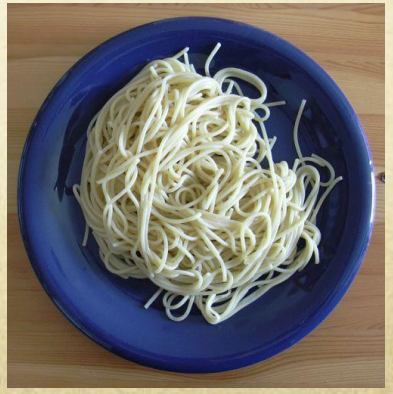
Tissue Mechanics

Silly Putty: How does it work?

- Glue is a polymer, which means it is made of long chains of molecules.
- When borax is added, it cross-links these molecules.
- The amount of cross-linking determines the material properties of the silly putty.
- Does more borax increase or decrease the stiffness of the silly putty?
  - It increases the stiffness!



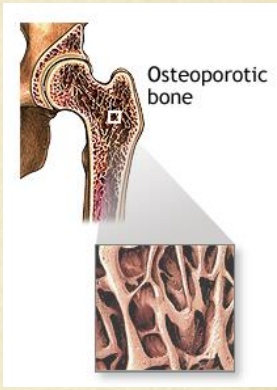
Tissue Mechanics

What does this have to do with **tissue mechanics**?

- Human tissues contain varying degrees of collagen. Collagen is similar to the strands of molecules in glue. It is a long protein strand.
- Collagen can also cross-link in our bodies similar to how the borax cross-links the glue.
- The amount of collagen cross-linking in our tissues is directly related to the material properties of that tissue.

Why study tissue mechanics?

- For the engineering design of devices that will be implanted or used inside of the body
  - Examples: *artificial heart valves, arterial stents, surgical devices*
  - Must be "biocompatible"



- To understand pathologies and their effect on tissues
  - Examples: *valve stenosis, osteoporosis*

- For the design of prosthetics (artificial body parts)
  - Examples: *artificial arms, legs, hands, feet*

Tissue Mechanics

Proteins that can determine the mechanical properties of tissues:

- Collagen: tissue strength
  - Example: *tendons*
- Elastin: elastic properties
  - Example: *arteries*
- Proteoglycan: allows tissues to retain water that can be used for lubrication
  - Example: *cartilage*