

# Preliminary Report: LION STALKING DEVICE

Group 22:

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BME 401

# OUTLINE

- The Need
- The Project Scope
- Background
- Design Specifications
- Existing Solutions/Patents
- Preliminary Analysis
- Design Schedule
- Team Responsibilities

# THE NEED

- Stalking behavior is an important component of a lion's natural lifestyle
- Difficult to encourage in captivity
- Negative consequences:
  - Obesity
- St. Louis Zoo
  - Laser pointers
- Prevent stereotypic behavior
  - Pacing or excessive licking

# PROJECT SCOPE

- Design a device that promotes stalking behavior
  - Actions: Chase, pounce or bite

# BACKGROUND: *General*

- Social cats
- Prides consist of an alpha male
- Active for 4 hours of the day
- Most active at dawn/dusk
- Dry savanna

# BACKGROUND: *Hunting*

- Lions are not fast runners
- Prefer ungulates (hoofed mammals)
- Rely on the sense of sight when hunting
  - Smelling and hearing assists
- Gender-specific hunting tactics:
  - Females prefer a cooperative approach
  - Males prefer an independent approach
- Tactic influenced by prey size

# BACKGROUND: *Device Preference?*

- Gender-specific hunting tactics → Gender-specific device preferences
- Houston Zoo Carnivore Unit
  - Preference based on personality

# DESIGN SPECIFICATIONS

- Elicit stalking behavior
- No adverse effects on health
- Compatible with the St. Louis Zoo's habitat
  - Rocky, hilly and grassy terrain
- Entices the lions without scaring them
  - Appearance or scent
- Humans do not need to be in the habitat
- Maximum Dimensions: 1.22 m x 0.61 m x 0.61 m  
(4 ft x 2 ft x 2 ft)
- Made of approved materials
- Lifetime of the device lasts for at least a day



# Approved Materials

Materials/ Items		Scents
Boomer Balls (Greater than bowling ball size)	Cardboard Boxes	Vanilla Extract
Kegs	Masking Tape	Lemon Extract
Pine Cones	Empty Grain Bags	Peppermint Extract
PVC	Large Wooden Spools	Perfumes
Zoo-made Pinatas	Antlers	Catnip
Shredded Paper	Plastic Buckets	Spices

Table 1. Various approved materials at the Houston Zoo

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# EXISTING SOLUTIONS: Zip-line

- Zip-line with food attached



Limitation: The device needs to be reset after each use and could lead to overfeeding

# EXISTING SOLUTIONS: Prey Dummy

- Prey Dummy made of approved materials



Limitation: The device doesn't move and may not entice the lion for a long period of time

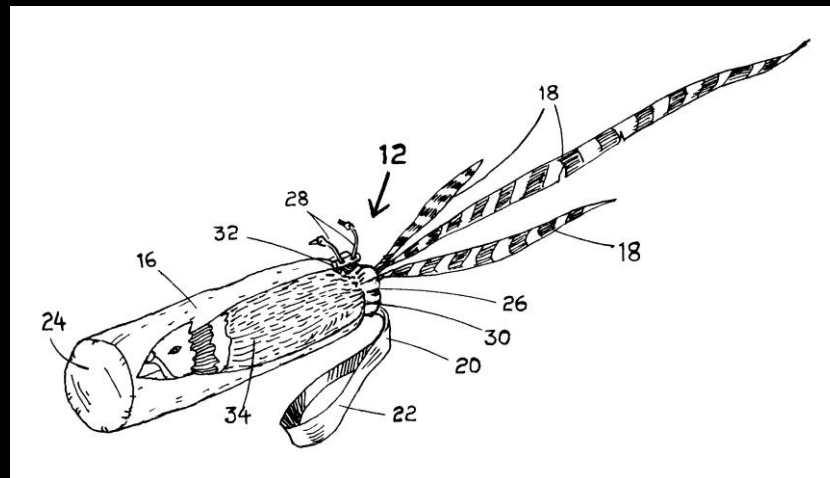
# EXISTING SOLUTIONS: Other “*Devices*”

- Hay Sacks
- Piñatas
- Laser Pointers
- Pumpkin filled with insects



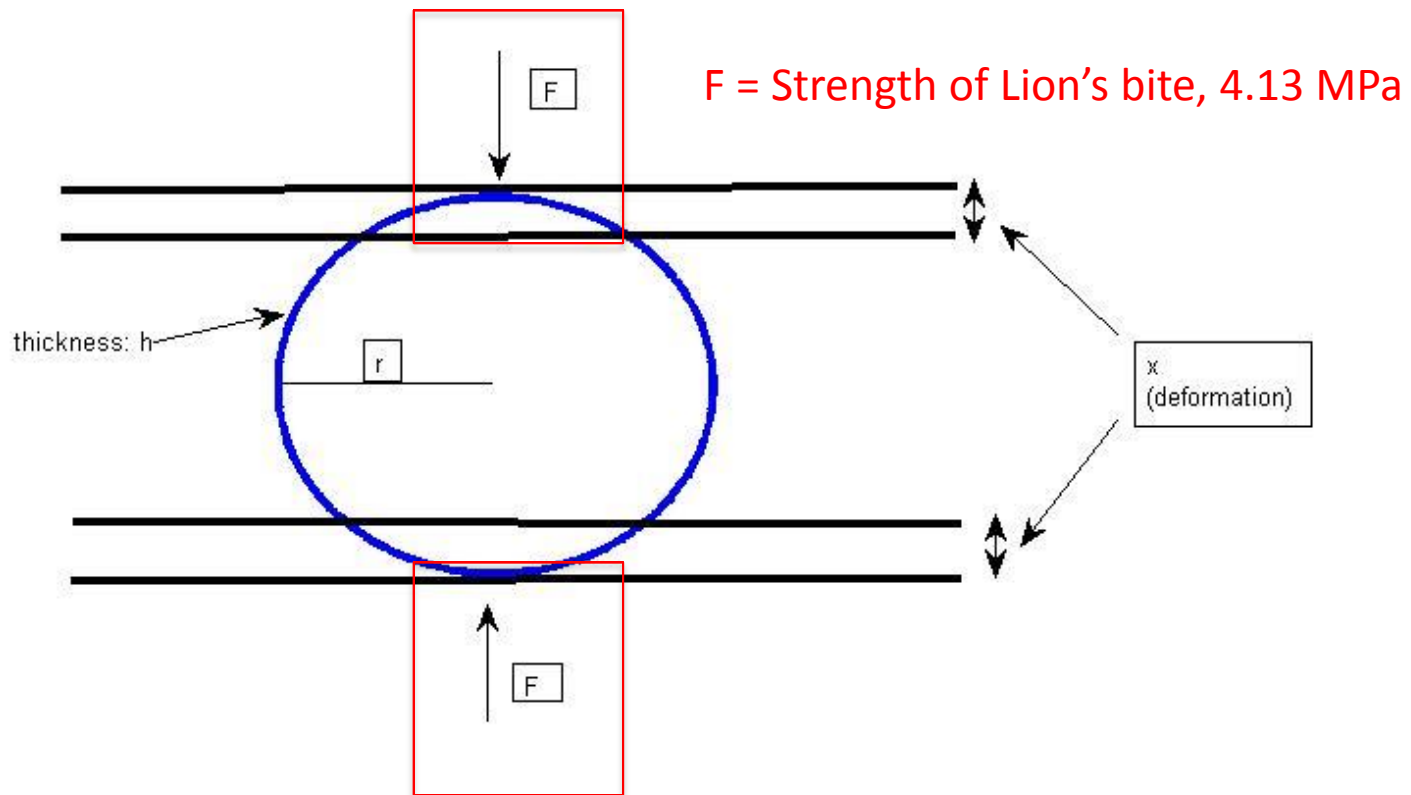
# PATENTS

- No patents specifically relating to lions
- Patents relating to dog hunting:
  - US6681721 B1
  - Simulated bird hunting dog-training device for teaching a dog to retrieve



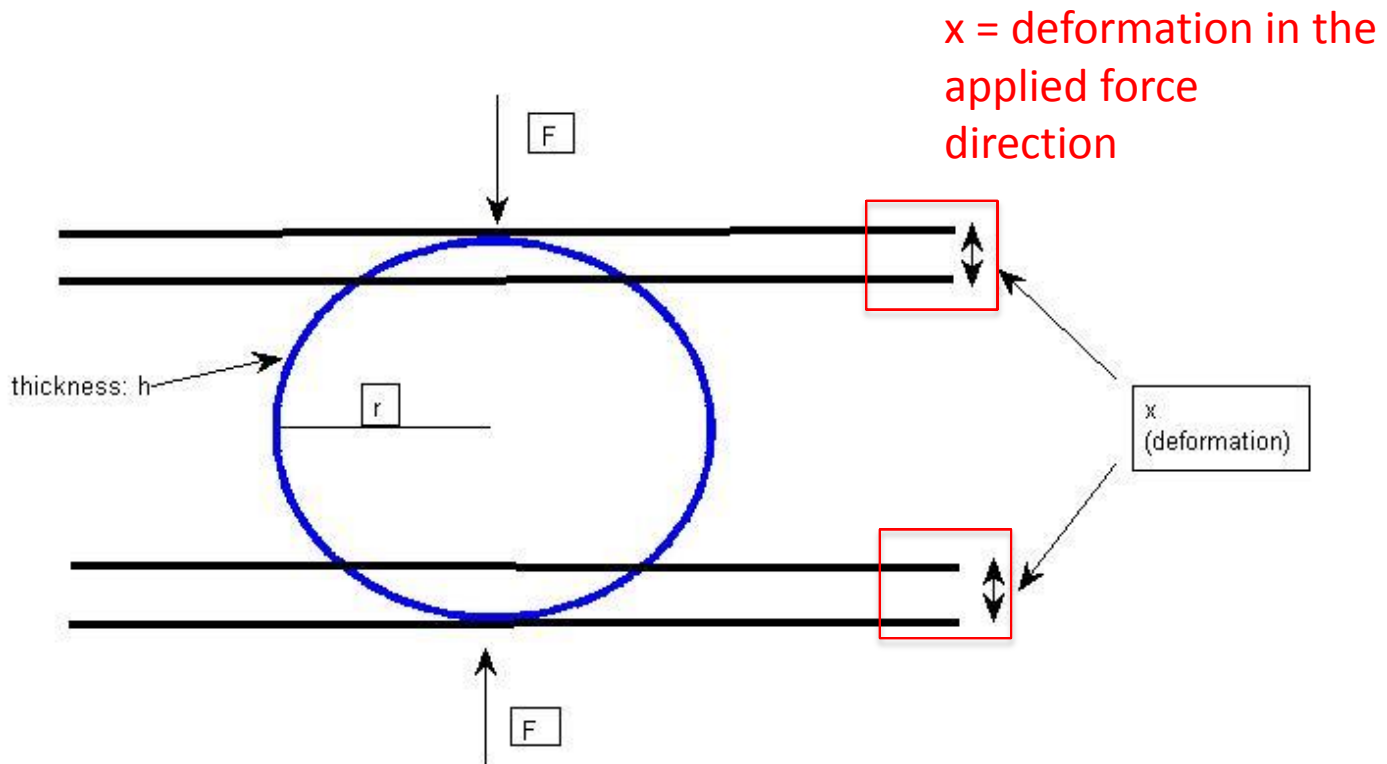
# PRELIMINARY ANALYSIS

- Assuming our device is spherical



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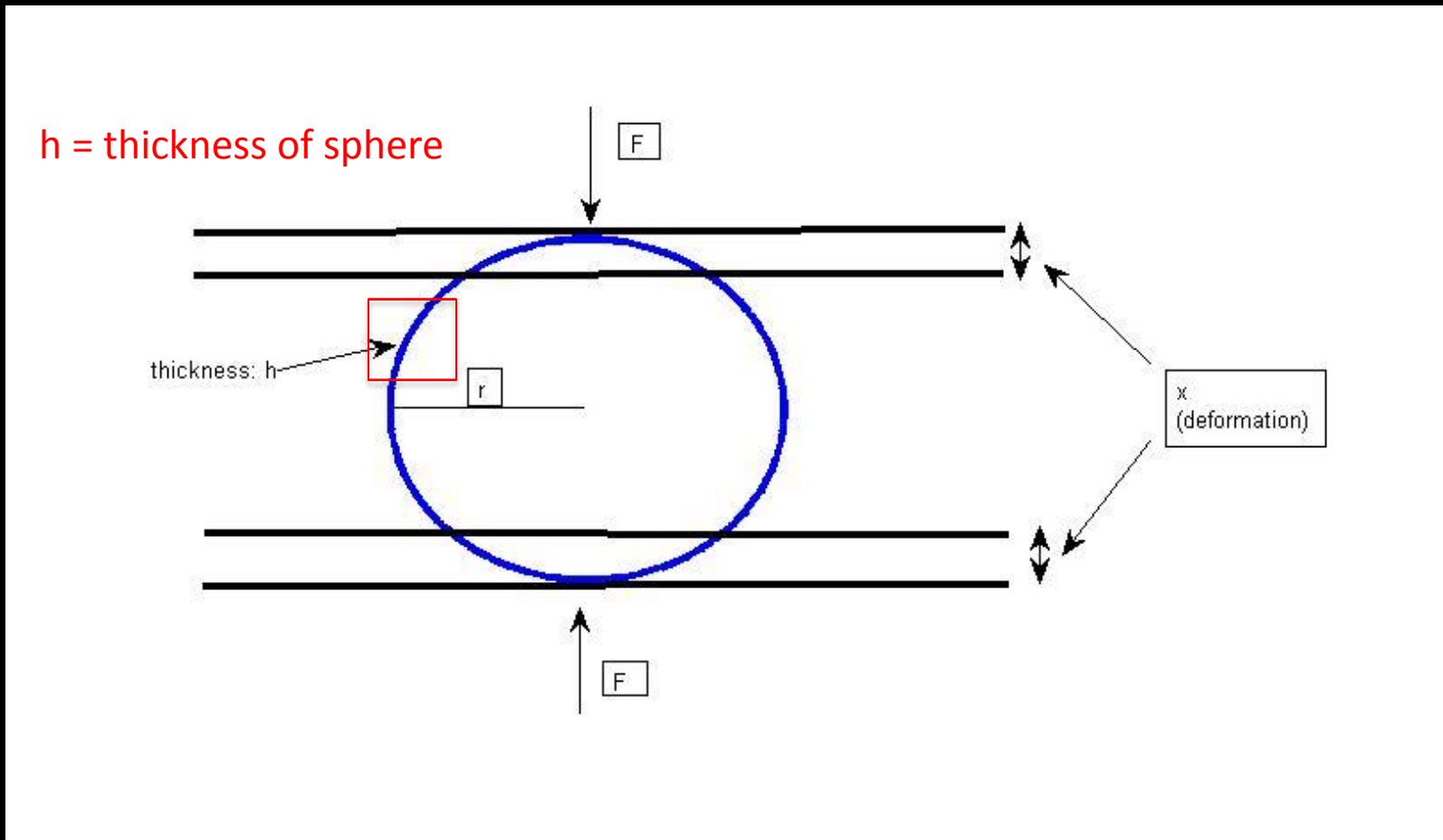
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# PRELIMINARY ANALYSIS

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# PRELIMINARY ANALYSIS (cont.)

$$\varepsilon = \frac{x}{h}$$

$\varepsilon =$  Strain

$x =$  Deformation

$h =$  thickness of shell

$$\sigma = E\varepsilon$$

$E =$  Young's Modulus

$\sigma =$  Stress

$$E = \frac{h\sigma}{x}$$

# PRELIMINARY ANALYSIS (cont.)

$$\varepsilon = \frac{x}{h}$$

Axial Compression of Hollow  
Elastic Spheres (Shorter et al.)

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Basic Mechanics of Stress-Strain Relationship

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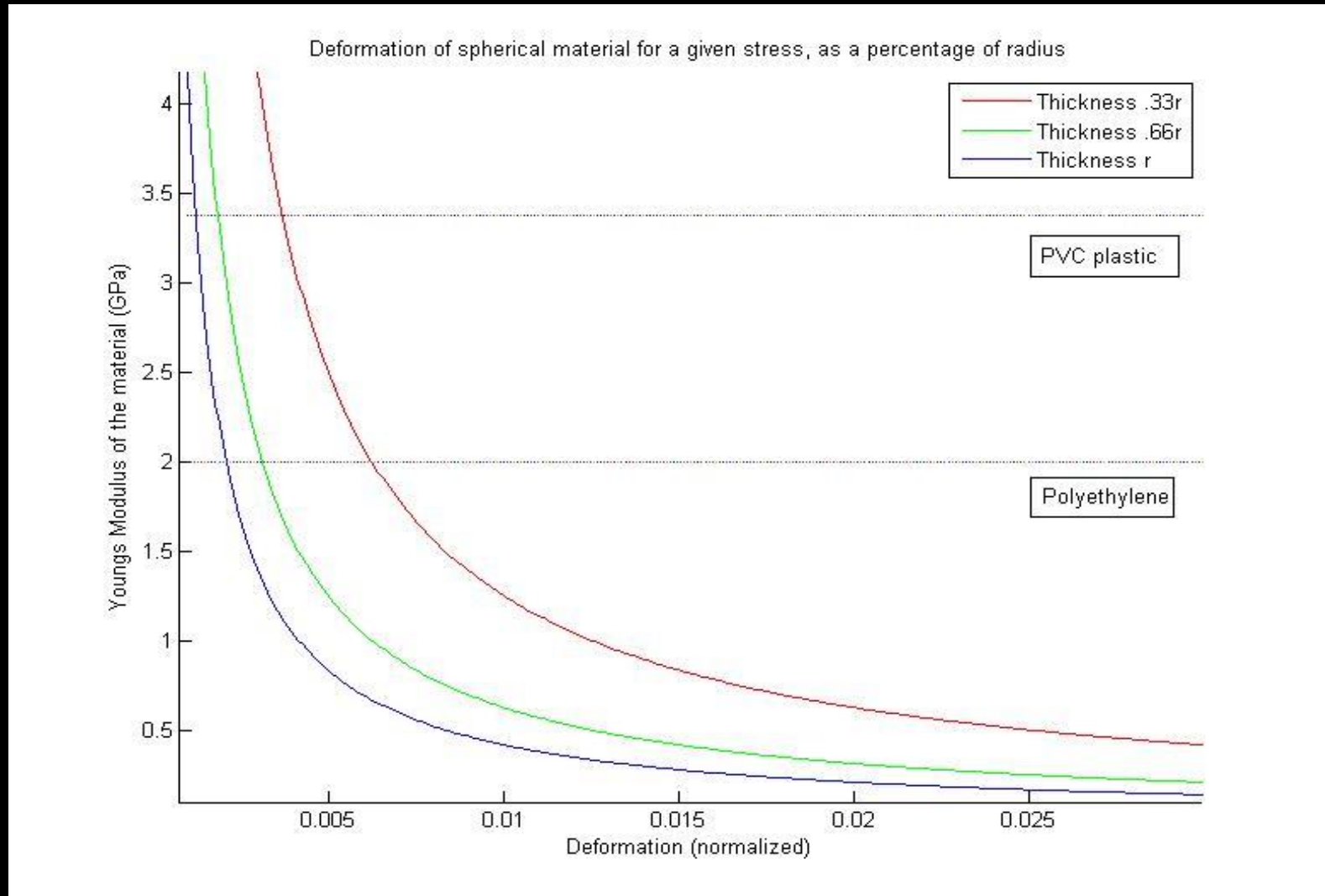
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Rearranged Equation

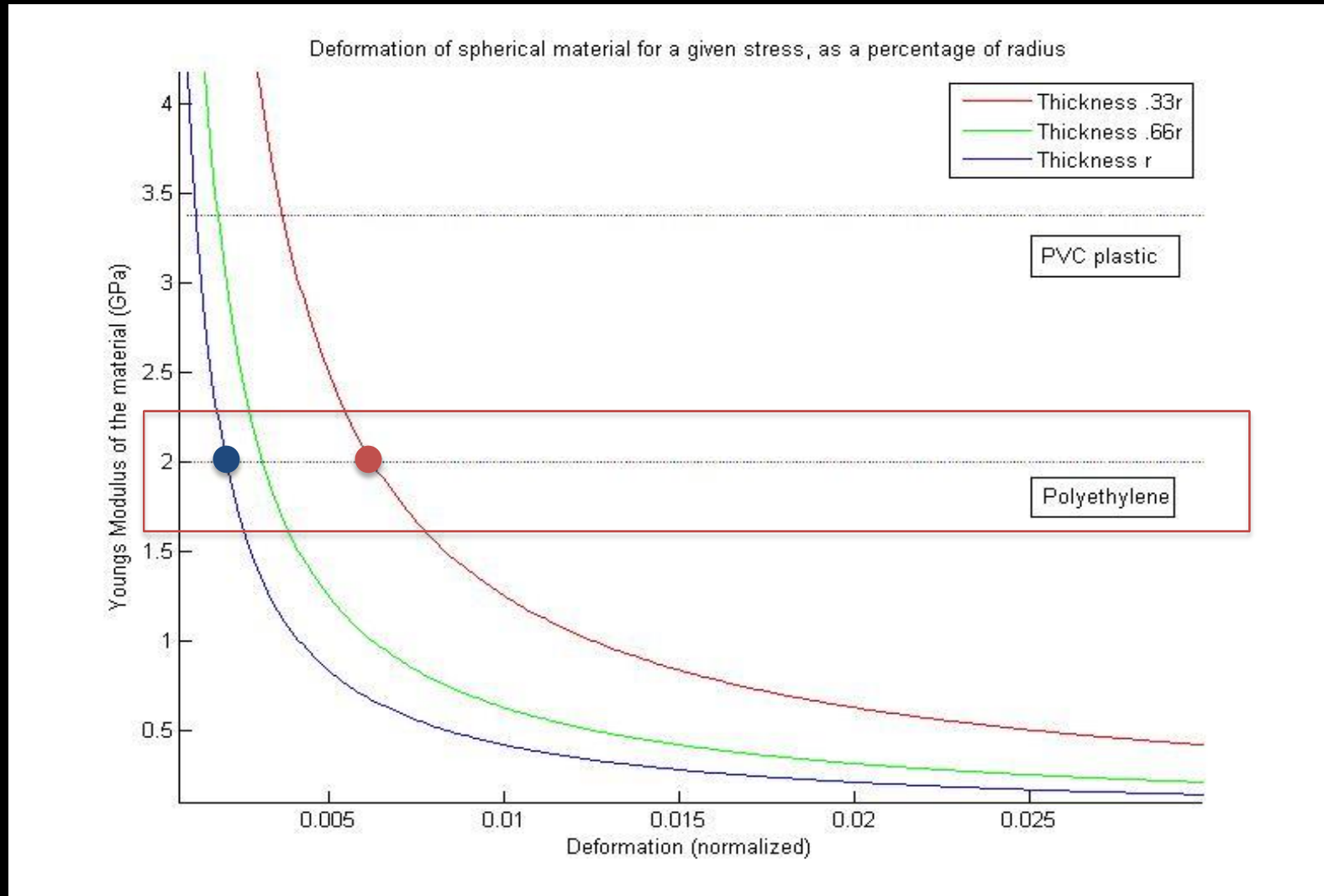
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Deformation of spherical material of various thicknesses



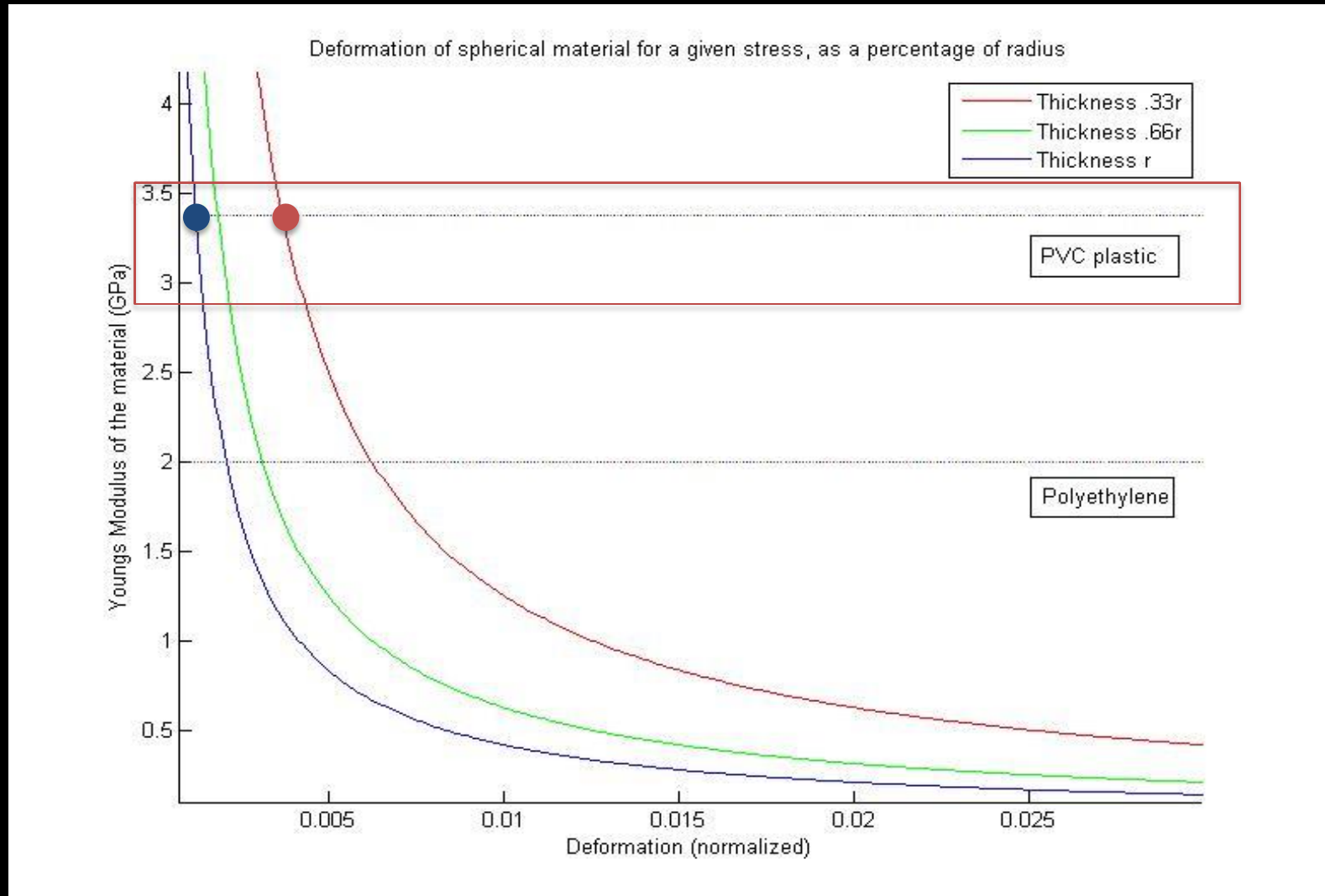
# PRELIMINARY ANALYSIS (cont.)

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# PRELIMINARY ANALYSIS (cont.)

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# TEAM RESPONSIBILITIES

Rachel Bilski	Quinn Kern Allely	Joshua Wong
Weekly Reports (Alternate)	Weekly Reports (Alternate)	Weekly Reports (Alternate)
Progress Report Presentation (2 <sup>nd</sup> )	Final Report Presentation (3 <sup>rd</sup> )	Preliminary Report Presentation (1 <sup>st</sup> )
Brainstorm 4-5 project ideas	Brainstorm 4-5 project ideas	Brainstorm 4-5 project ideas
Assessing feasibility of project ideas	Website Design/maintenance	Research Approved Material Properties
Organize group meetings	Order necessary materials	Continue contacting other ZOOS
Build prototype	Build prototype	Build prototype

Questions?