

# Presentation of various more demanding FEM/FVM problems

**Miroslav Halilovič**, Bojan Starman, Janez Urevc, Nikolaj Mole

Faculty of Mechanical Engineering, University of Ljubljana

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Univerza v Ljubljani



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## Research activities and skills:

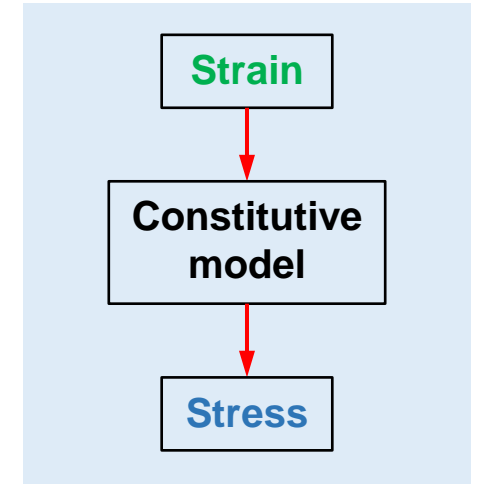
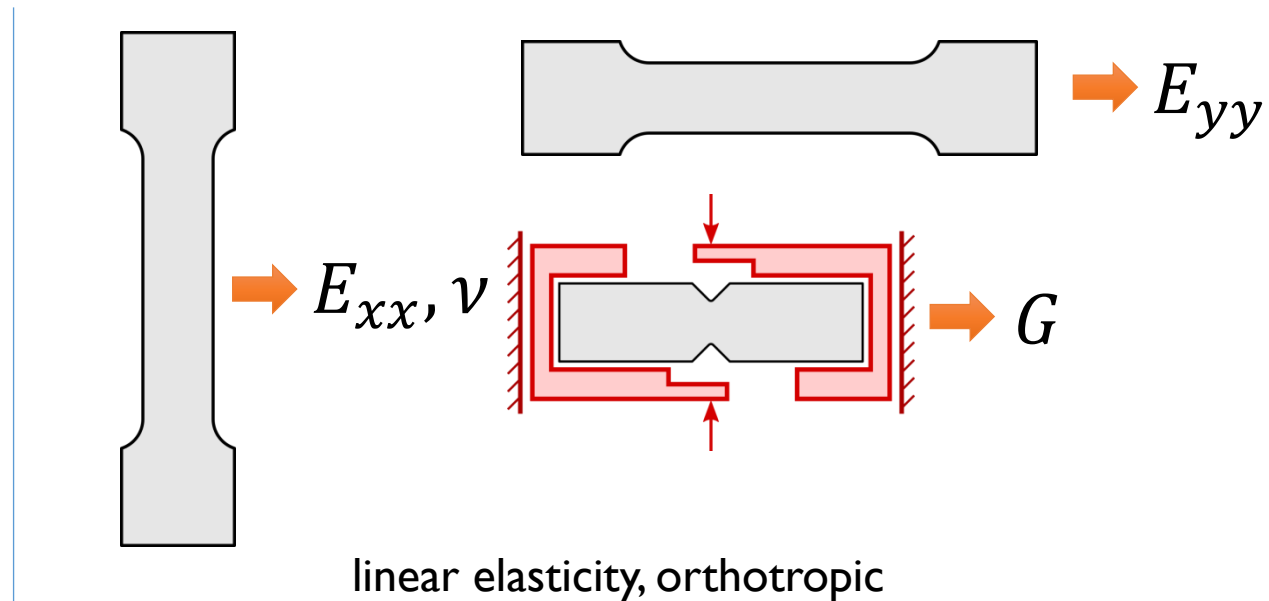
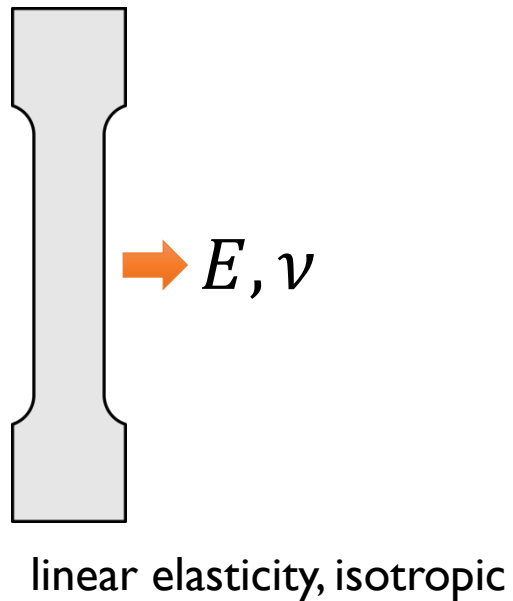
- numerical modelling and simulation of technological and physical processes
- thermo-mechanical analyses for product development
- constitutive modelling, implementation of models into FEM, mechanical testing

**Miroslav Halilovič**, Bojan Starman, Janez Urevc, Nikolaj Mole  
Faculty of Mechanical Engineering, University of Ljubljana  
**Laboratory for Numerical Modelling and Simulation (LNMS)**

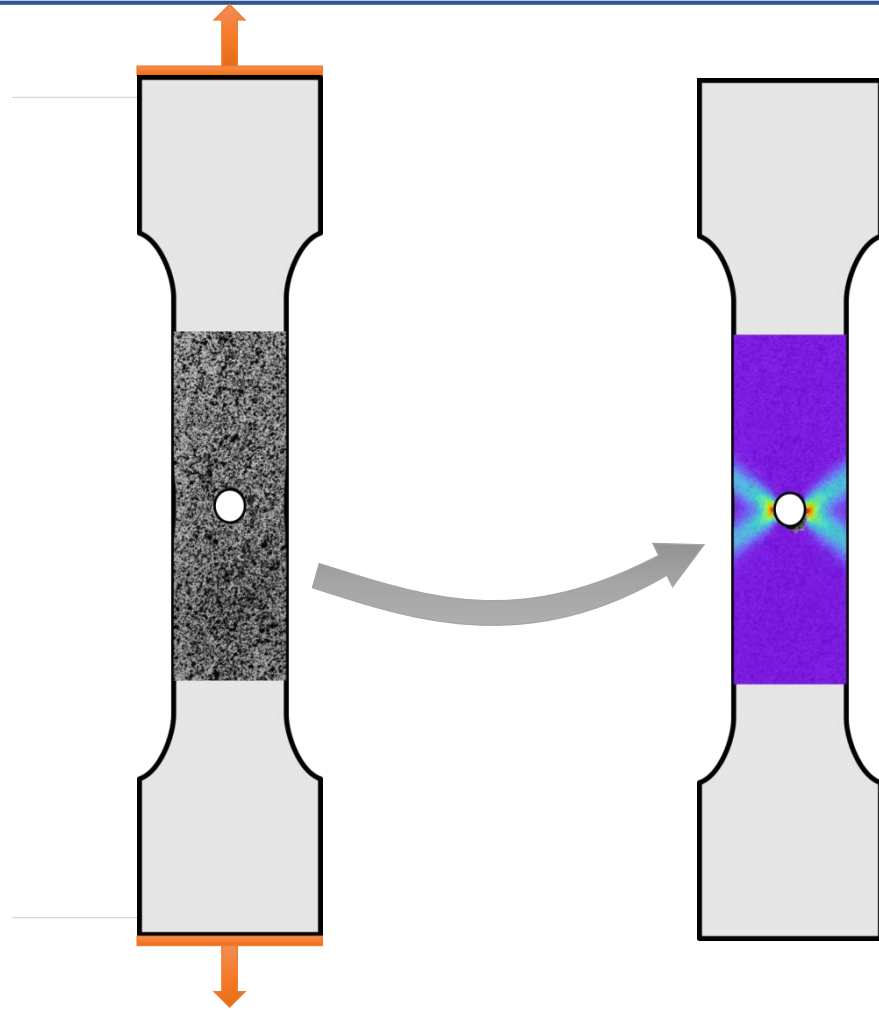
Constitutive modelling, implementation of models into FEM, mechanical testing

- a large variety of new materials
- material data?

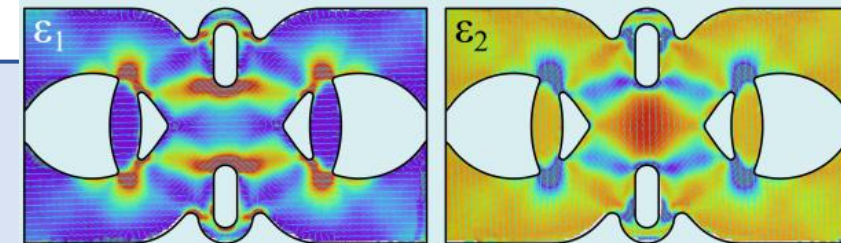
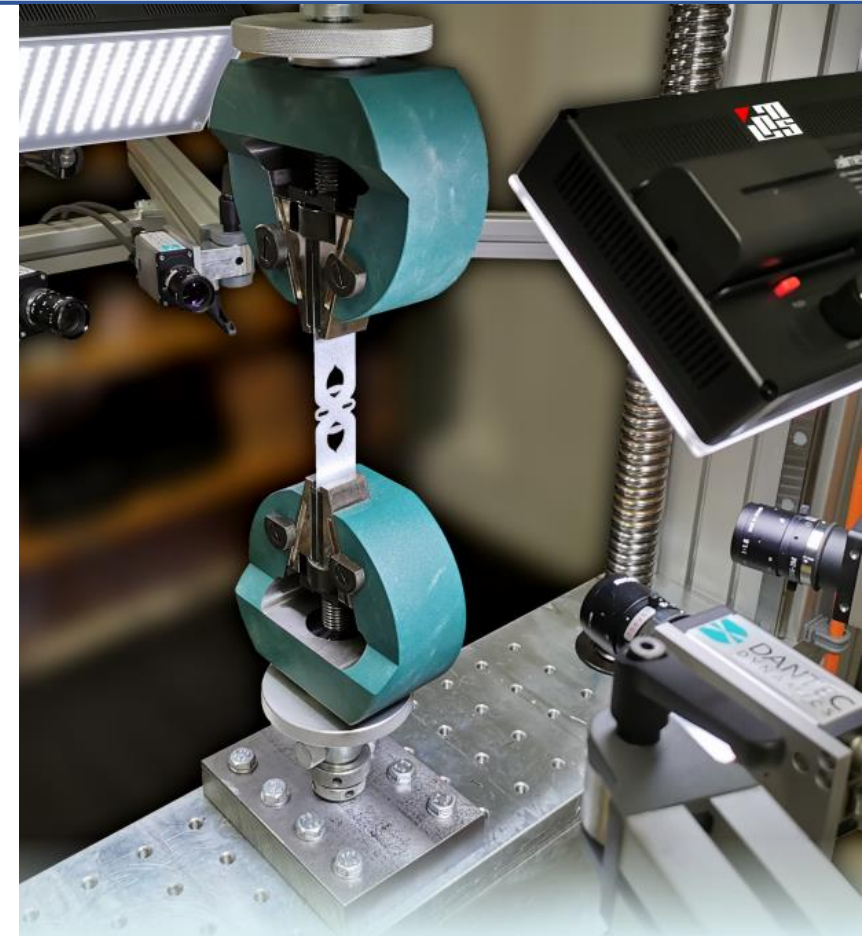
Constitutive model + material parameters



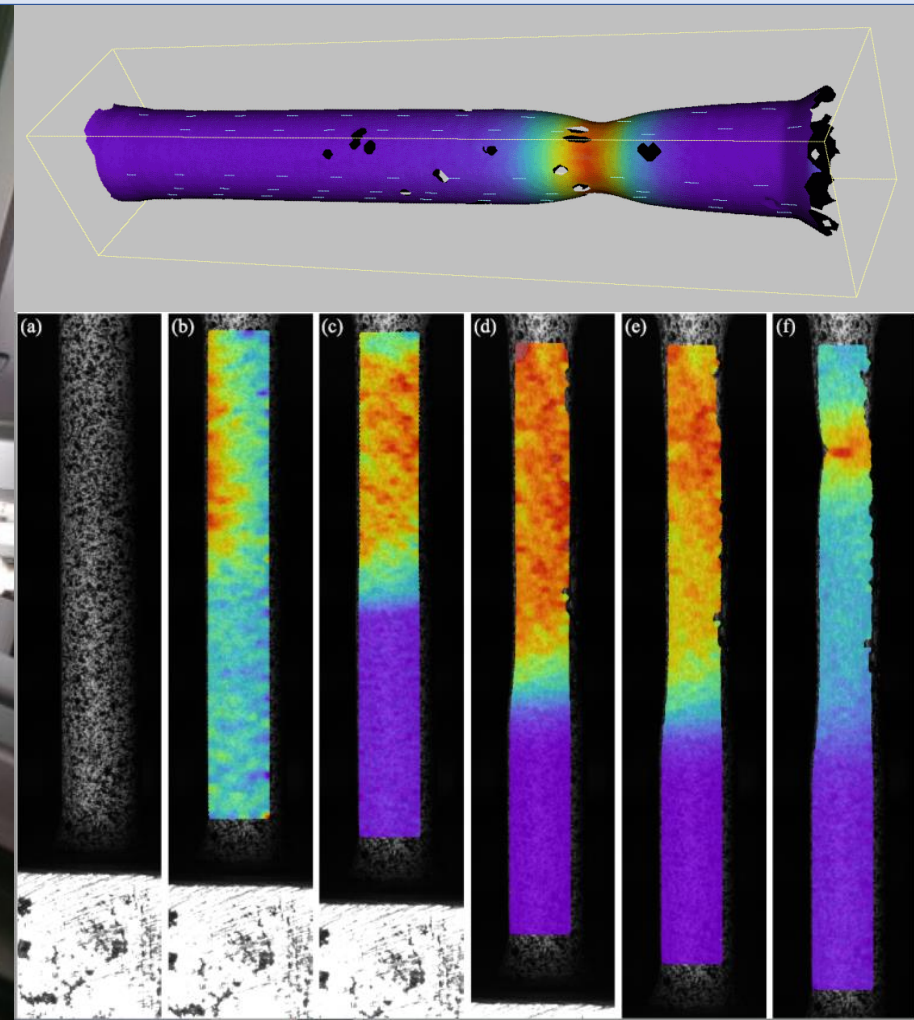
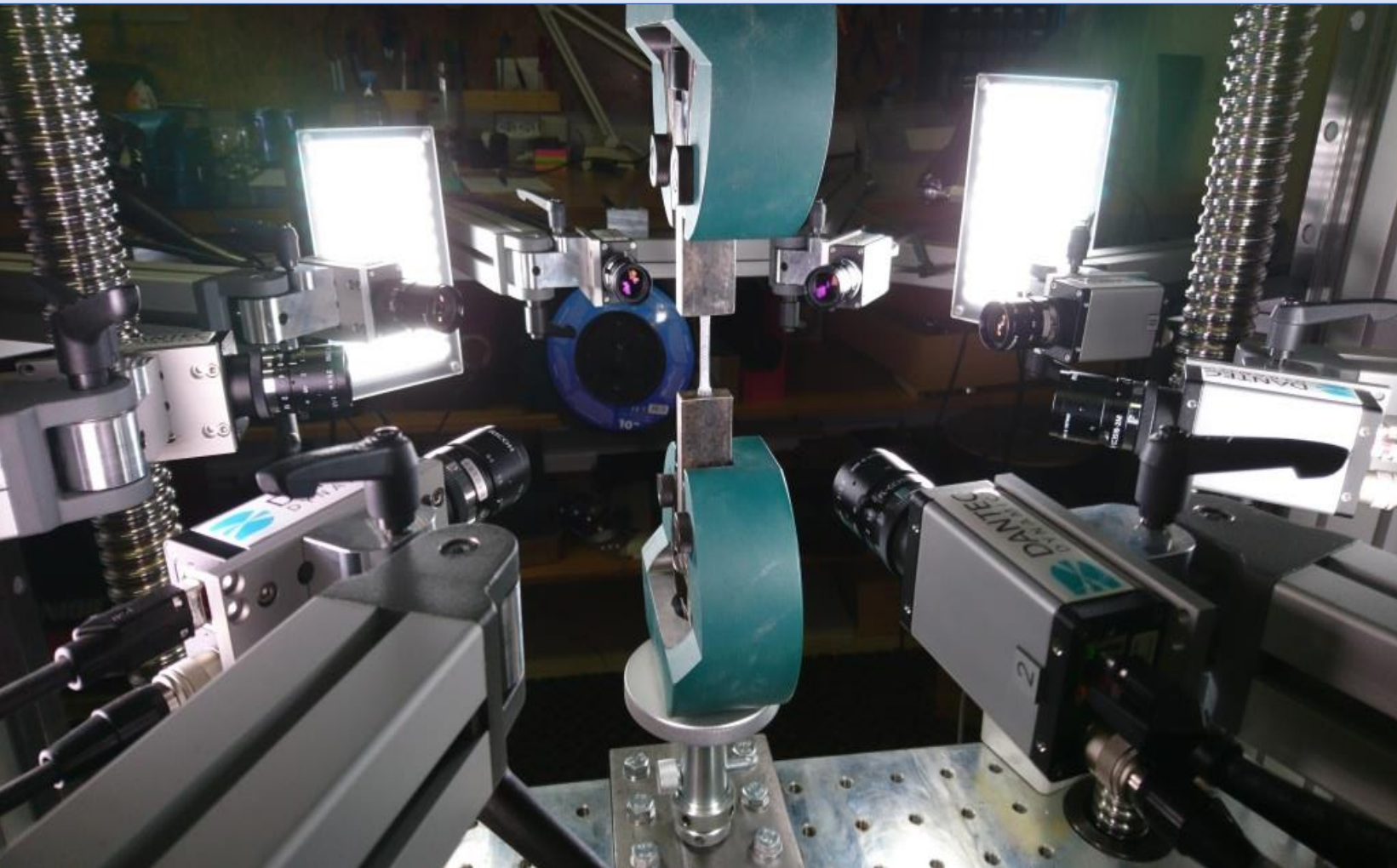
# Material characterization



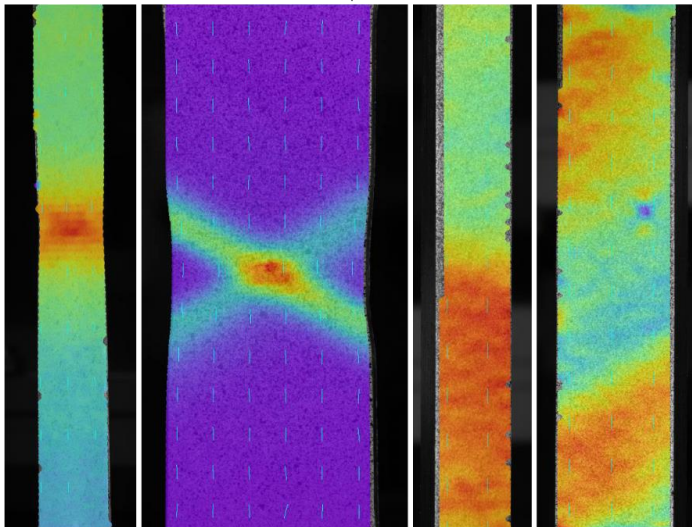
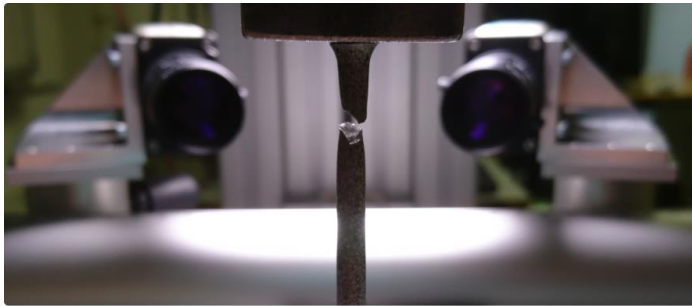
→  $E_{xx}, E_{yy}, \nu, G$



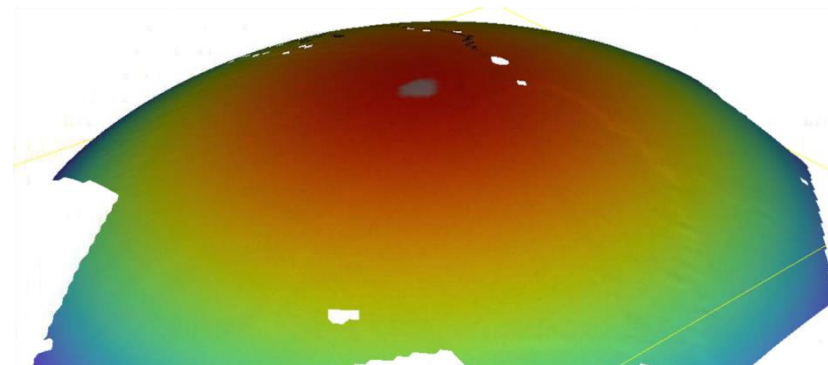
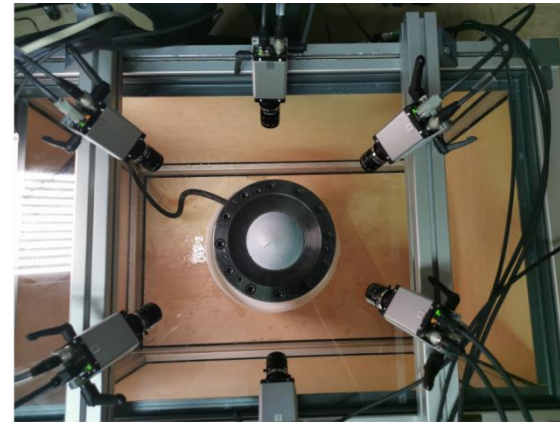
# Material characterization



Tensile testing

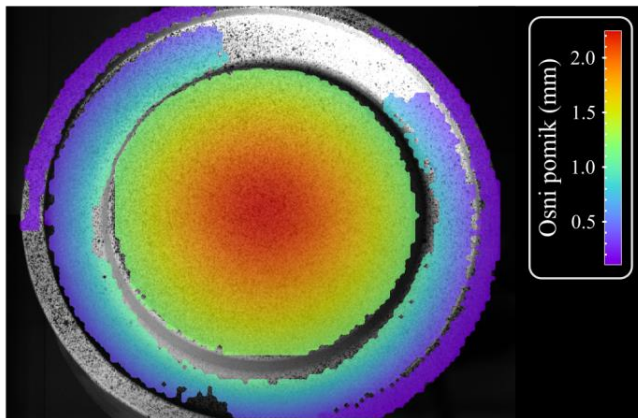
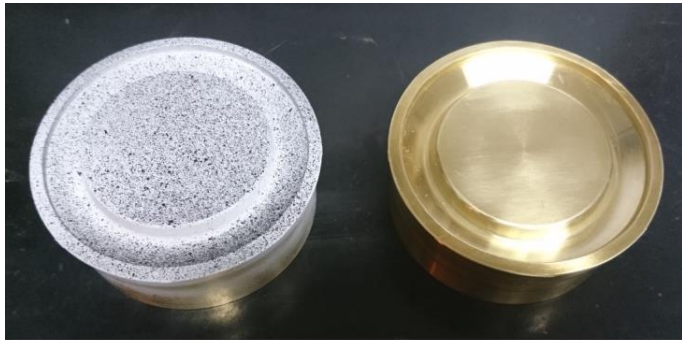


Bulge testing

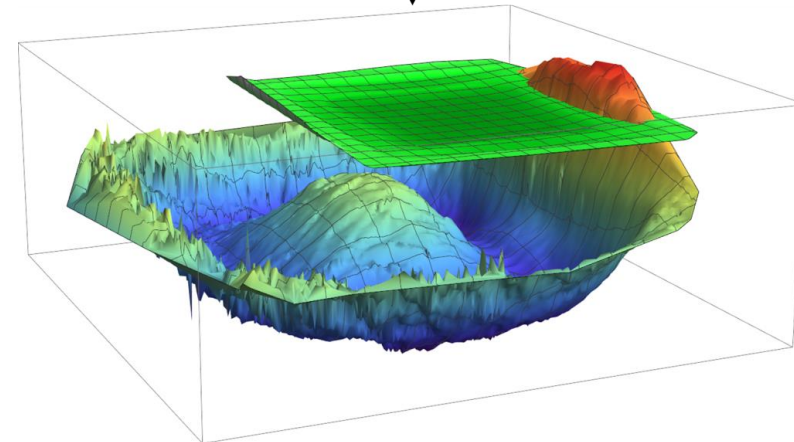


# Digital image correlation

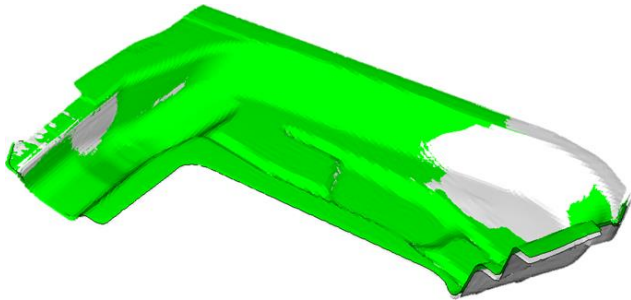
Valve housing at applied pressure



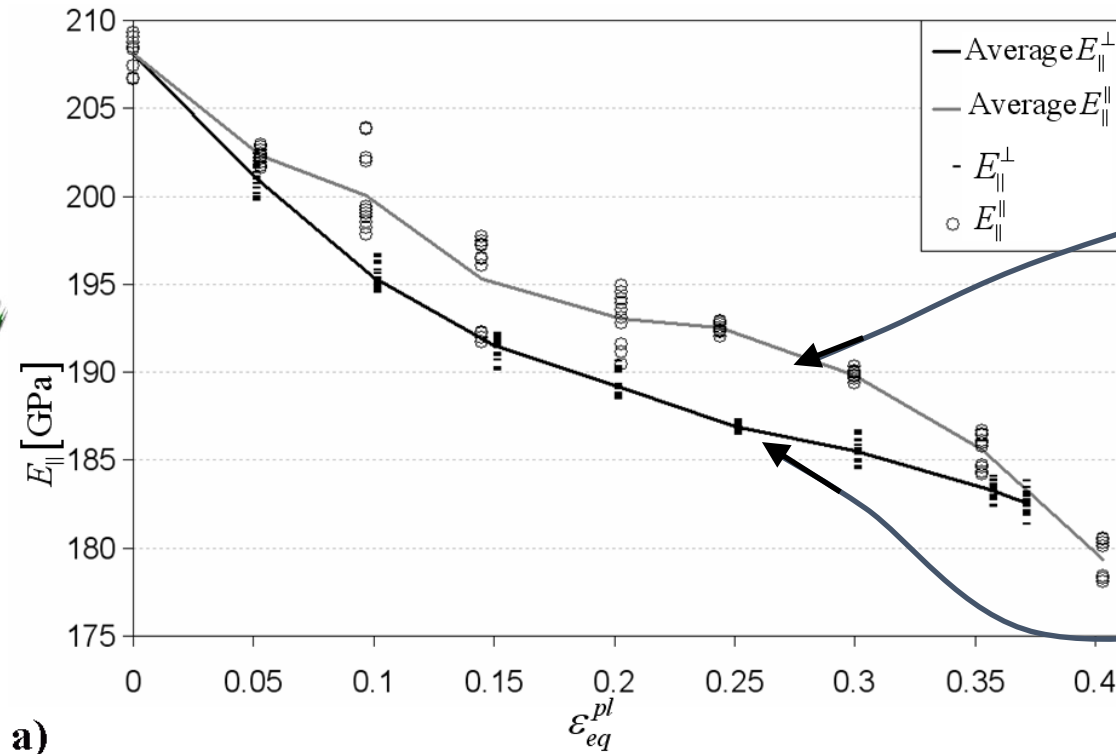
Kitchen oven during heating



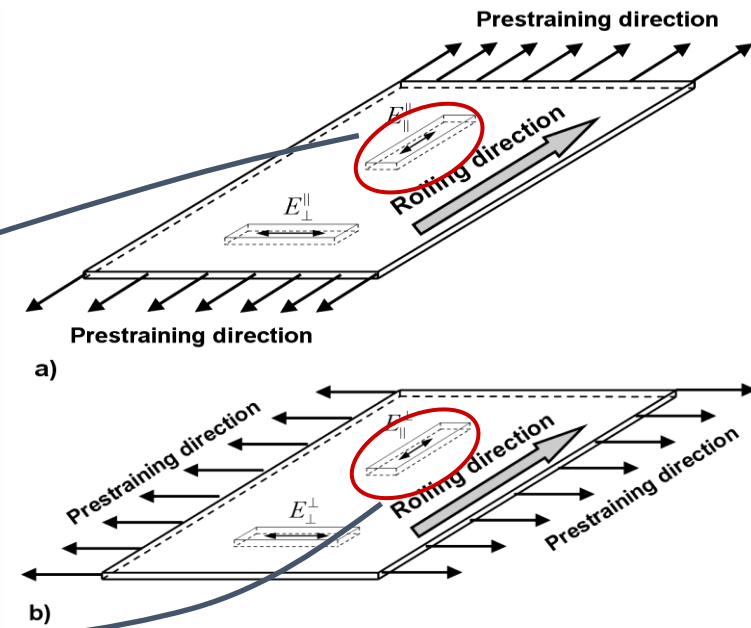
Springback



Young's modulus degradation



a)





Earing prediction

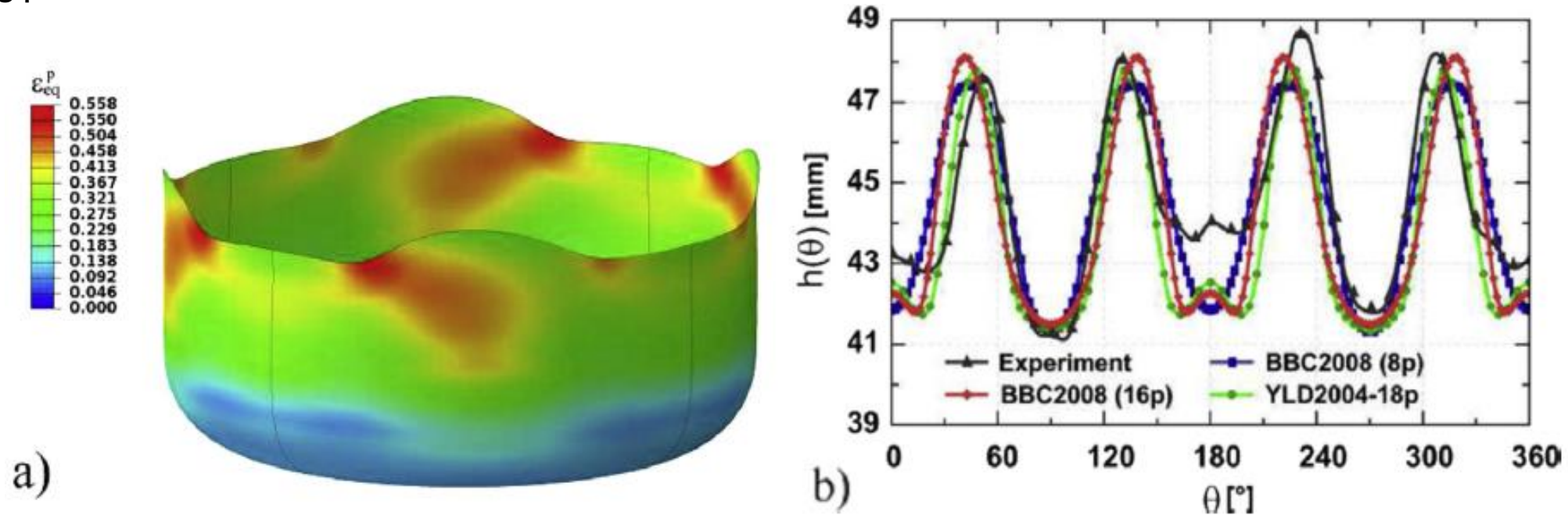
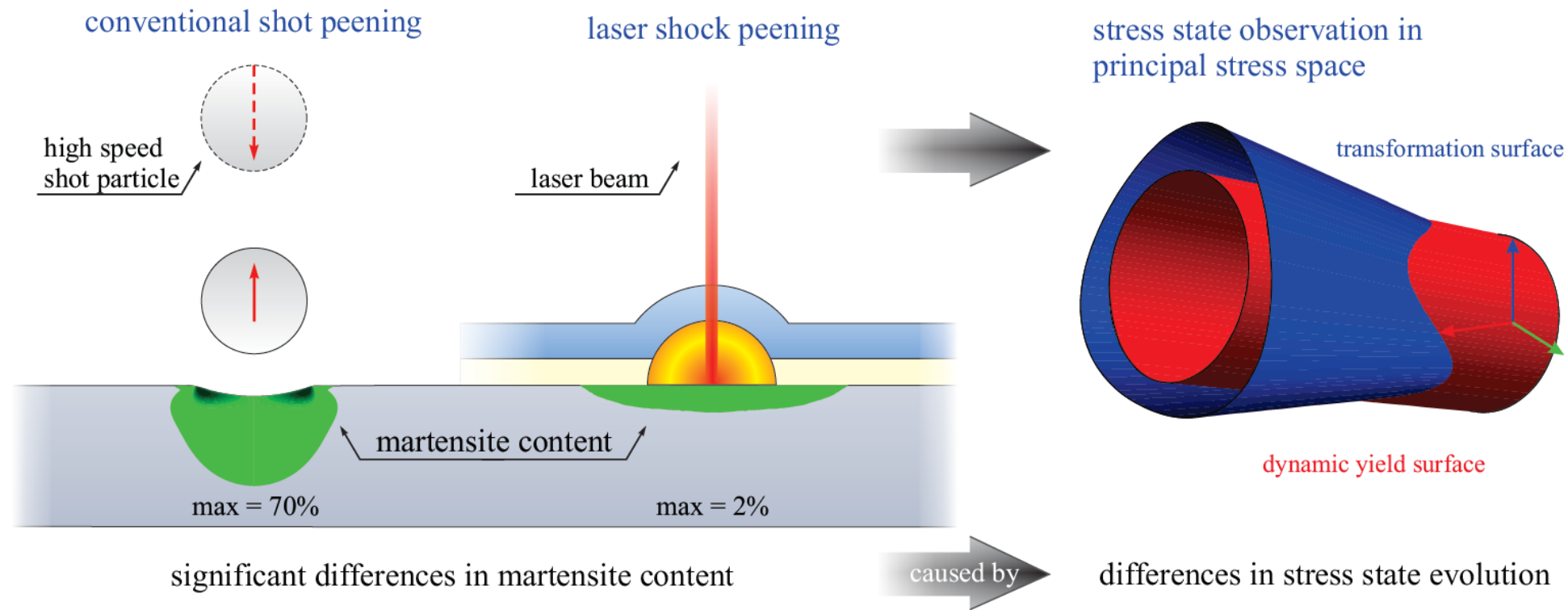
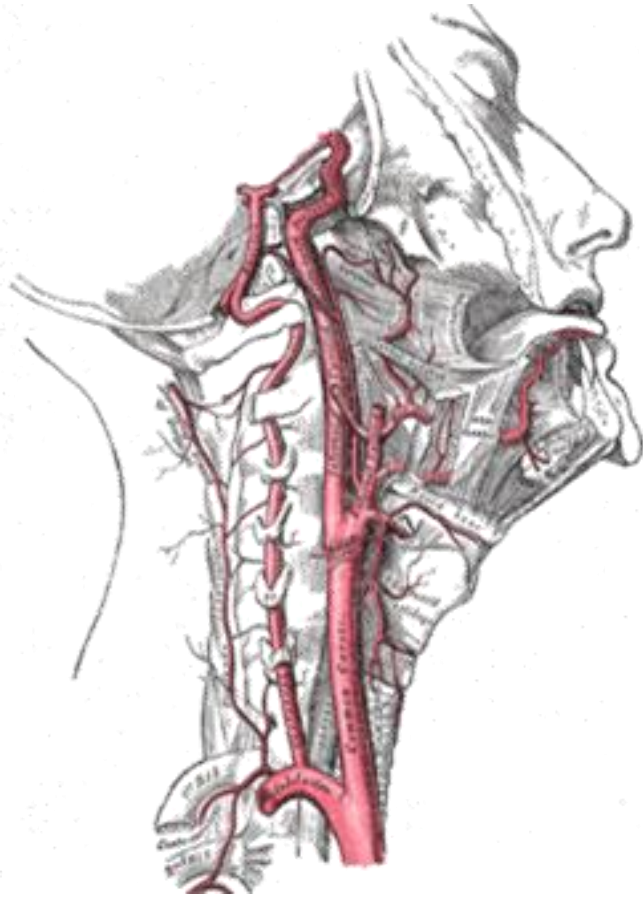


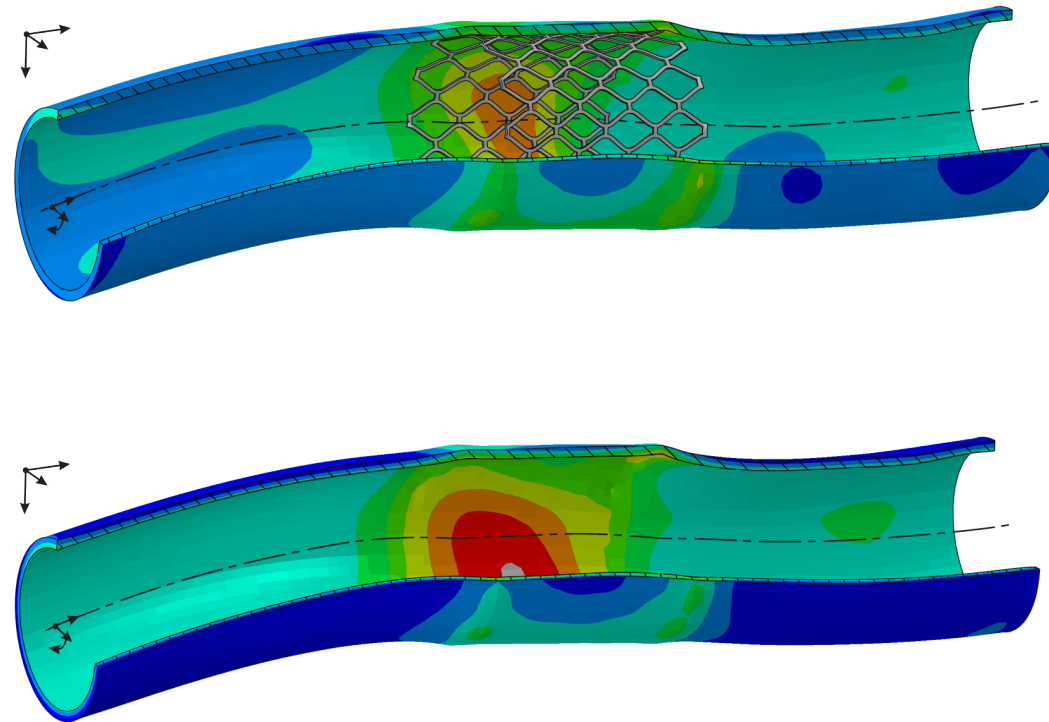
Fig. 11. Experimental vs. numerical earing prediction for aluminum AA2090-T3.

## Deformation-induced phase transformation



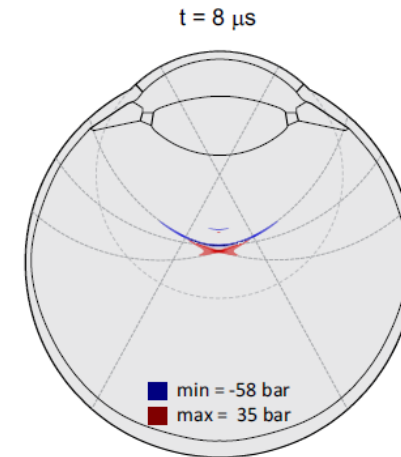
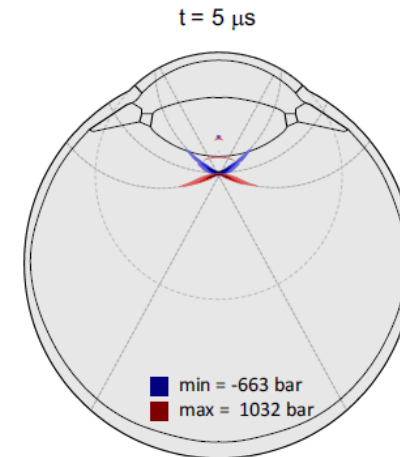
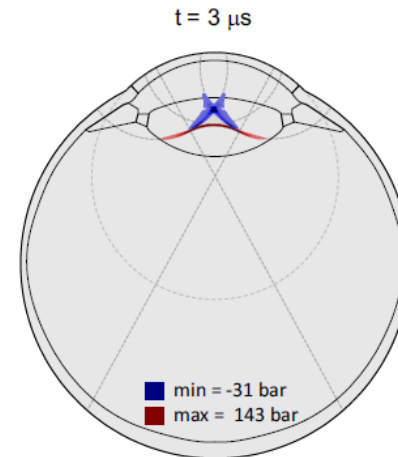
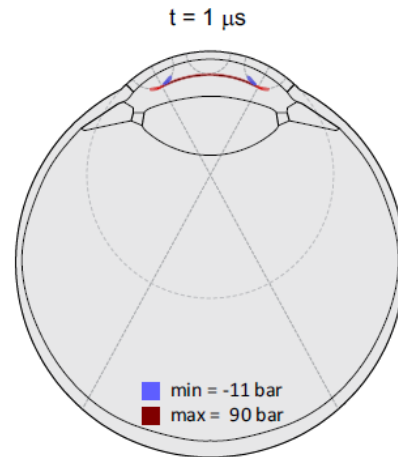
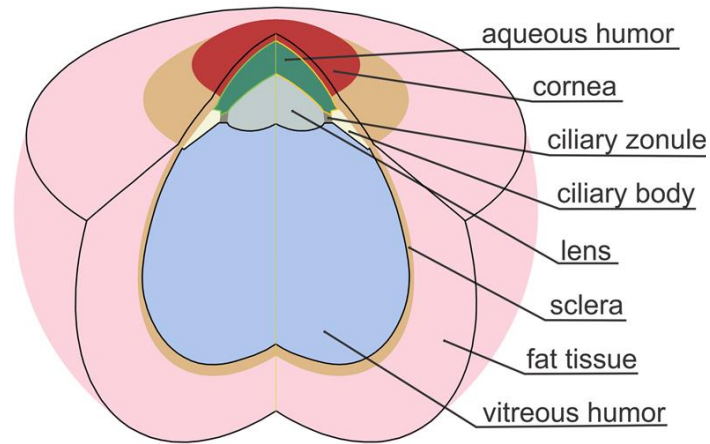
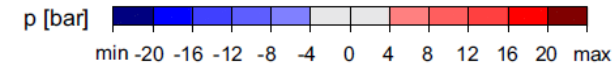


Residual stresses in carotid artery and stent insertion

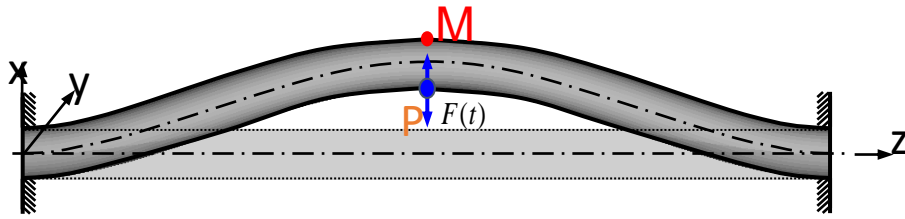


## Eye laser surgery

acoustic pressure evolution – 6.5 mm spot diameter

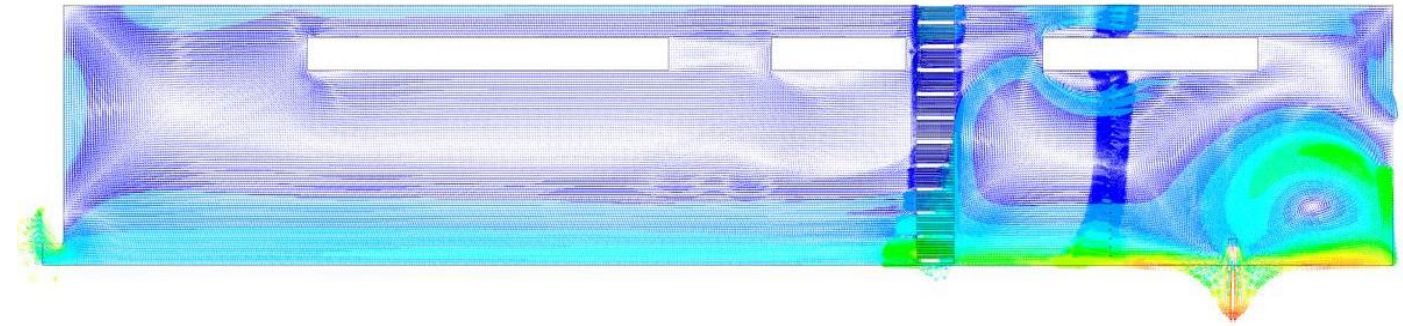


### Coriolis flowmeter

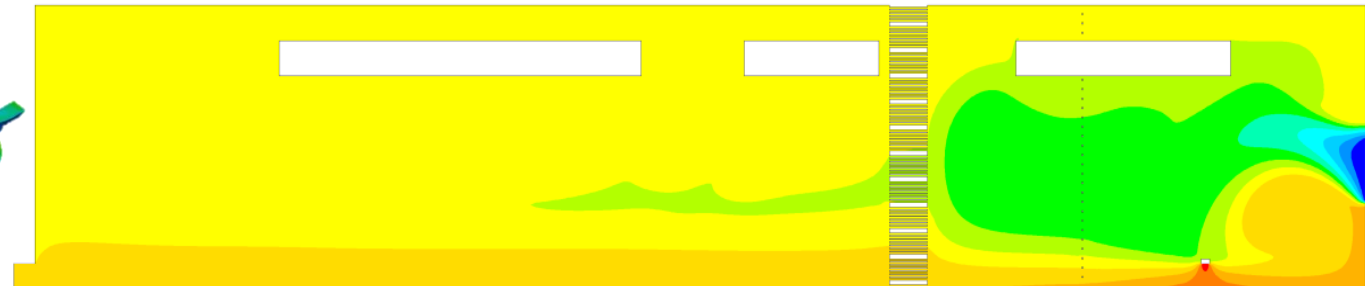


### Thermo-hydraulic simulation

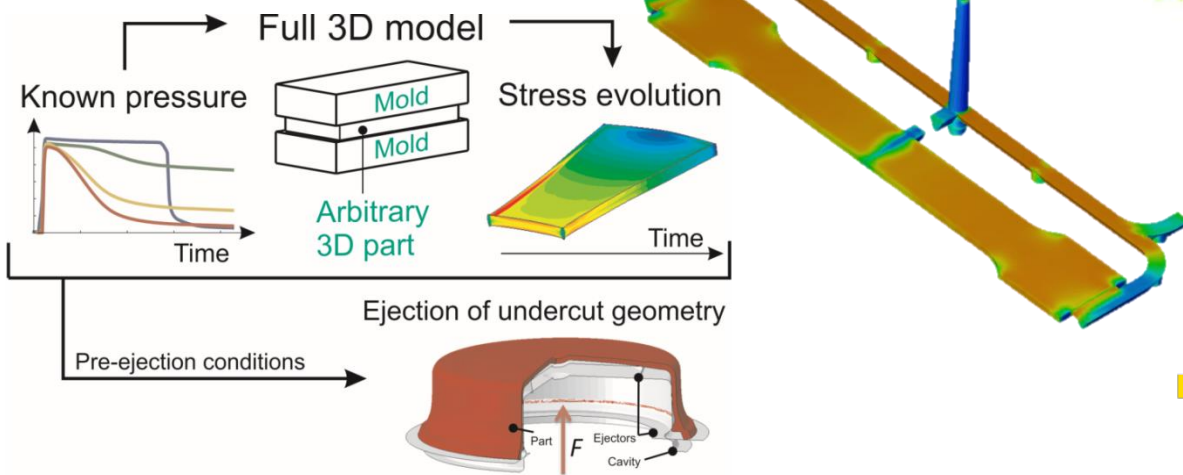
#### velocity



#### Temperature

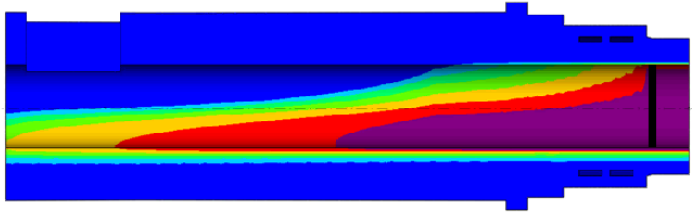


### Injection moulding

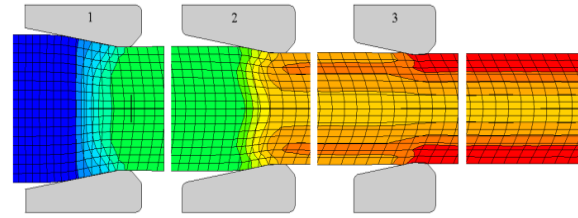


# Simulation of technol. processes SCtrain | SUPERCOMPUTING KNOWLEDGE PARTNERSHIP

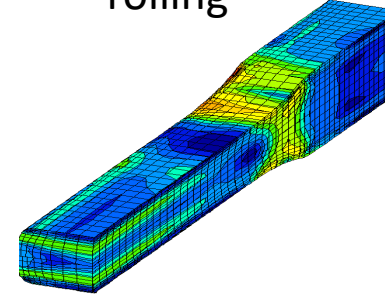
die casting



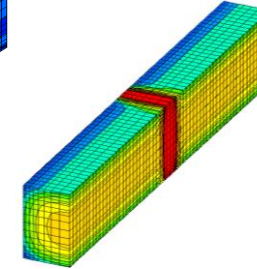
extrusion



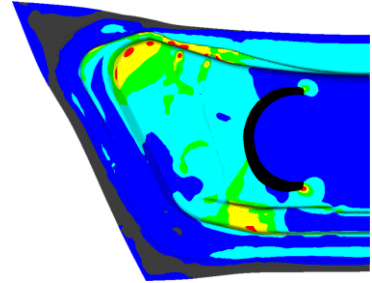
rolling



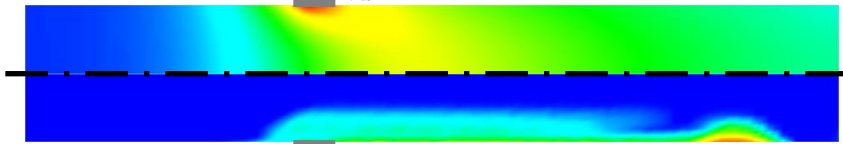
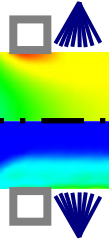
welding



deep drawing, stamping

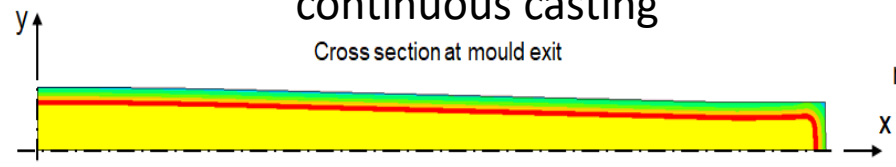


induction heating

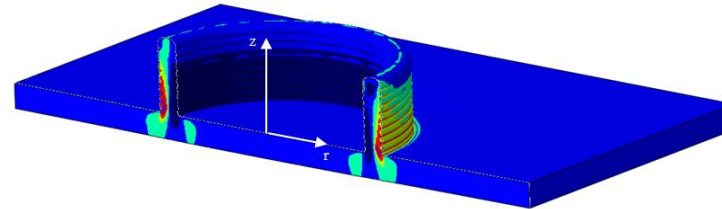


continuous casting

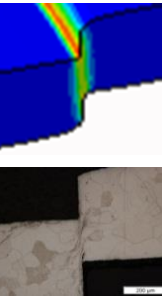
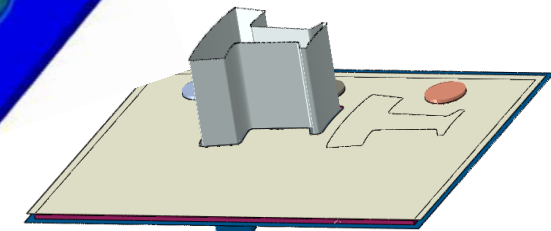
Cross section at mould exit



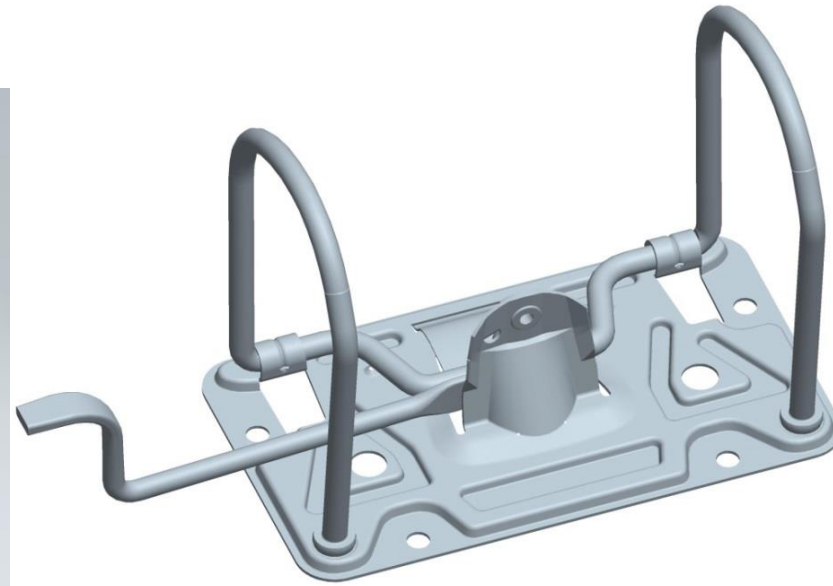
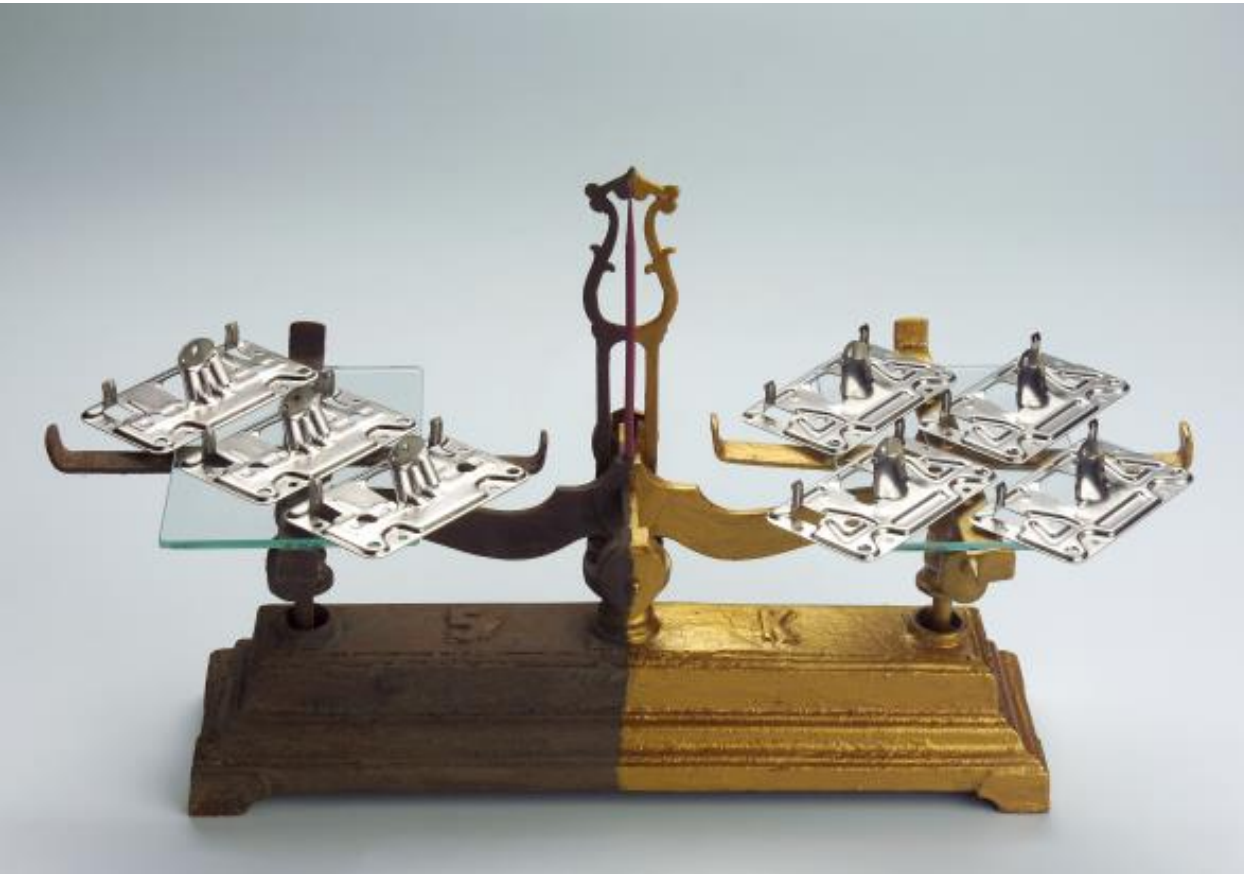
additive manufacturing



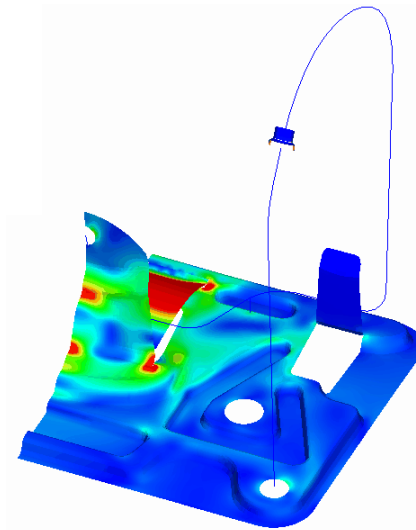
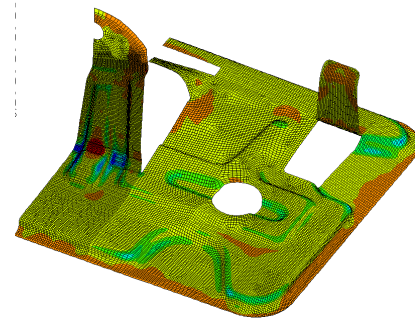
blanking



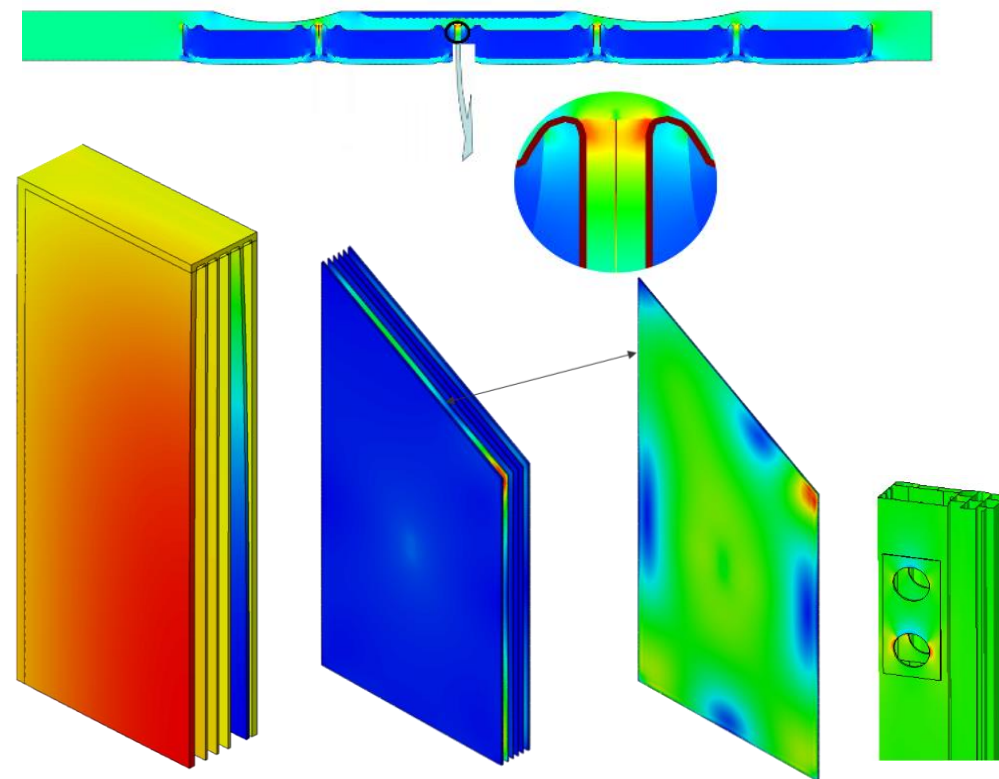
Lever-arch mechanism



**Optimisation of product**  
**Material savings: 25%**  
**European market share: 40 %**



## Highly insulative gas-filled multipane facade unit





# Product development

Highly insulative gas-filled multipane facade unit



## UL-FME, Laboratory for Numerical Modelling and Simulation (LNMS)

miroslav.halilovic@fs.uni-lj.si

<https://web.fs.uni-lj.si/lnms>

Thank you for your attention!

<http://sctrain.eu/>

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