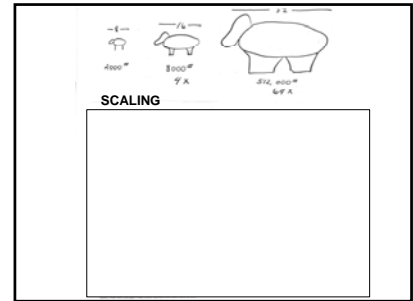


BIOMECHANICS AND SKELETAL SYSTEM
 Physics and Biological Design

Statics--gravity Dynamics--motion

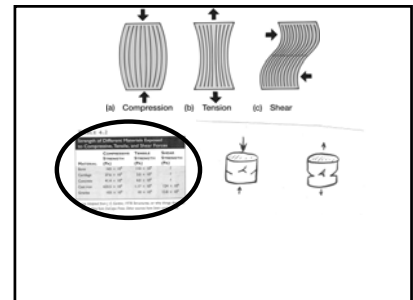
General Capabilities of Supportive Systems

- 1) Accommodate Size Increases



General Capabilities of Supportive Systems
(continued)

- 1) Accommodate Size Increases
- 2) Accommodate Direction Force Application



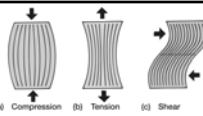
Compressive > Tensile > Shear

TABLE 4.2

Strength of Different Materials Exposed to Compressive, Tensile, and Shear Forces

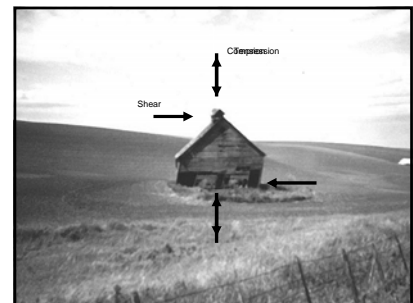
MATERIAL	COMPRESSIVE STRENGTH (Pa)	TENSILE STRENGTH (Pa)	SHEAR STRENGTH (Pa)
Bone	165×10^6	110×10^6	?
Cartilage	27.6×10^6	3.0×10^6	?
Concrete	41.4×10^6	4.0×10^6	?
Cast iron	620.5×10^6	1.17×10^6	124×10^6
Granite	103×10^6	10×10^6	13.8×10^6

Source: Adapted from J. E. Gordon, 1978. Structures, or why things don't fall down, New York: Dutton Press. Other sources have been used as well.



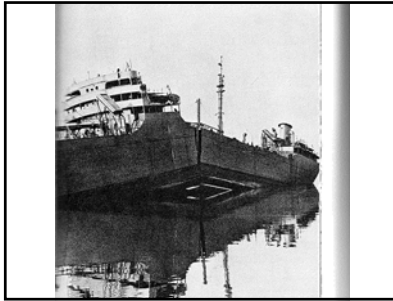
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St. Paul



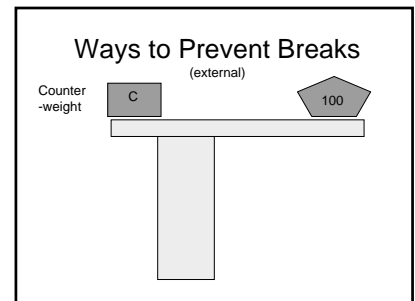
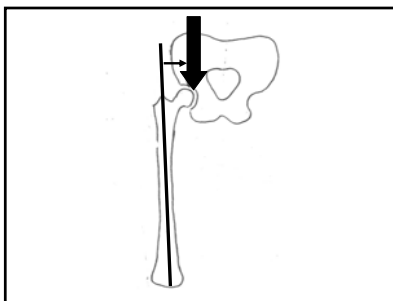
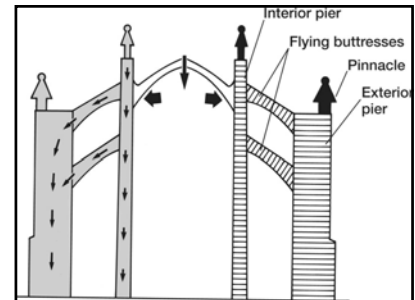
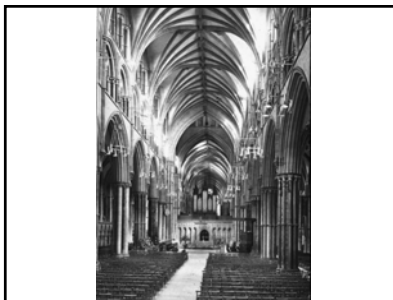
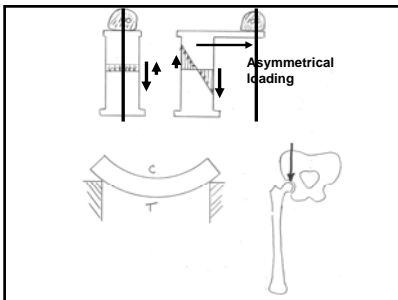
If bone is so strong, then how does it break?

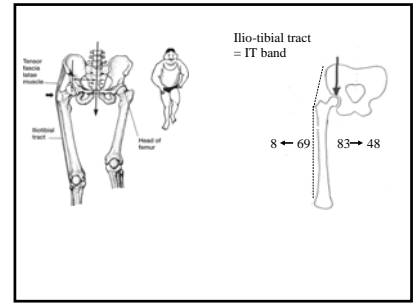
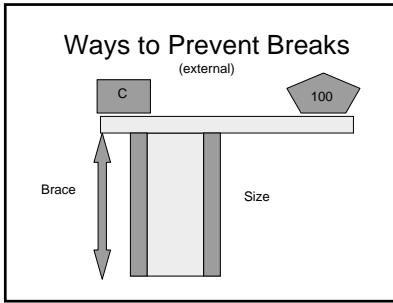
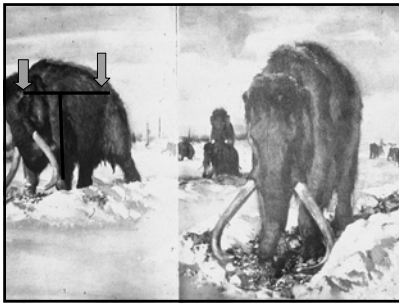
- 1) Stress concentration



If bone is so strong, then how does it break?

- 1) Stress concentration
- 2) Loading





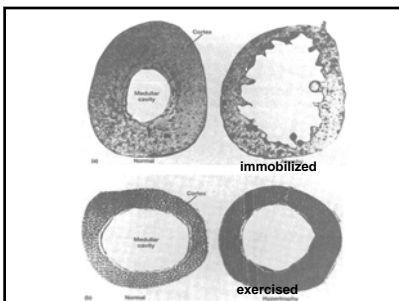
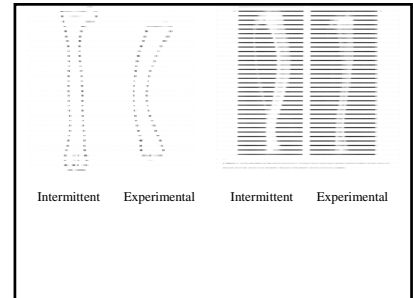
General Capabilities of Supportive Systems

(continued)

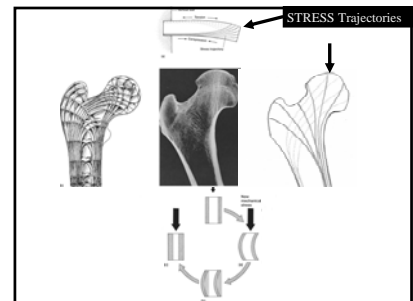
- 1) Accommodate Size Increases
- 2) Accommodate Direction Force Application
- 3) Duration of Force Application

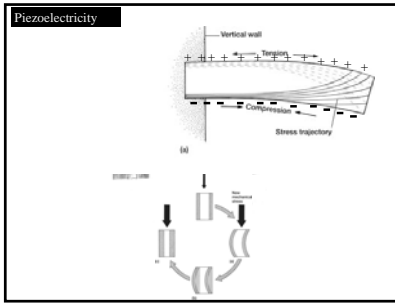
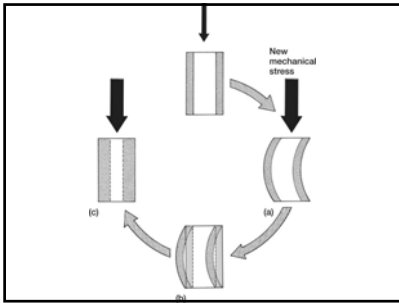
Duration of Force Application

- Continuous → Atrophy
aneurism, tumor, dislocation
- Unstressed → Atrophy
weightlessness
- Intermittent → Hypertrophy



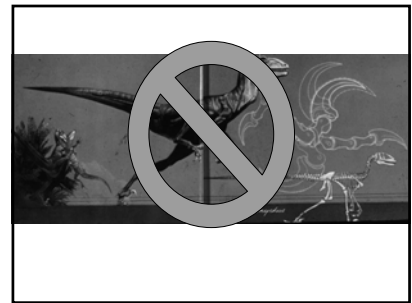
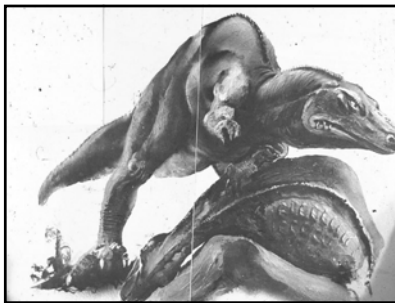
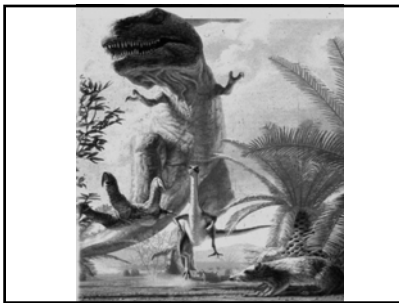
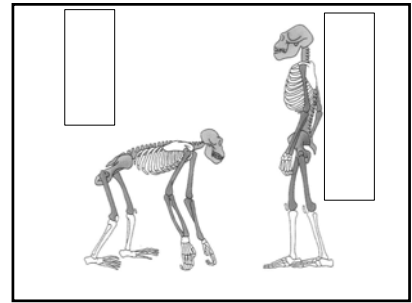
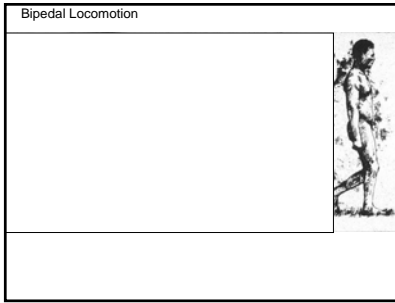
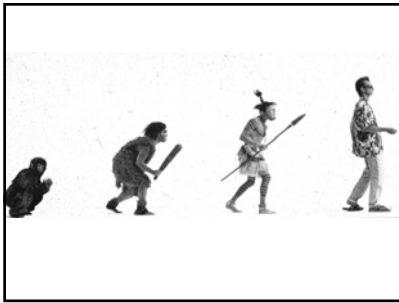
Internal Response of Bone to Mechanical Factors

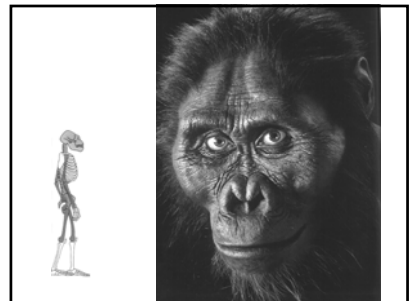
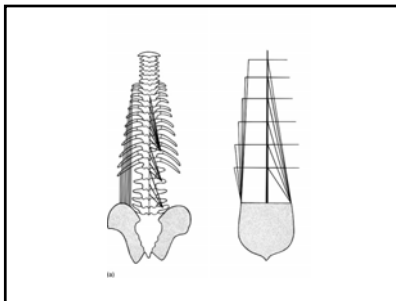
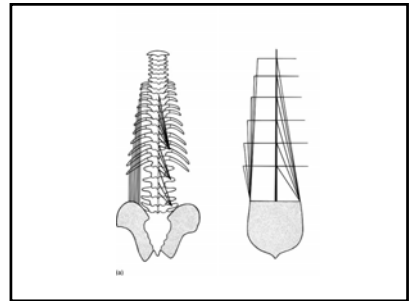
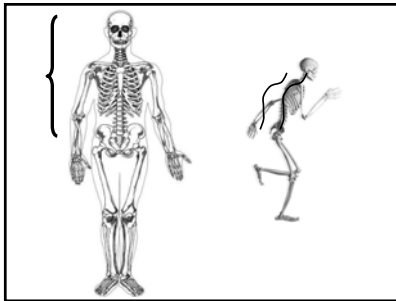
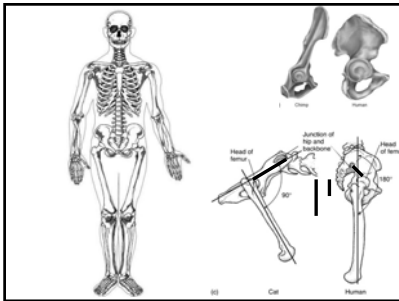
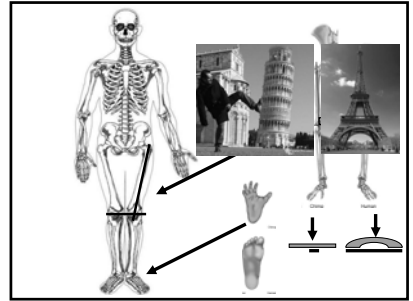
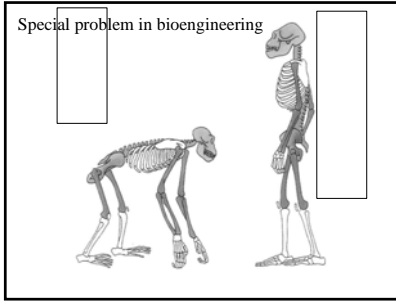




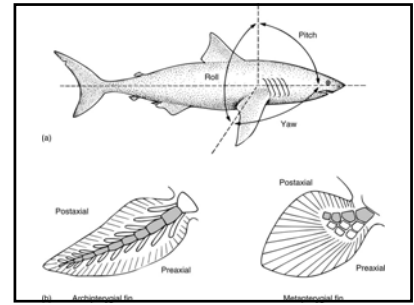
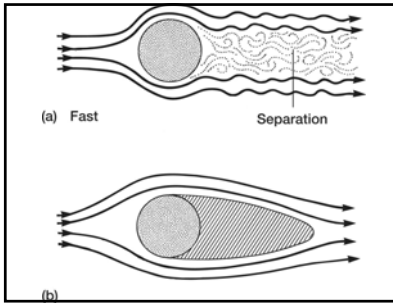
Quick Summary

- Environment of forces affect design
- Physiological response of bone to forces
- Next,
 - Evolutionary response of skeletal system

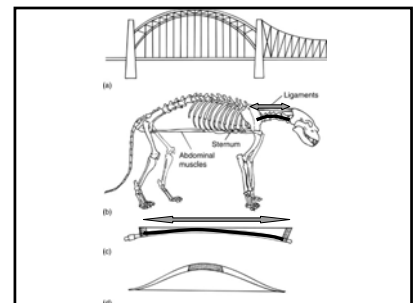
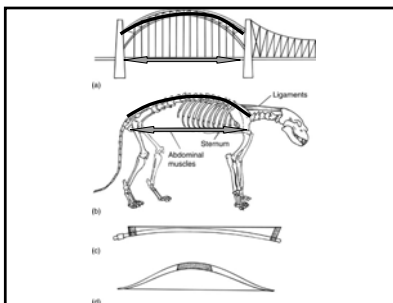
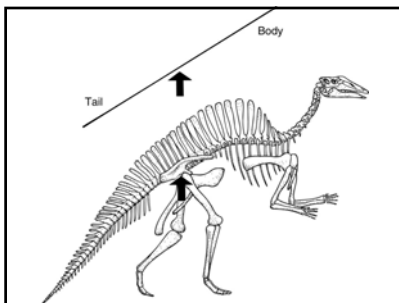
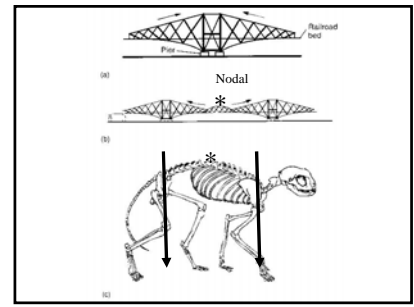
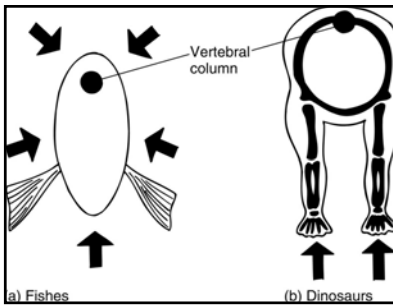




SUSPENSION SYSTEM



SUSPENSION SYSTEM Static Support



SUSPENSION SYSTEM
Form and Function of the
Vertebral Column

