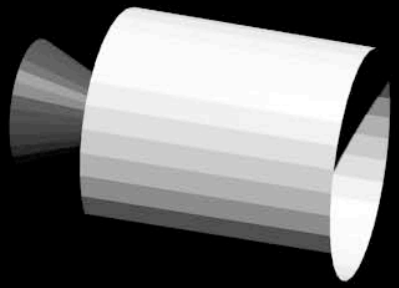
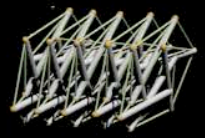
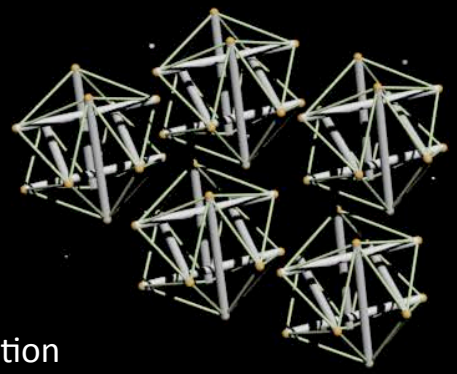
Tensegrity Robots for Space Exploration





Adrian Agogino



BEST REUNION SATURDAY
August 08, 2015

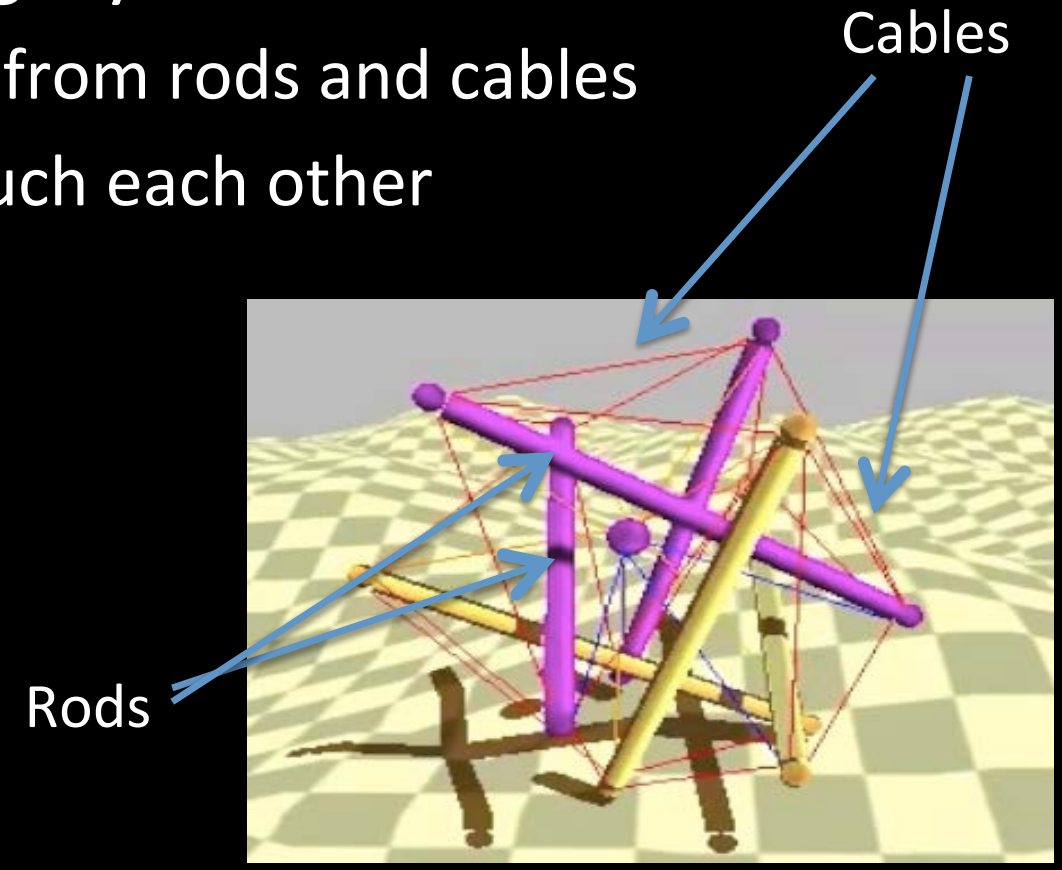
NASA Early Stage Innovation

Multiuse Planetary Rover

- Platform for all three mission aspects
  - Deployment
  - Landing
  - Exploration

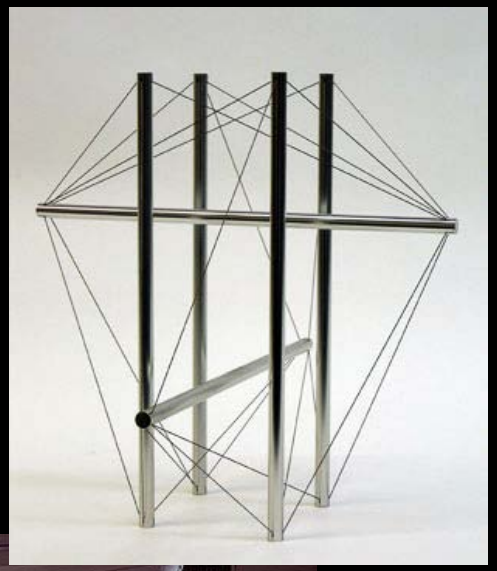
Robot Built from Tensegrity Structures

- What is a tensegrity structure?
  - Structure build from rods and cables
  - Rods do not touch each other

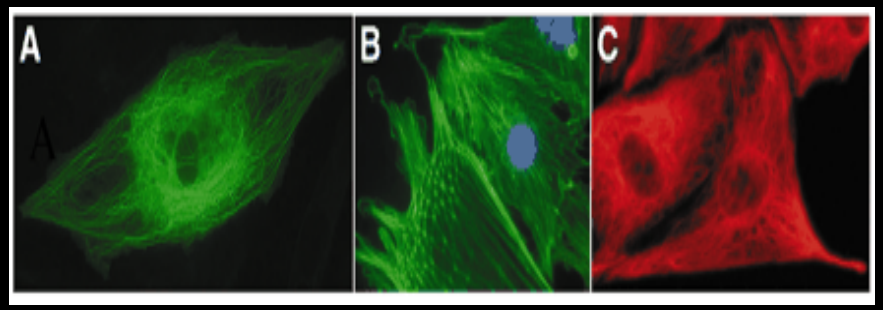


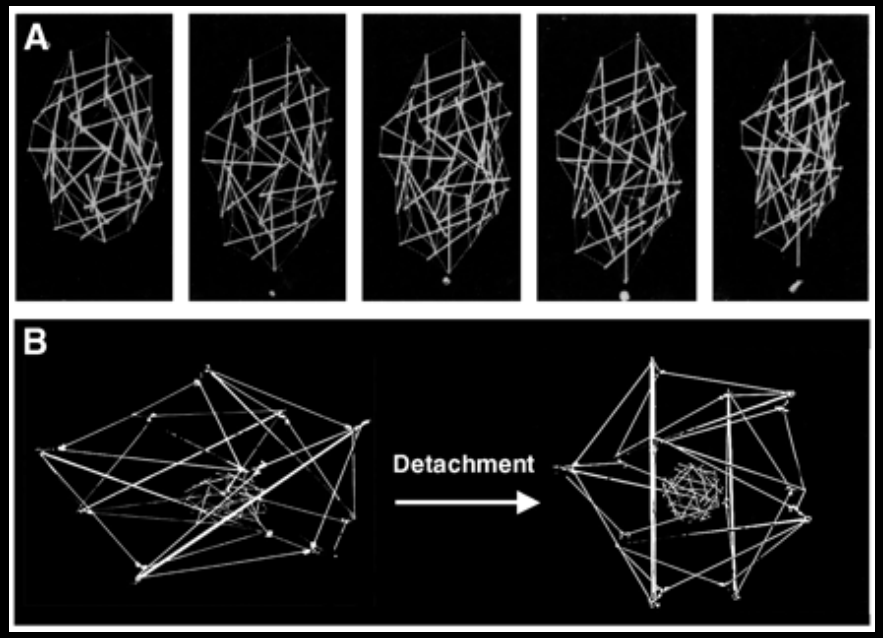
Tensegrity

- First explored by Kennith Snelson in 1960's



Tensegrity and Biology





Dr. Donald Ingber, Harvard U.

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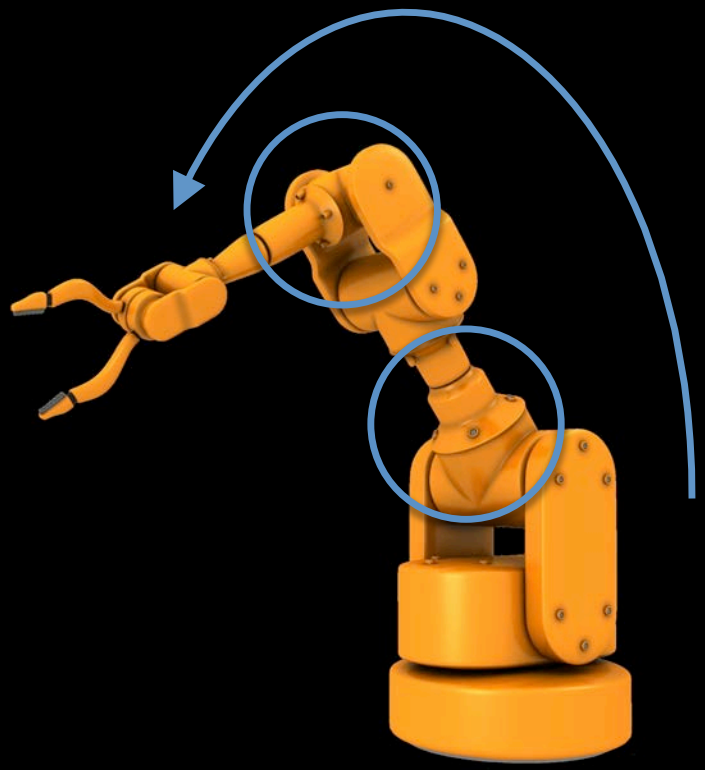
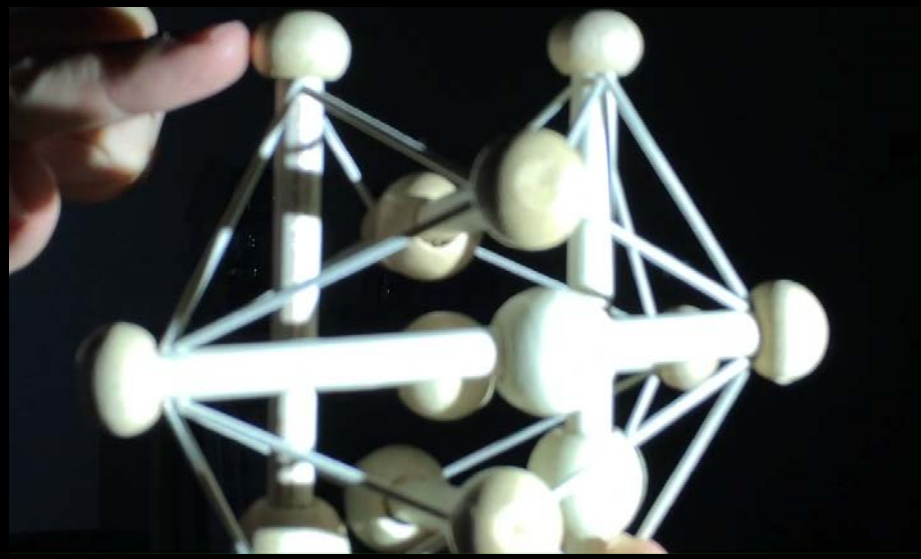
No Lever Arms

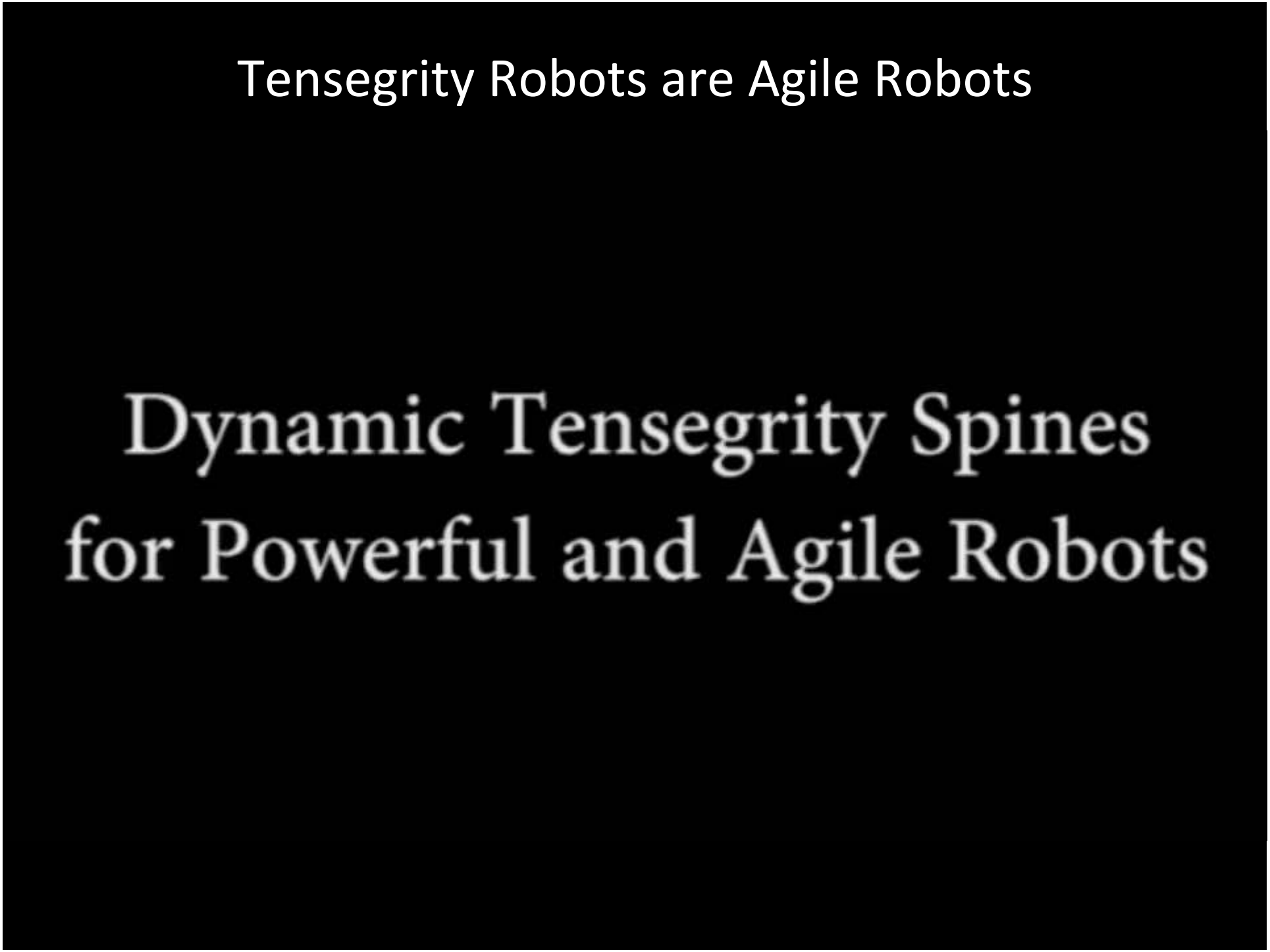
Forces Amplify



Forces Distribute



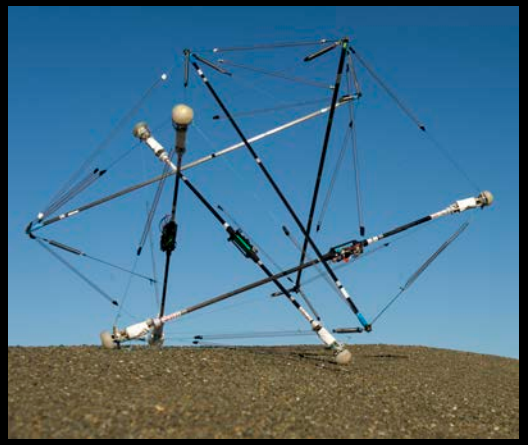
Tensegrity Robots are Agile Robots



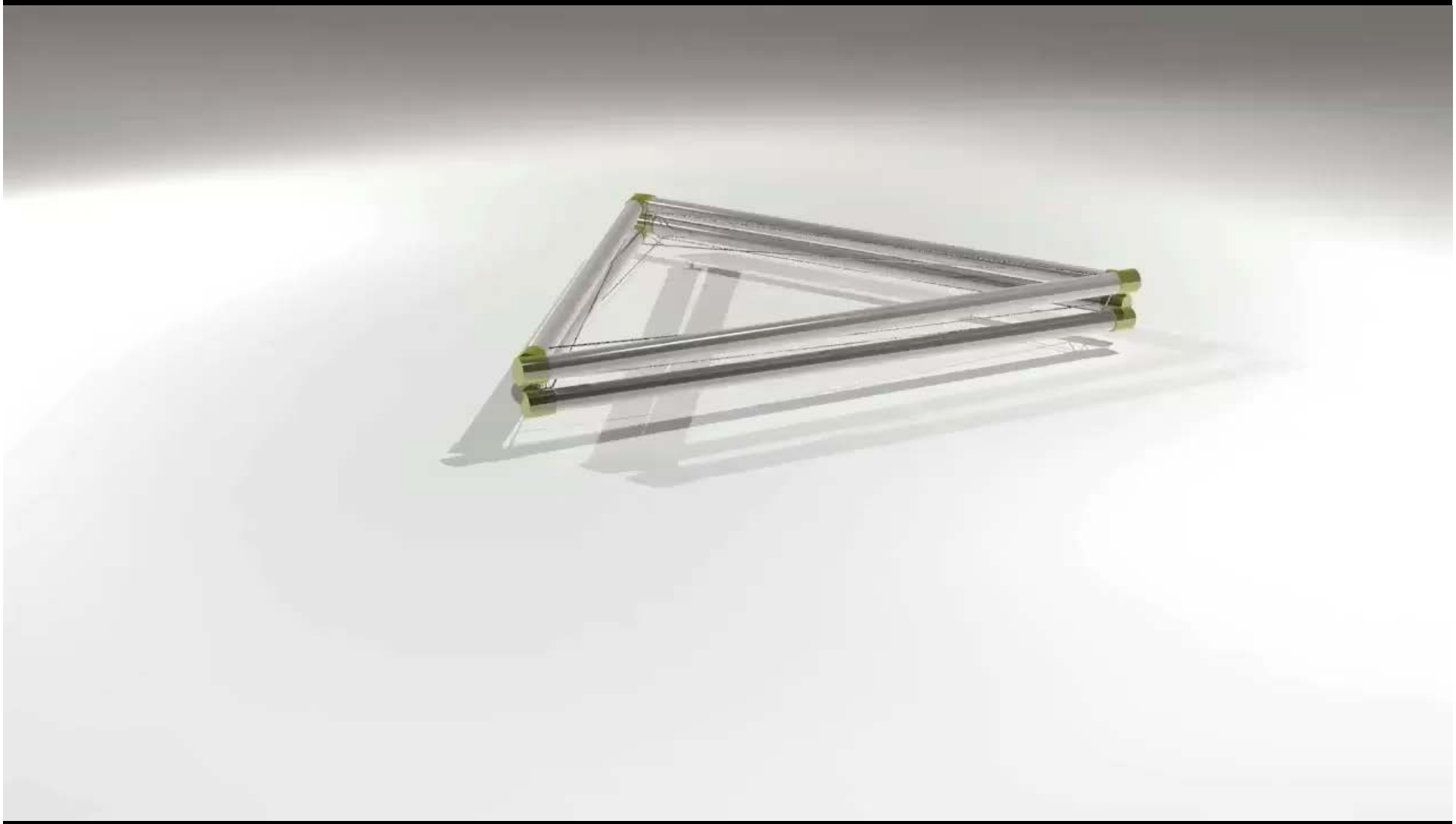
Robot in Action

NASA Mission

- Design for:
  - Deployment
  - Landing
  - Exploration



Multi-Function: Unpacking, Landing, & Mobility



Drop Test

Robustness

Super Ball Prototype

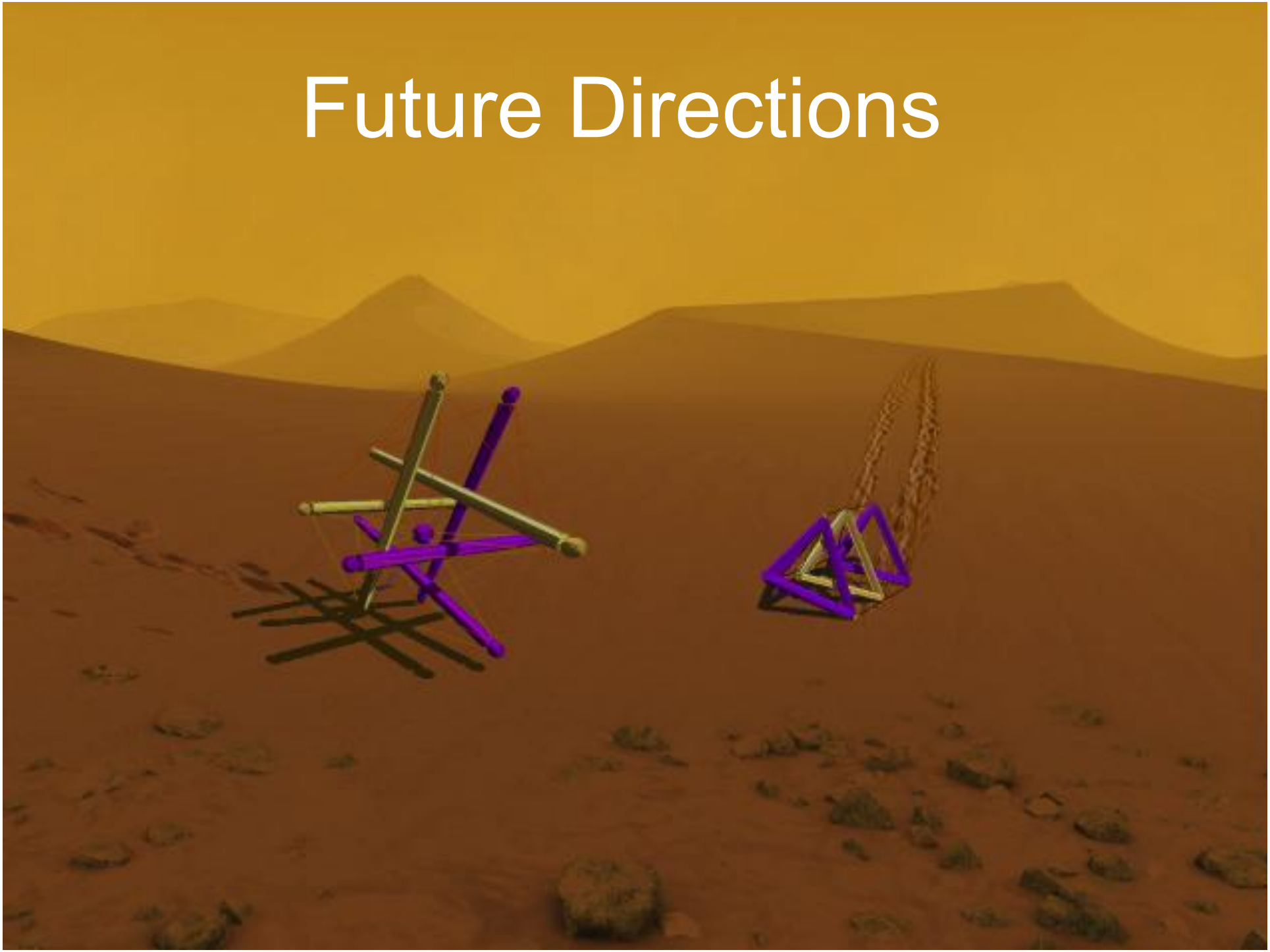
Tensioning

Drop Test

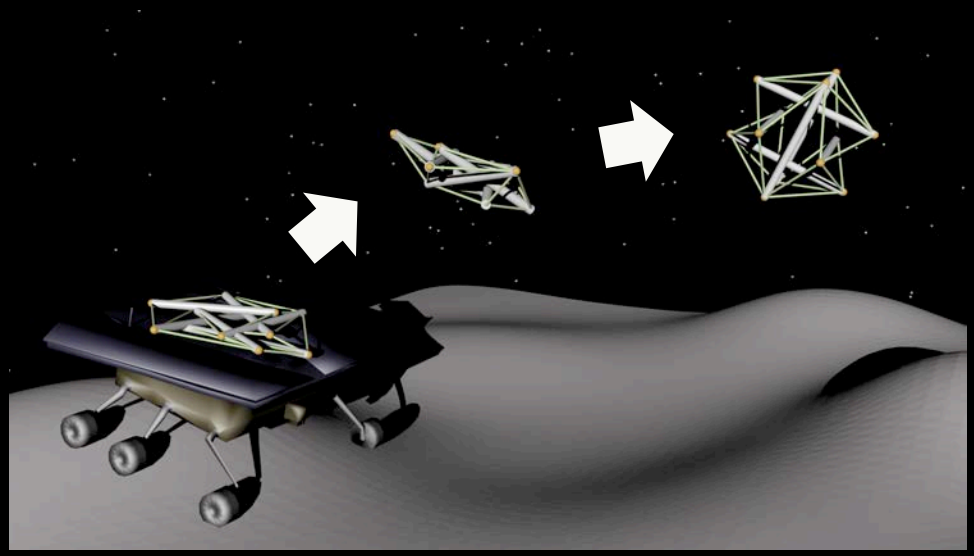
Roll

Super Ball Prototype

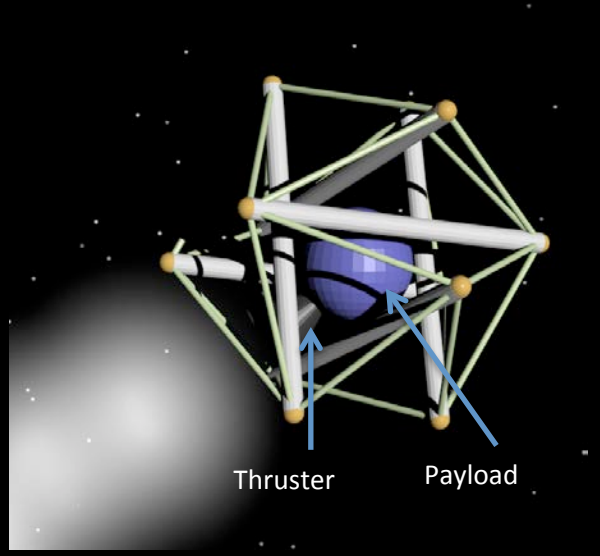
Future Directions



Lunar Scouting Robot



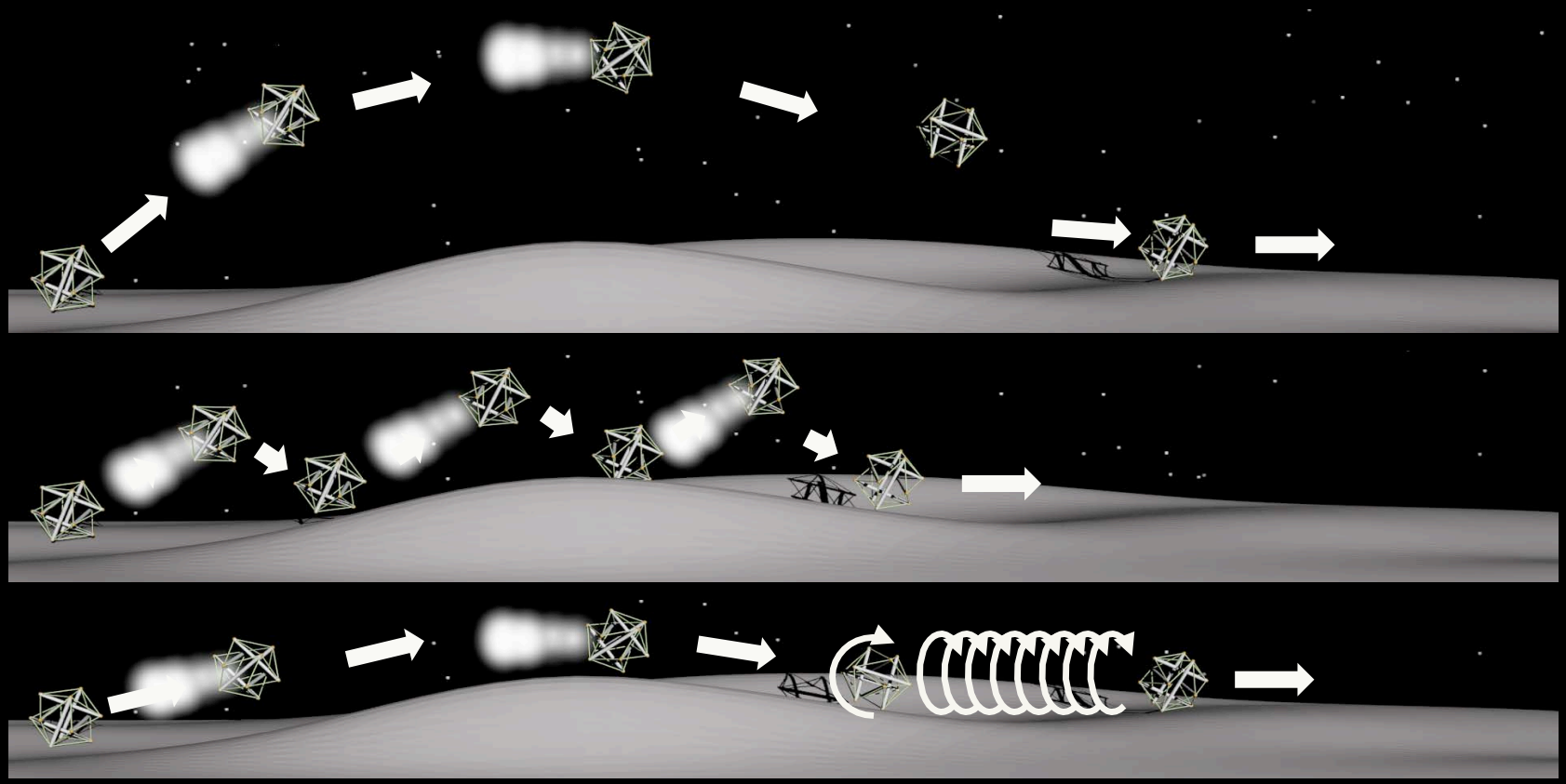
Eject from main rover



Use rockets for large movements

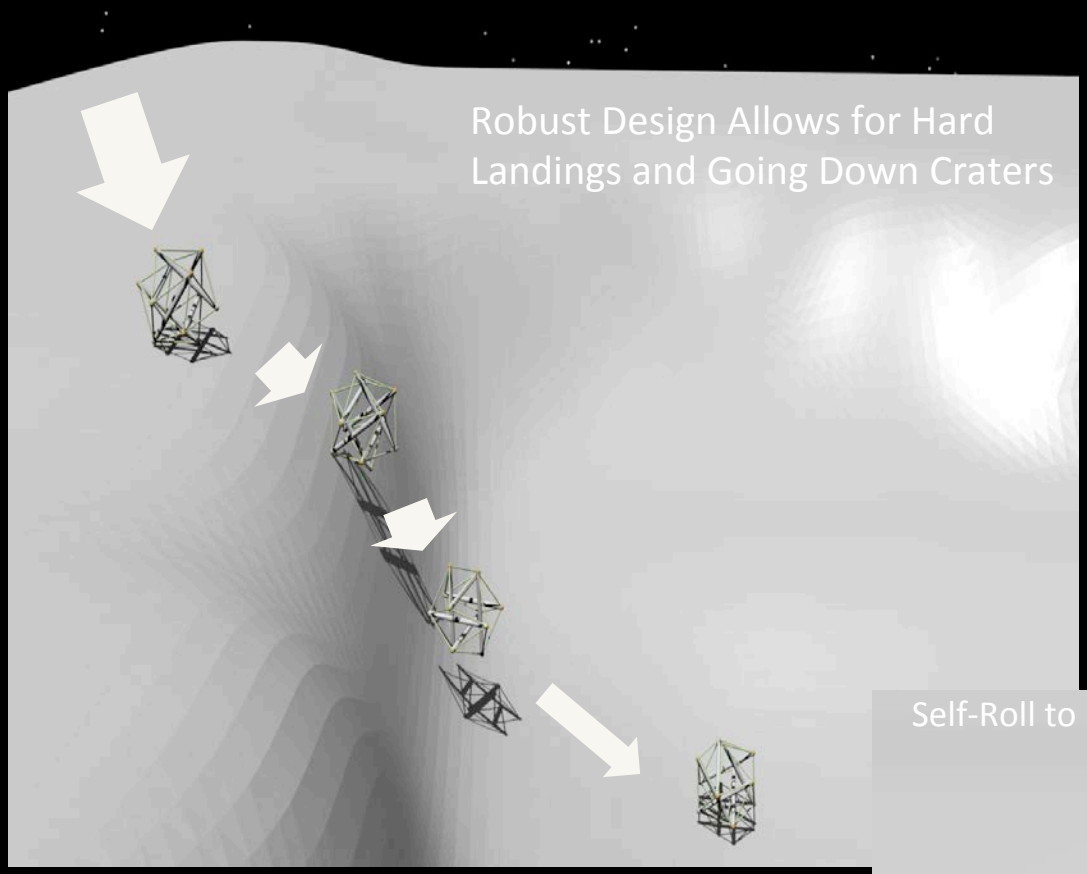
(NASA Early Stage Innovation Program)

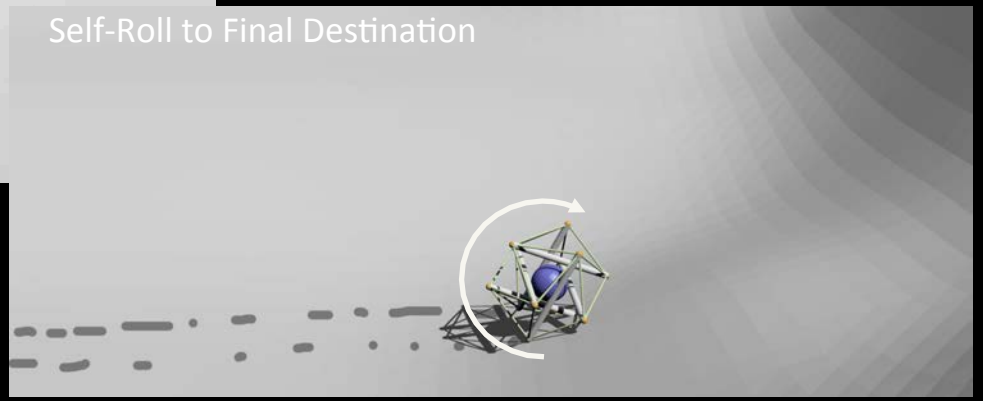
Lunar Scouting Robot



Hop close to destination
Many hopping profiles possible

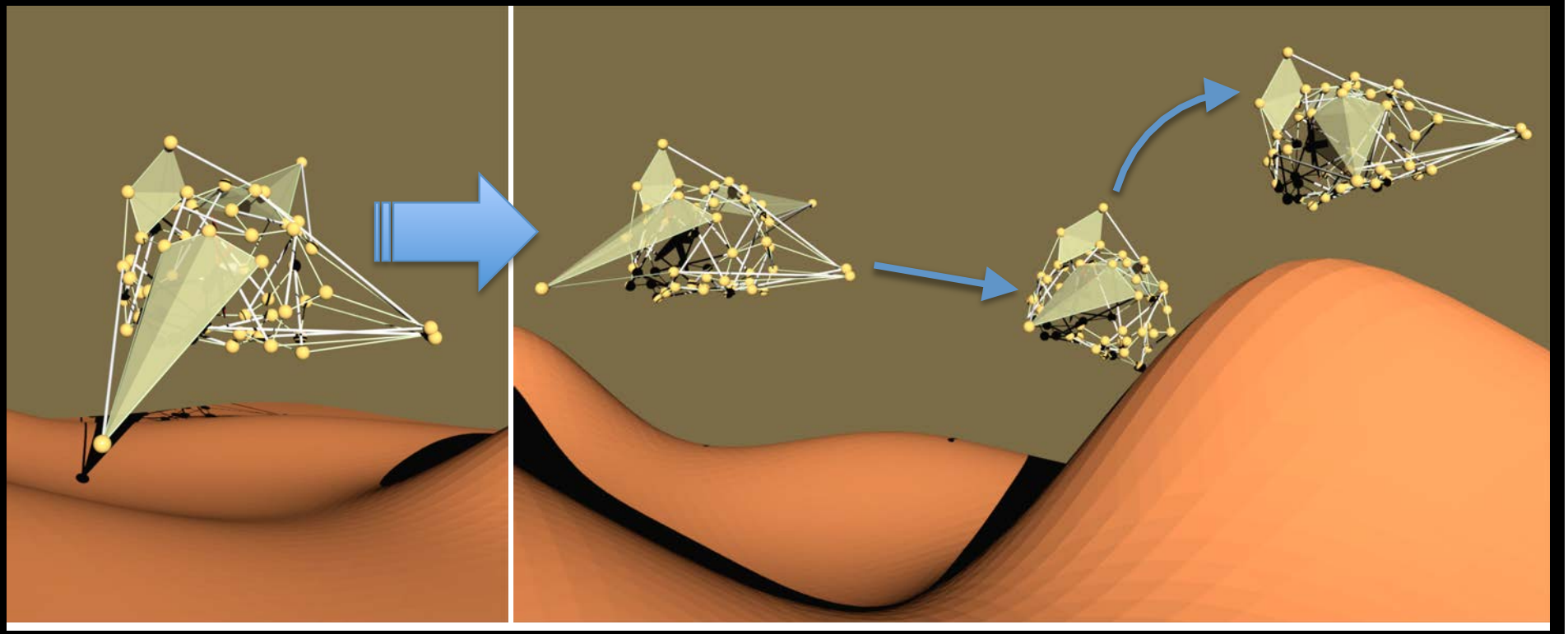
Lunar Scouting Robot



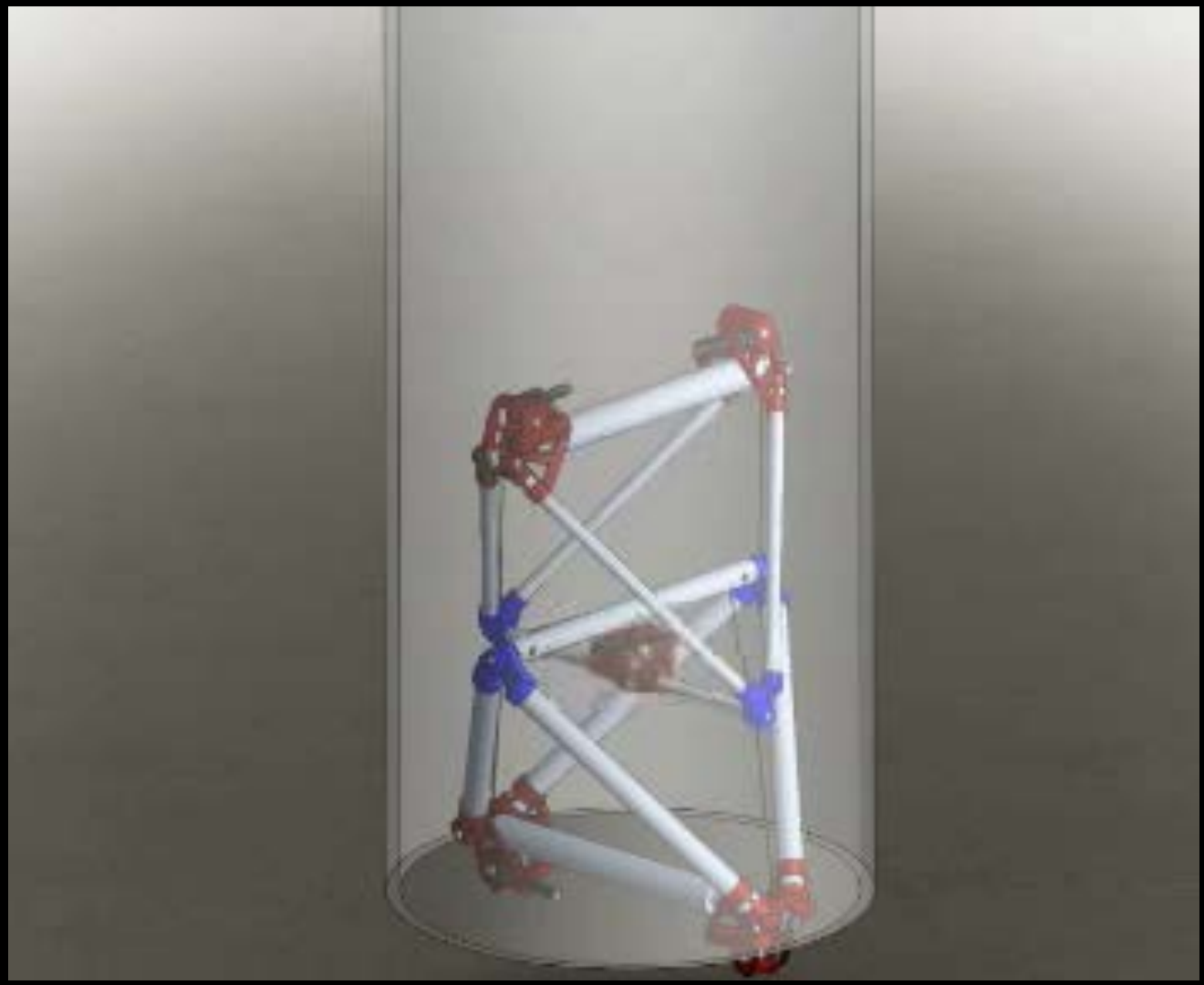


UAV dropped Analog Demonstration

SUPERBall Bird – Crash Proof Flight



Duct Climbing and Compliant Joints



Dynamic Tensegrity Team