

Statically Indeterminate Systems 1

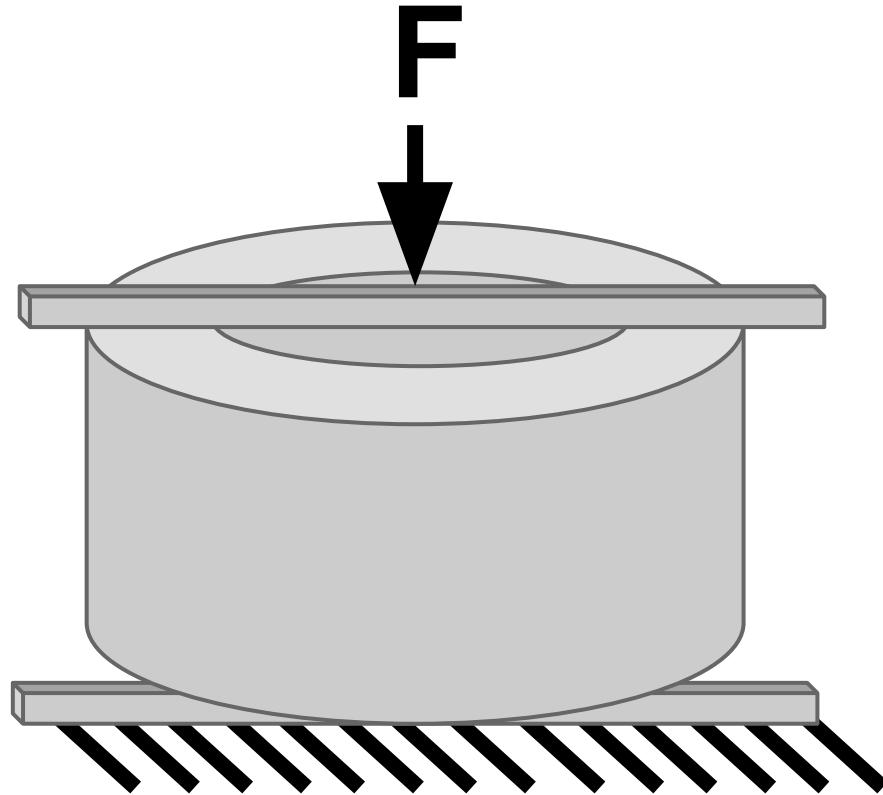
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BMED 3410: Introduction to Biomechanics
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Lecture 8

Outline

1. Physical Example of Static Indeterminacy

Statically Indeterminate Example



We have a problem...

- **How does the real world decide how to divide up F ?**
- Even with our simple model, our static equilibrium assumption is insufficient to find the load applied.
- Too few equations to solve for our unknowns
- What is this called?
- What can we do?

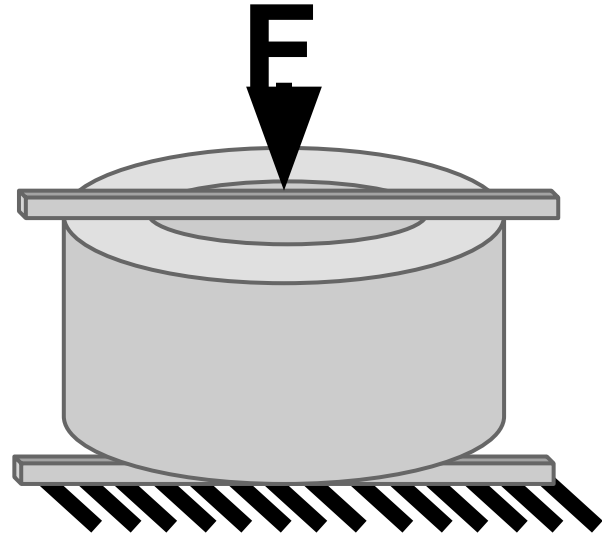
The System is Statically Indeterminate

- [Wikipedia Article](#)
 - “... a structure is **statically indeterminate** ... when the [static equilibrium](#) equations are insufficient for determining the internal forces and reactions on that structure.”
 - “Considerations in the [material](#) properties and compatibility in [deformations](#) are taken to solve statically indeterminate systems or structures.”

What additional assumptions can we make about the system?

Physical Model #1

- Let's take an extreme example
 - Outer material stiffness \gg inner material stiffness
 - Extruded aluminum square with foam cylinder inside
- What do you expect to happen?
- What does this imply?



The Deformations are Related

$$\delta_{\text{total}_1} = \delta_{\text{total}_2}$$