Last time:

- Linear elasticity
- Area / Area tensors (deformations ≠ rigid body rotation)
- Constitutive laws

Newtonian fluids:
- Constitutive law "modulus": \( \sigma = \epsilon \)
- Thermo equation \( \frac{\partial \sigma_{ij}}{\partial x_j} = 0 \)
- Equilibrium (no inertia)

Hookean solid:
- \( \sigma = \epsilon \)
- 2nd Lamé constant
- \( (\mu, E, \nu, K) \) only two independent

\[ \sigma_{ij} = \lambda \epsilon_{kk} \delta_{ij} + 2 \mu \epsilon_{ij} \]

with notation:
- \( \sigma_{ij} \) (i direction of surface normal)
- \( A, B \) normal stress
- \( s_{ij} \) shear stress

\[ \epsilon_{kk} = \epsilon_1 + \epsilon_2 + \epsilon_3 = \frac{V}{V_0} \quad (volumetric expansion) \]

\[ \frac{1}{3} \sigma_{kk} = \frac{1}{3} \epsilon_{kk} \quad (\text{mean normal Area}) = -p \quad (\text{hydrostatic pressure}) \]

A Hookean material is characterized by any three of \( \lambda, \mu, E, \nu, K \)

- confined compression
- undefined compression
- space shear (*)
- plane extension

\[ \sigma_{ii} = \sigma_{kk} = 0 \]

\[ \sigma_{22} = E_2 \epsilon_{22} + O \]

\[ \sigma_{33} = E_3 \epsilon_{33} + O \]

Tissue Mechanics:

1. Molecular structure & composition of extracellular matrix
2. Elastic behavior of tissues
3. Viscoelastic (time-dependent) behavior - creep / strain relaxation
4. Poroelastic behavior (fluid can move around)
5. Electromechanical behavior
6. Mechanobiology (living - tissue adaptation - mechanotransduction)

Today:
- Connective tissues
  - Acute, irregular (basement membranes)
  - Dense, irregular (dense fascia)
  - Adipose tissue (fat)