Introduction to nonlinear finite element modeling

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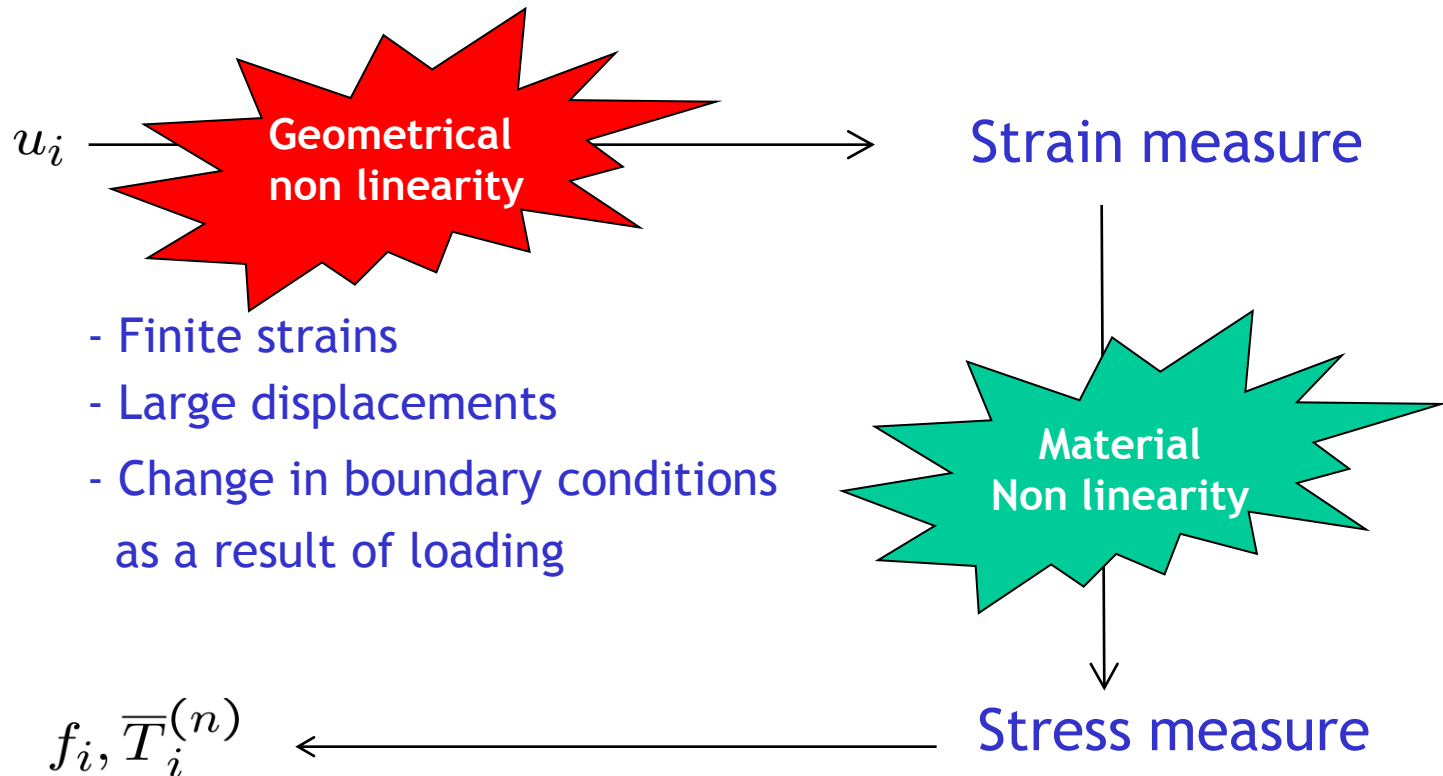
2.0. Sources of nonlinearity

Inspired and adapted from the 'Nonlinear Modeling of Structures' course of Prof. Thierry J. Massart at the ULB

Definition

Cause of a non proportionnality between applied forces and Resulting displacements
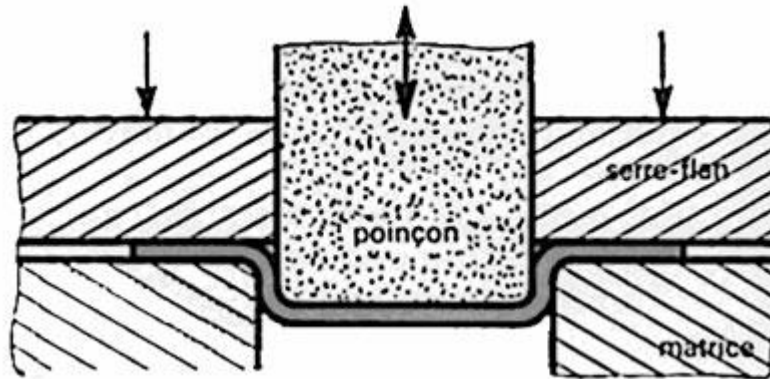
Sources

u_i —→ **Geometrical non linearity** —→ Strain measure

- Finite strains
- Large displacements
- Change in boundary conditions
  as a result of loading

Material Non linearity

$f_i, \overline{T}_i^{(n)}$ ←— Stress measure

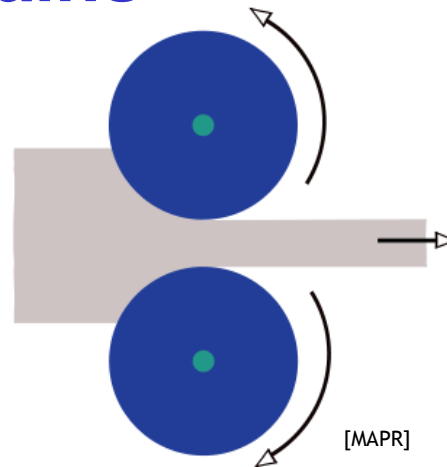# Load-induced changes in geometry

Large displacements

[www.futura-sciences.com]

[unknown source]

Finite strains

[MAPR]

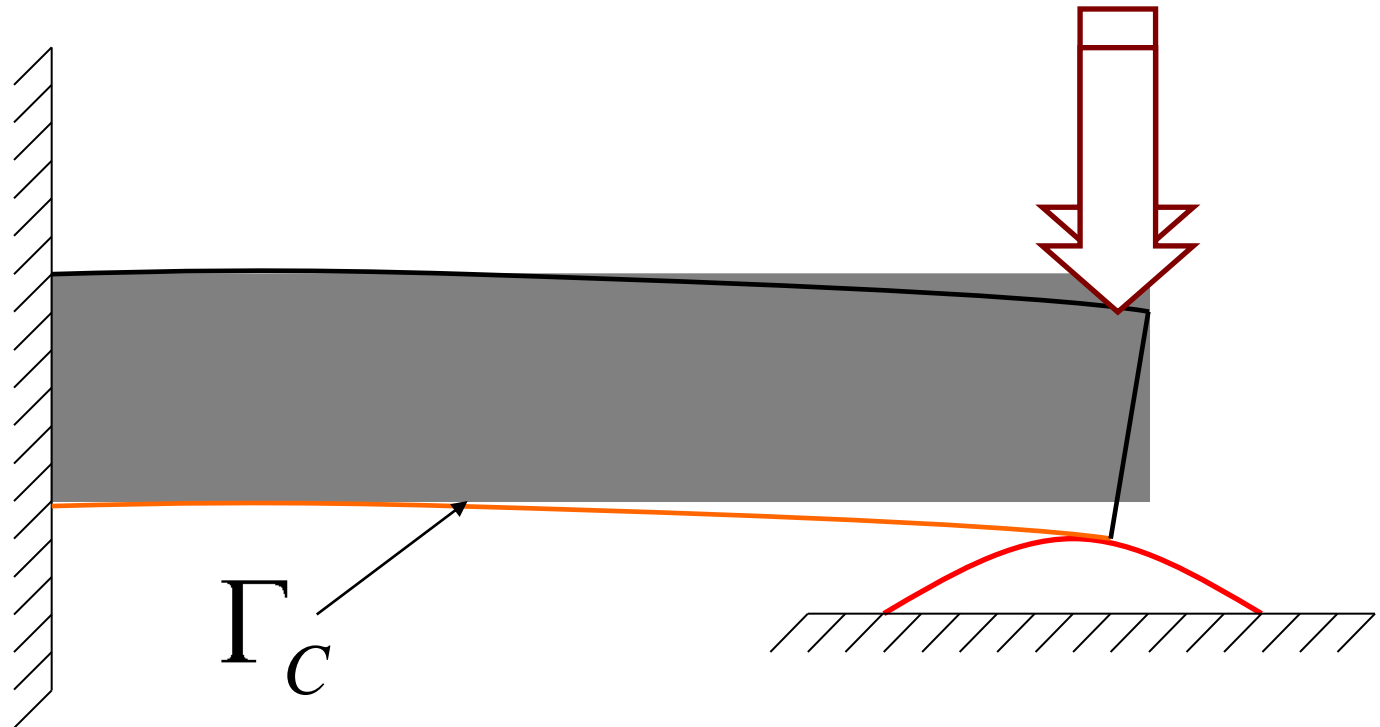

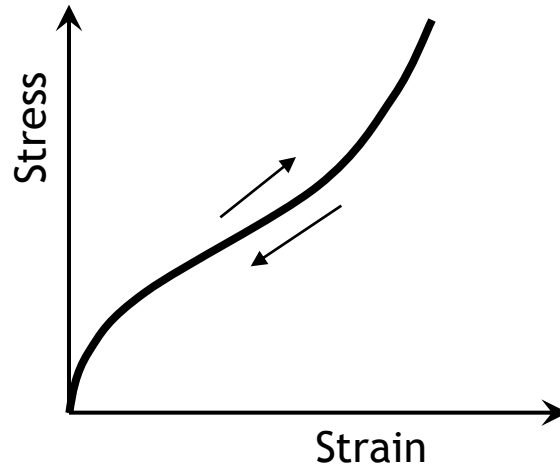http://www.eef.org.uk/NR/rdonlyres/CABEE2C5-271E-419B-876A-6E8ED573A15F/12685/hot4.jpg

Contact

$$\Gamma_c$$

Nonlinear material behavior

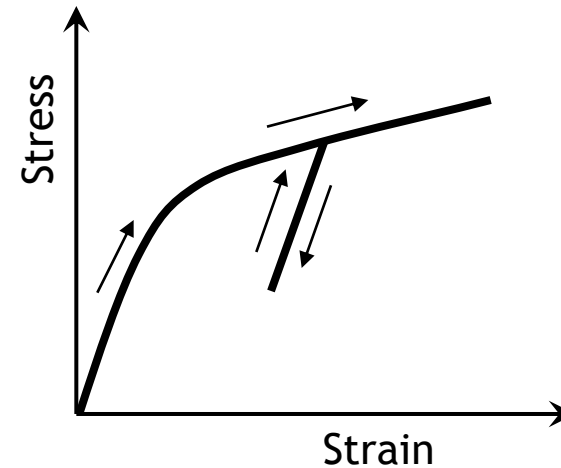## Non linear elasticity

Elasto-plasticity

Elasto-visco-plasticity

Strain rate
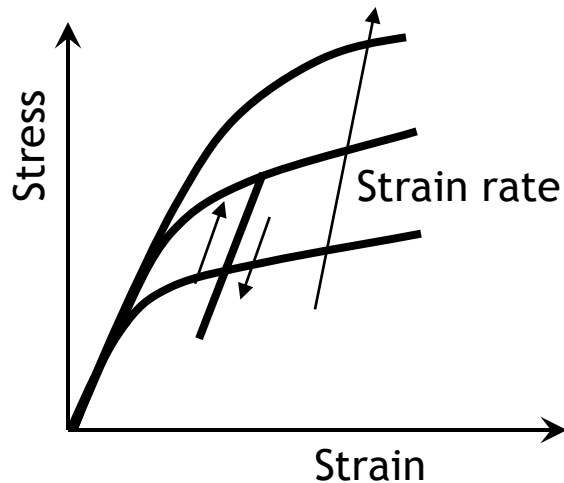
Damage (stiffness degradation)