

## BIOLOGICAL FRAMEWORKS FOR ENGINEERS

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### Session #23 [nm-m: Tissue Replacement]

#### General Objectives:

- ✓ Discuss the replacement of biologic tissues in the body which have failed
- ✓ Discuss the replacement of body parts with synthetic biomaterials and their strengths and weakness

#### Central Framework:

- ✓ When tissues or systems in the body fail, our natural response is to replace that tissue with a synthetic analog to perform the function of the original tissue.

#### Interactive Activity:

- ✓ Discuss the development of a replacement intervertebral disc for the spine

#### Session Outline:

### **Replacement Body Parts**

Why?

What do we need to know about the natural part to replace it?

Biologic or synthetic?

## **Biomaterial Science**

From Temenoff & Mikos, *Biomaterials*, 2008 (Ch. 1)  
<http://www.coursesmart.com/9780136037835/chap01>

A wide-ranging field that encompasses aspects of basic biology, medicine, engineering, and material science, that has developed to since World War II with the intent to develop materials that interface with biological systems to evaluate, treat, and augment, or replace any tissue, organ, or function of the body.



Common Examples:

Materials (Biocompatibility)

## Choosing the Correct Material

Inert

Bioactive

## Integration with the Body

Inflammation

Immune Response

Blood Clotting

Infection

Tumor formation (neoplasia)

Calcification

## Types of Biomaterials

Metals

Ceramics

Polymers

## Biomaterial Properties