

# Cast3M: the PASAPAS procedure and the user's procedures

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## Summary

- Reminders reminders on Cast3M and **PASAPAS**
- How works **PASAPAS**
- Mechanical static equilibrium - procedure **UNPAS**
  - exercice 1: **following force**
  - exercice 2: **fracture by elements removal**
- How works **TRANSNON** (thermal)
  - exercice 3: **variable heat source**
  - exercice 4: **thermo-mechanical contact**

## What is Cast3M?

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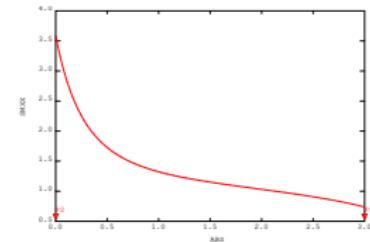
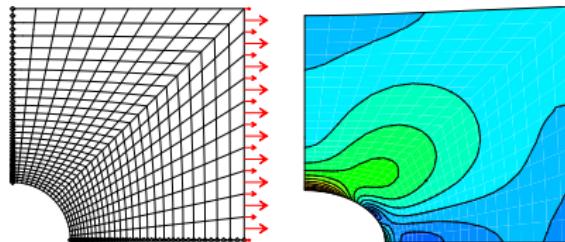
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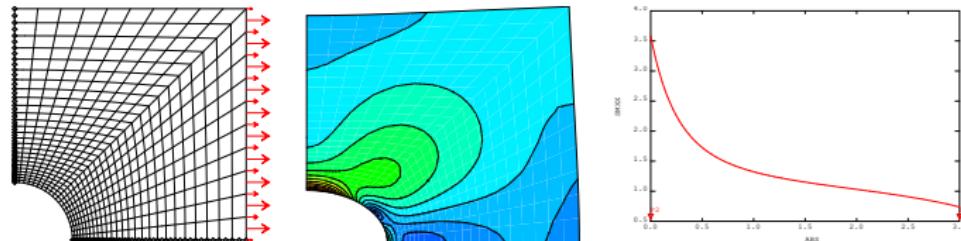
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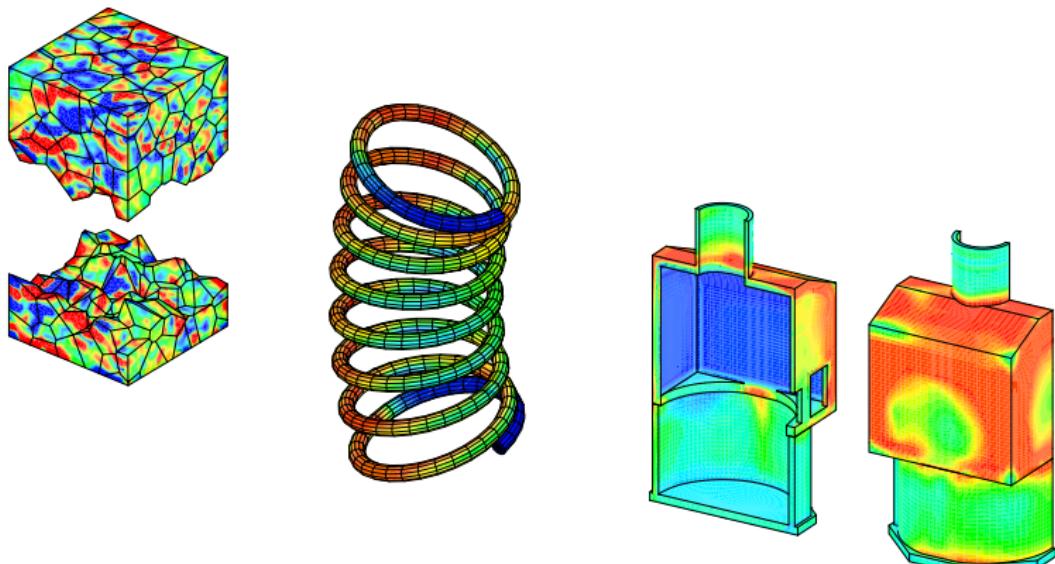


- Based on a programming language: **Gibiane** (objet-oriented)

## Wide range of applications

- **Structural mechanics**

Quasi-static (non linear behavior, geometry, boundary conditions)



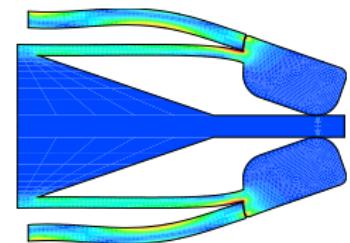
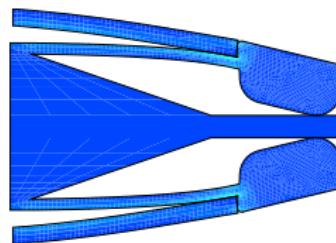
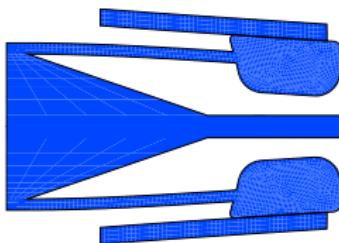
(S. Durand)

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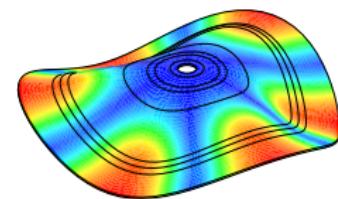
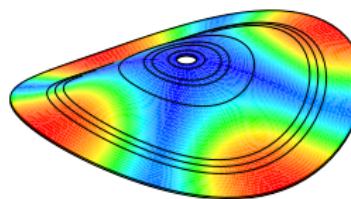
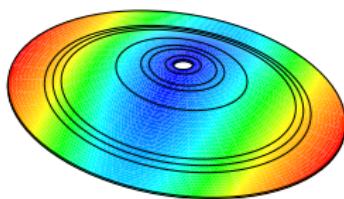
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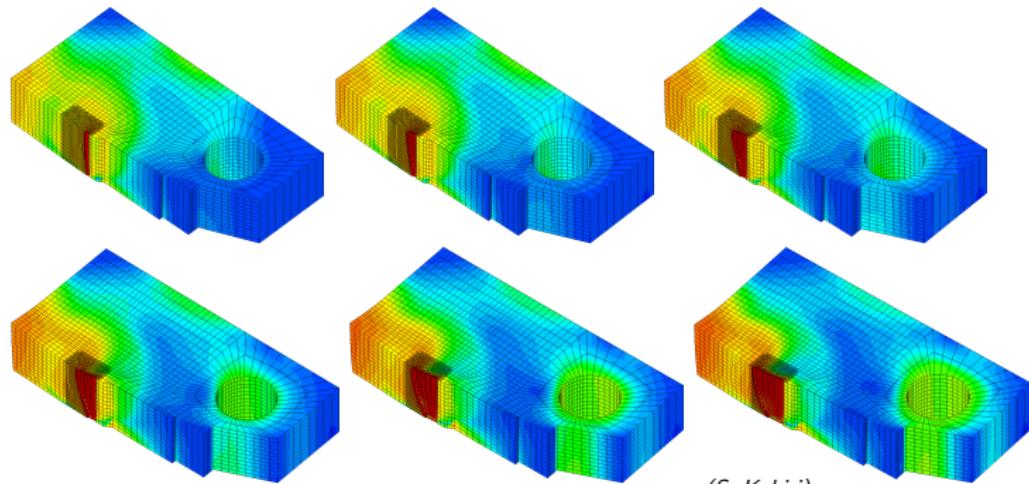
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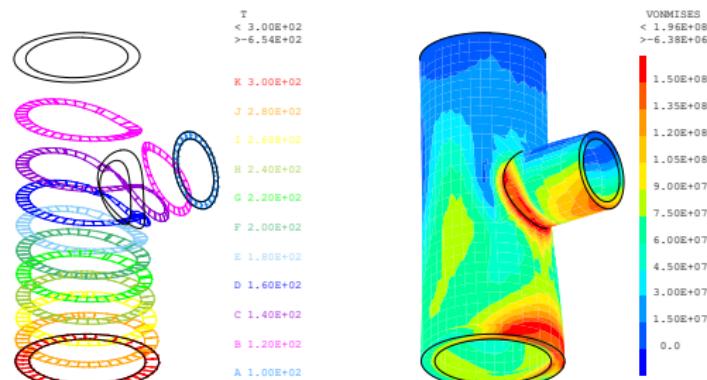
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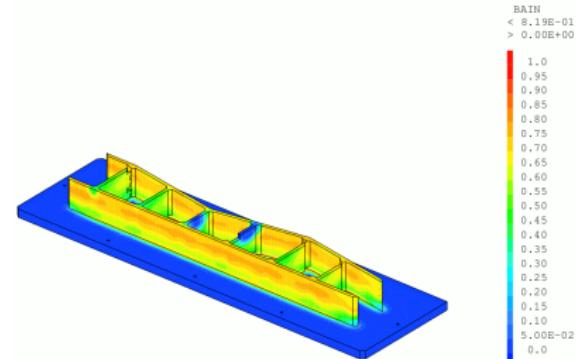
- **Fluid mechanics**

- Multi species **diffusion** (Fick's law)

- Magneto-statics

- Metallurgy

- Thermo-hydro-mechanics coupling



(C. Berthinier)

## The PASAPAS procedure

- Objective
  - incremental solving of *non linear progressive thermal* and *mechanical* problems
  - time can be physical (e.g. thermal transients)  
or not (e.g. plasticity with progressive loading)
  - time or pseudo-time is called the *evolution parameter*
- Non linear phenomena considered
  - behavior** (plasticity, damage, variable material properties, etc.)
  - geometry** (large displacements)
  - strains** (large rotations)
  - boundary conditions** (radiation, friction, following pressure, etc.)

## PASAPAS use

- **Create a table** containing all the data:

```
tab1                      = TABL ;
tab1 . 'MODELE'           = mod1 ET mod2 ;
tab1 . 'CARACTERISTIQUES' = mat1 ET mat2 ;
tab1 . 'BLOCAGES_MECANIQUES' = blo1 ;
tab1 . 'CHARGEMENT'       = cha1 ET cha2 ET cha3 ;
tab1 . 'TEMPS_CALCULES'   = PROG 0.1 'PAS' 0.1 50. ;
tab1 . 'TEMPS_SAUVES'     = PROG 4. 8. 15. 16. 23. 42. ;
tab1 . 'PRECISION'        = 1.E-6 ;
tab1 . 'GRANDS_DEPLACEMENTS' = VRAI ;
```

- **Procedure call:**

```
PASAPAS tab1 ;
```

- **Results post-processing**

# Overview of input parameters

- General

MODELE (MMODEL)  
CARACTERISTIQUES (MCHAML)  
CHARGEMENT (CHARGEML)

Equations to solve, F. E. formulation (**MODE**)  
Material and/or geometrical parameters (**MATE**)  
Boundary conditions and loading variation during calculation (**CHAR**)

- Thermal analysis

BLOCAGES\_THERMIQUES (RIGIDITE)  
CELSIUS (LOGIQUE)  
TEMPERATURES . 0 (CHPOINT)

Stiffness matrix for DIRICHLET B.C. (**BLOQ**)  
=VRAI (true) if temperature unit is Celsius  
Initial conditions

- Mechanics

BLOCAGES\_MECANIQUES (RIGIDITE)  
GRANDS\_DEPLACEMENTS (LOGIQUE)  
DEPLACEMENTS . 0 (CHPOINT)  
CONTRAINTE . 0 (MCHAML)  
VARIABLES\_INTERNES . 0 (MCHAML)  
DEFORMATIONS\_INELASTIQUES . 0 (MCHAML)

Stiffness matrix for DIRICHLET B.C. (**BLOQ**)  
Equilibrium checked on the deformed mesh  
Initial conditions  
Initial conditions  
Initial conditions  
Initial conditions