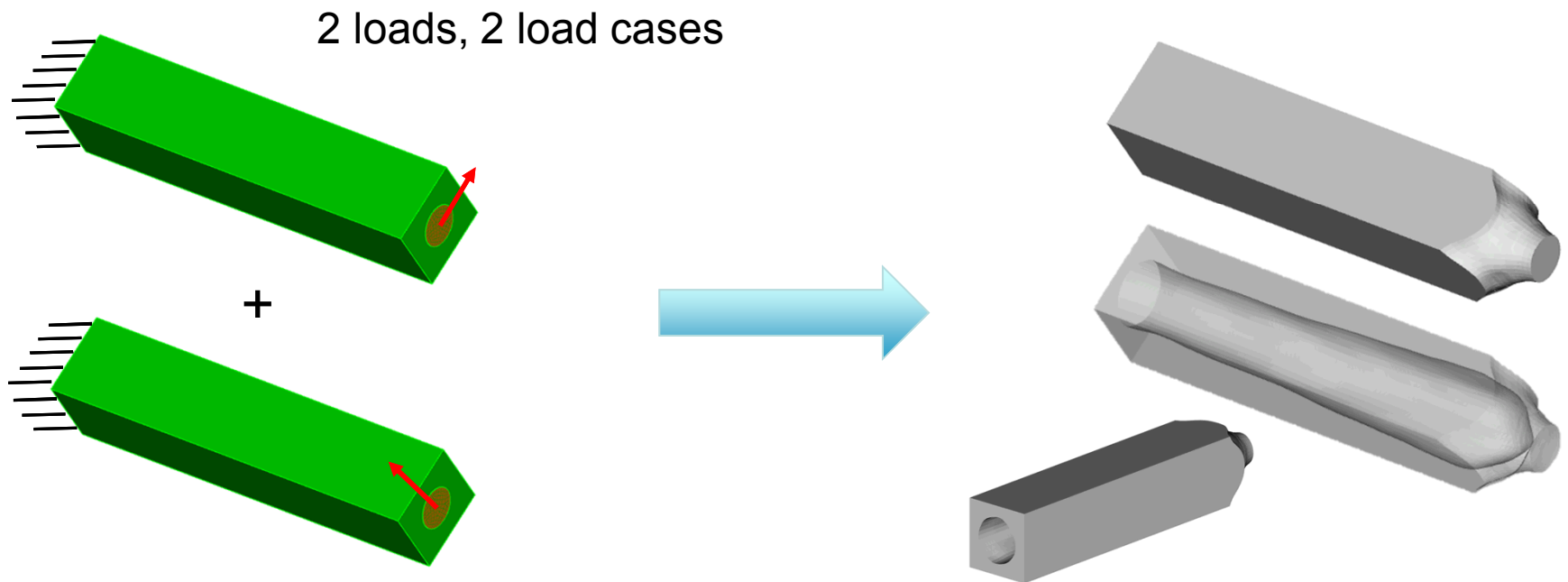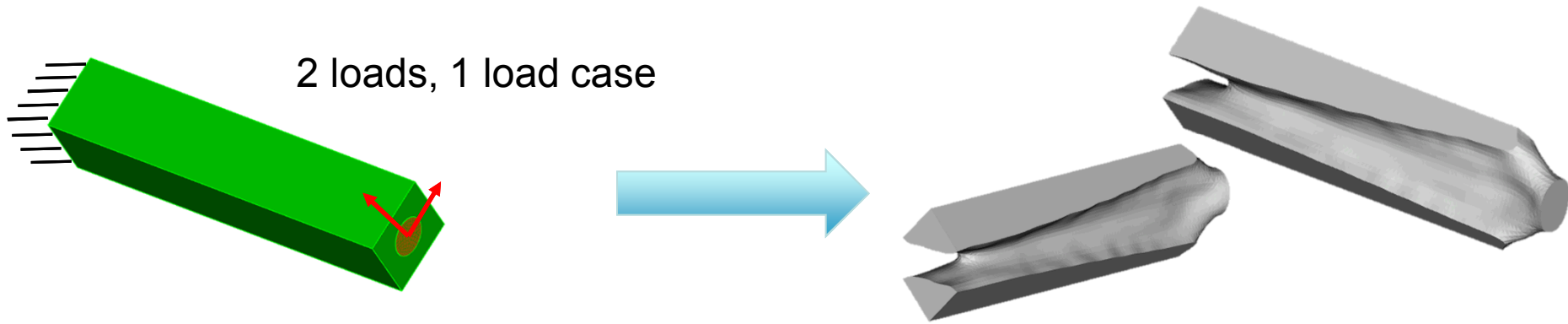
Stress Minimization

Compliance Minimization
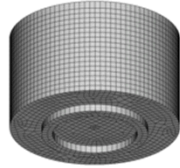
Stress Minimization

48% reduction in maximum element stress

Both images are colored by their element's Von Mises stress

Auto prune/refine
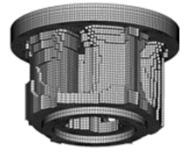

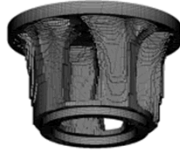Initial Mesh

Result from run #1

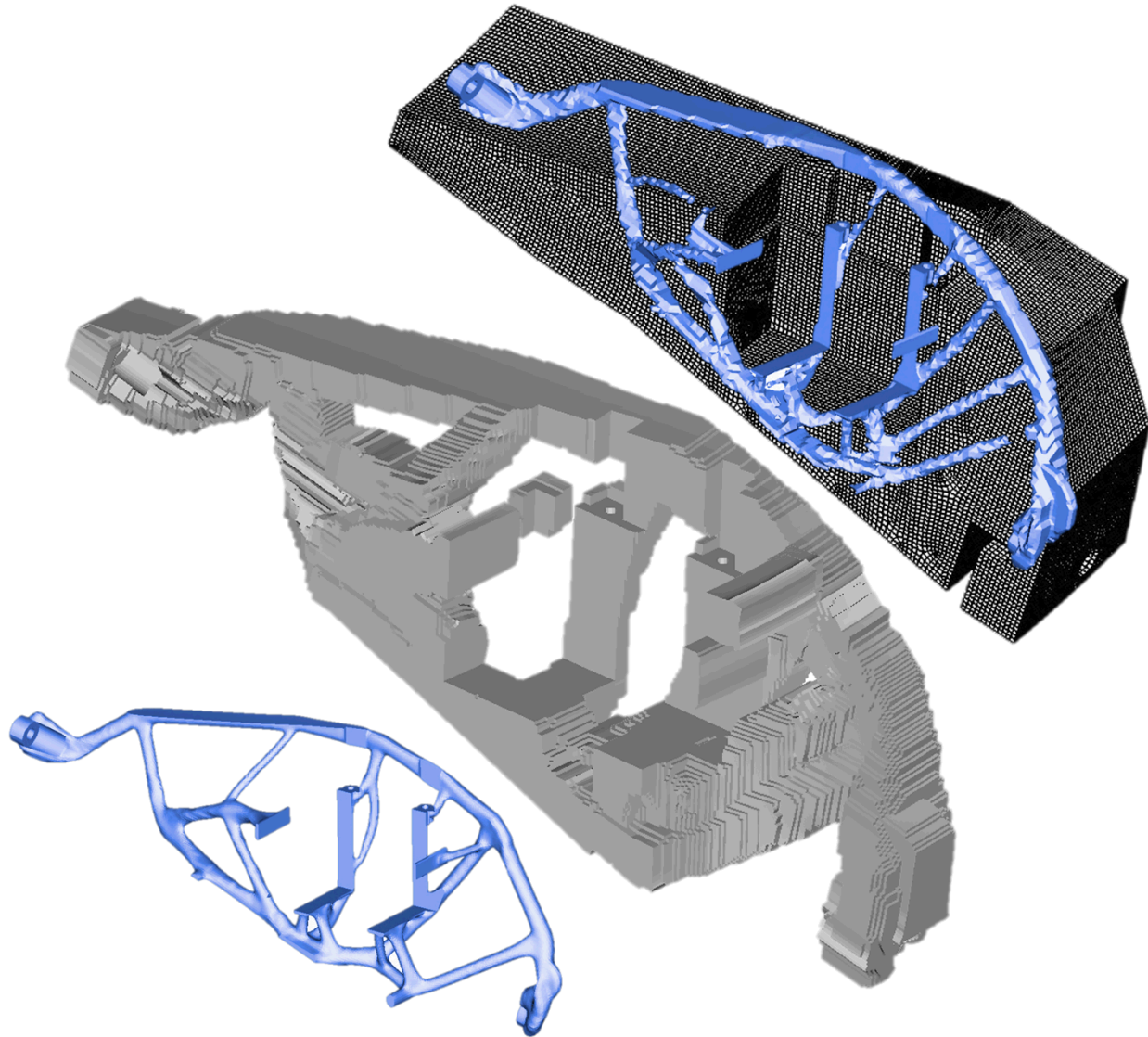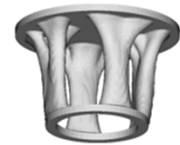Pruned mesh using result from run #1 with one level of refinement.

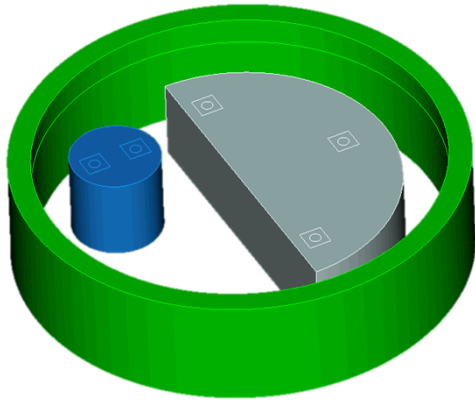Result from run #2 using pruned and refined mesh #1.
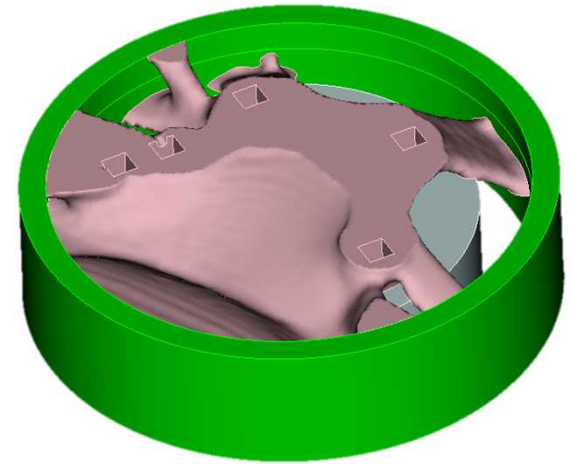
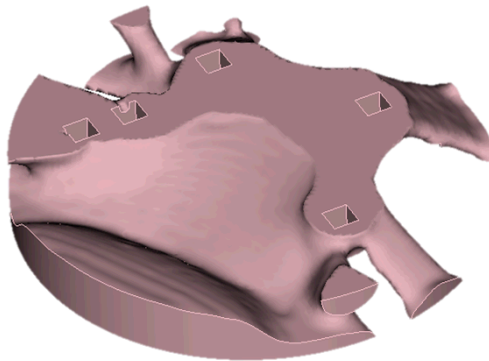Pruned mesh using result from run #2 with two levels of refinement.

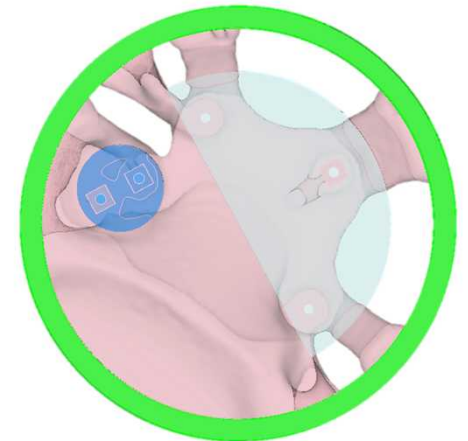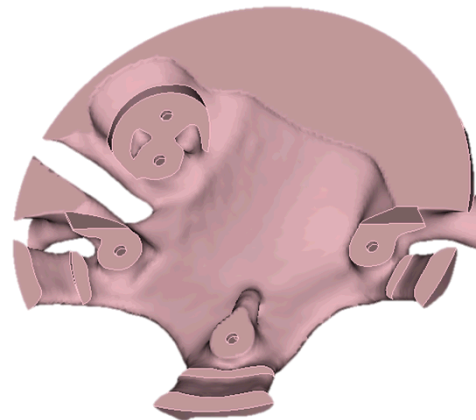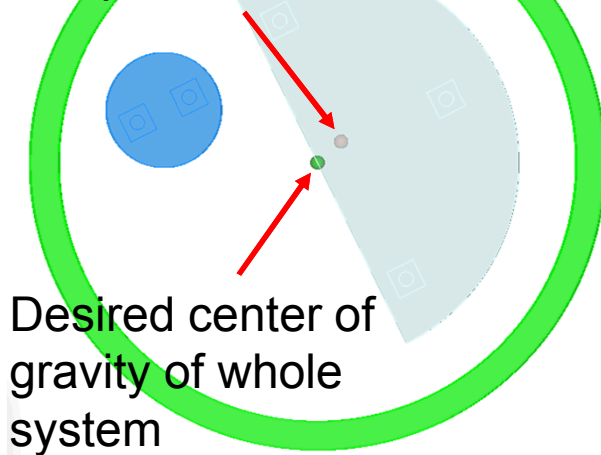Result from run #3 using pruned and refined mesh #2.
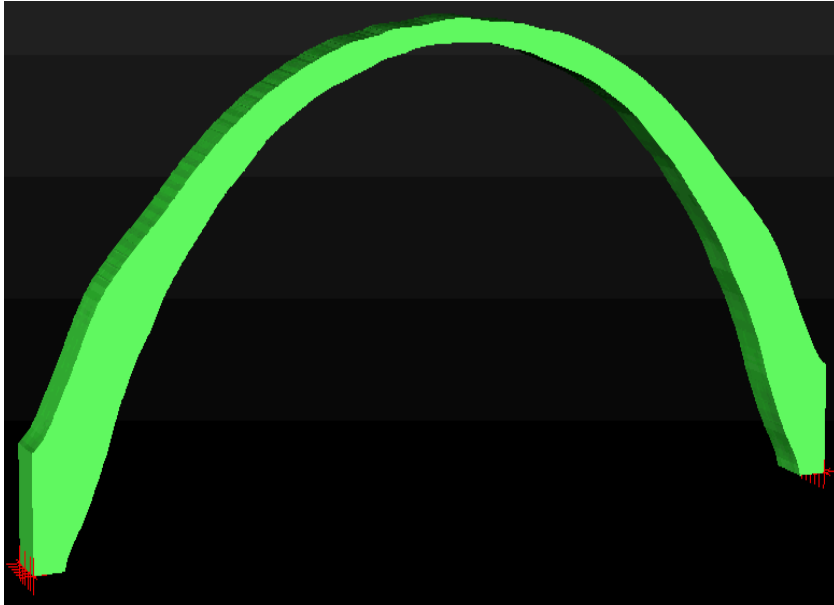
Center of Gravity Constraint

Goal: Design a bracket to secure the components and also move the center of gravity to the desired location

Center of gravity of 3 components

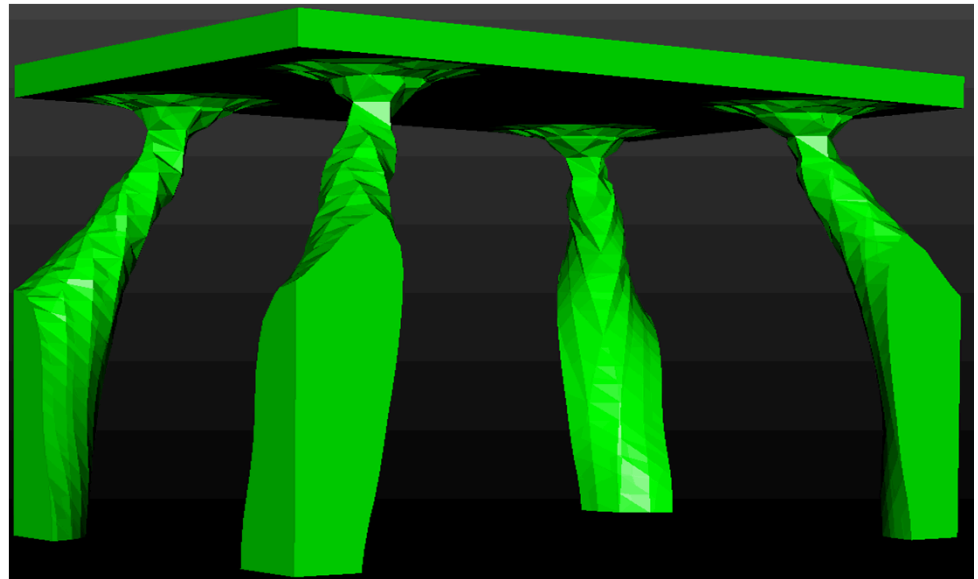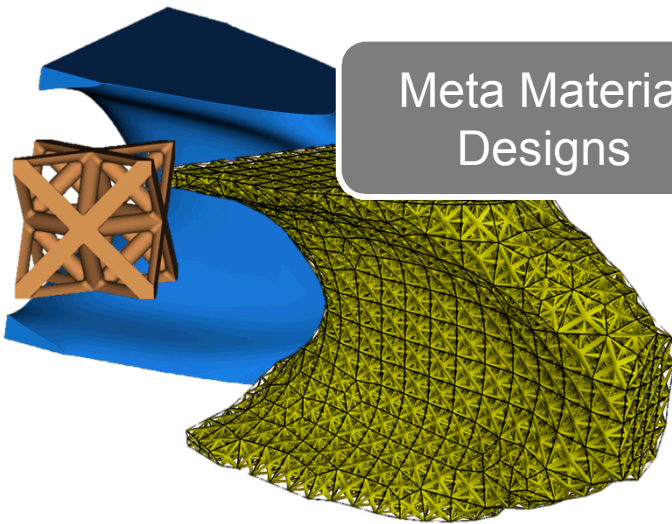Desired center of gravity of whole system

Body Loads

Arch starting from rectangular domain with fixed boundary conditions at two lower corners undergoing a vertical gravity load.
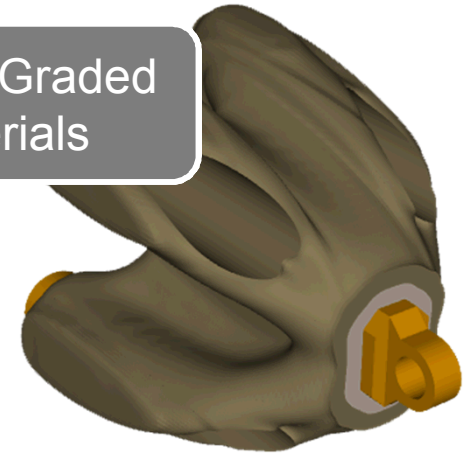

Table problem with fixed table top, cube-shaped optimizable domain, and fixed boundary conditions at leg bases undergoing a gravity load.
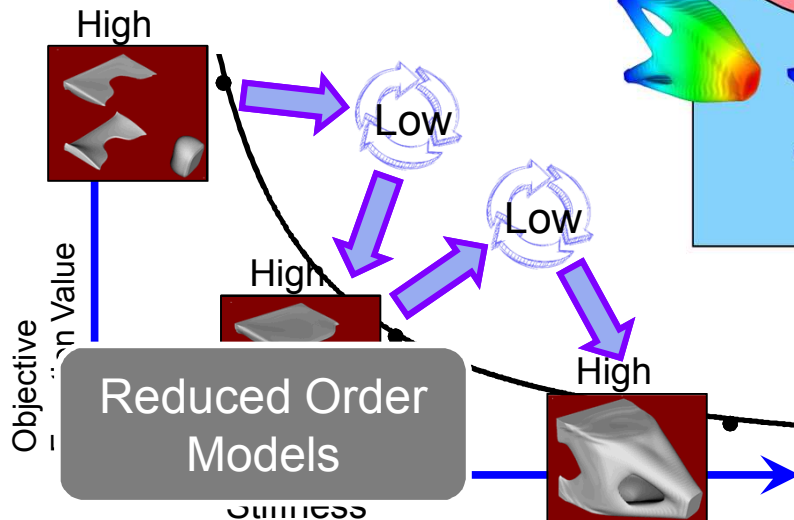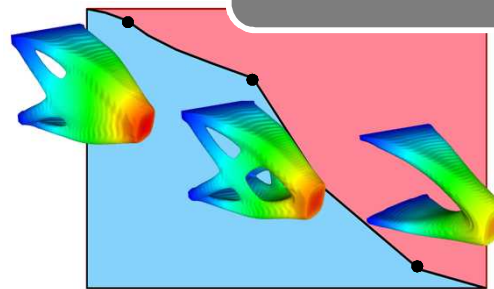
Other Research

Meta Material Designs

Mixed / Graded Materials

Pareto Space Tradeoffs

Random Strain Uncertainties

Reduced Order Models

High

Low

Low

High

High

High

Objective Value

Stiffness