

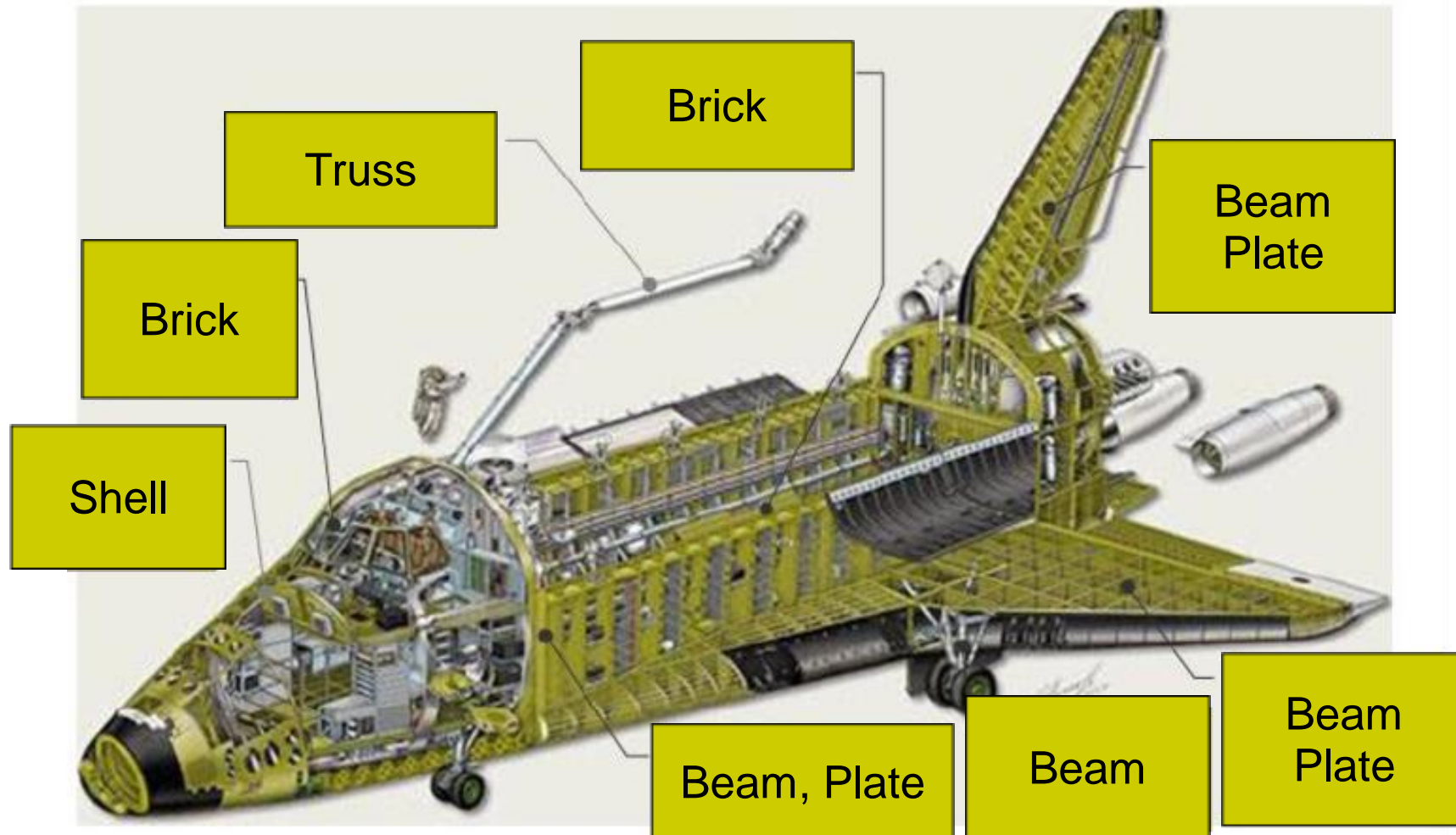
Applications of Finite Element Method

Wole Soboyejo
Jing Du
9/6/2011





Aircraft Design





Aircraft Parts Strengthening

EADS Military Air Systems

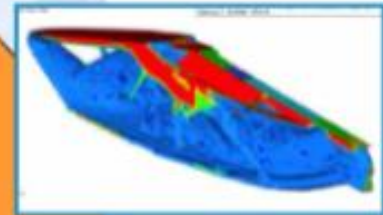
A350 Flap Tracks



Concept Design

Design Space

3D-Topology



Design Concept



Conceptual Sizing Optimization

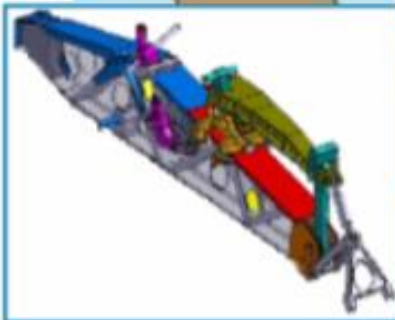


Manufacturing
Realised Part

CAE
Detailed Analysis and
Verification

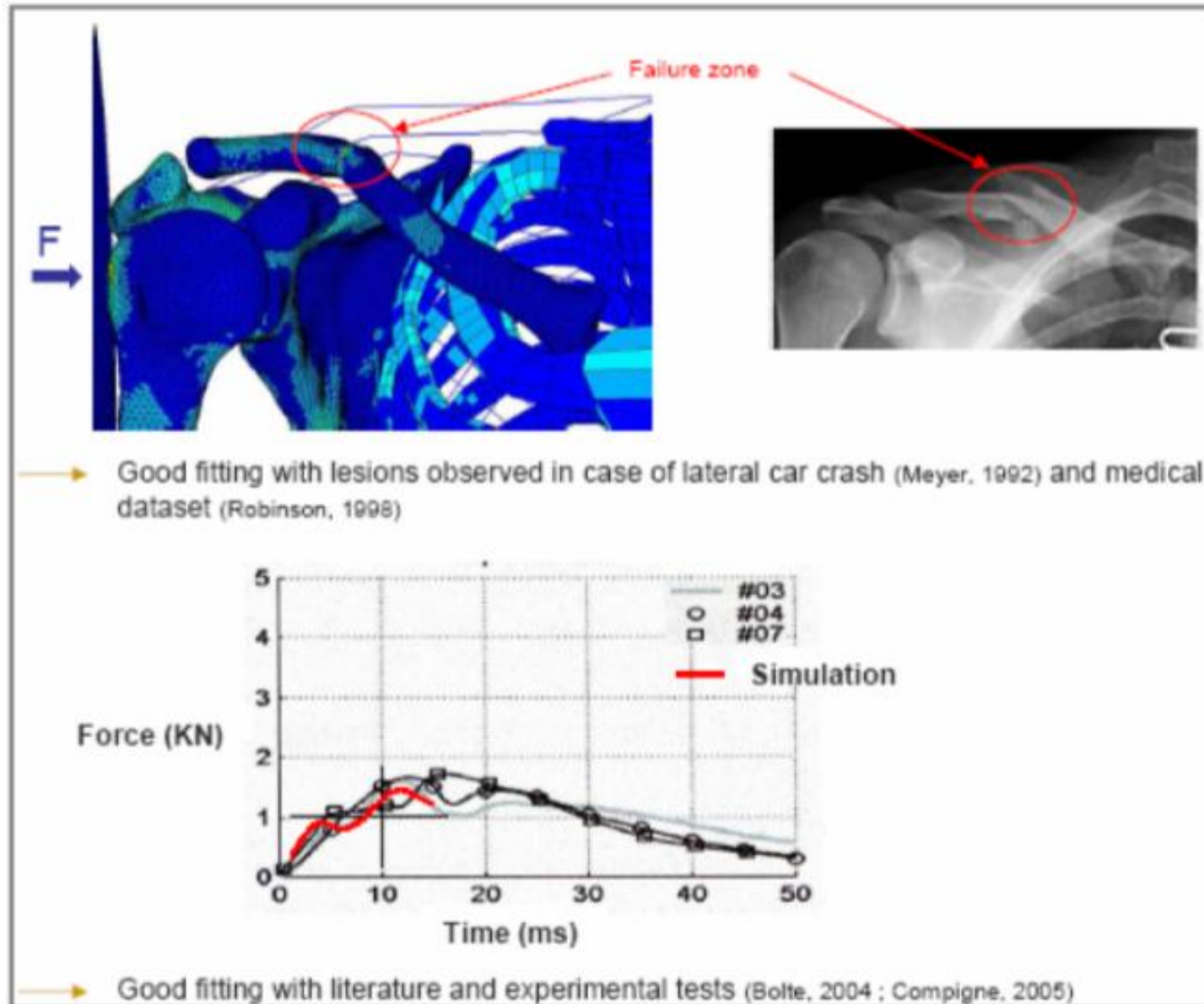
CAD
Geometry Model

Part





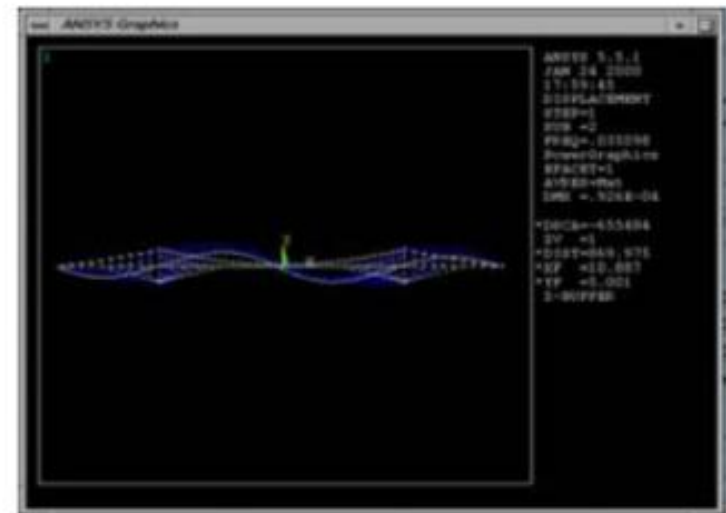
Skeleton in a Car Crash



Civil Engineering and Dynamic Analysis



Double-sided Suspension Bridge



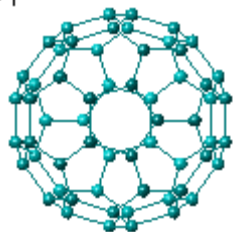
Dynamic Response of the Bridge

Nanomaterials and Raman Spectrum



Group Theory : $\Gamma_{C60} = 2A_g + 3T_{1g} + 4T_{2g} + 6G_g + 8H_g + A_u + 4T_{1u} + 5T_{2u} + 6G_u + 7H_u$

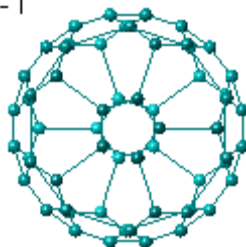
Irrep dimension: 1
This is 1-1
 $I_h : A_g(1)$
Raman



Serial No:24

Wave Num.:
443
 cm^{-1}

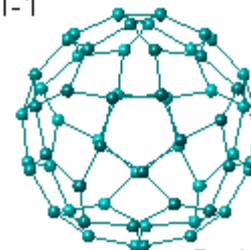
Irrep dimension: 1
This is 1-1
 $I_h : A_g(2)$
Raman



Serial No:151

Wave Num.:
1599
 cm^{-1}

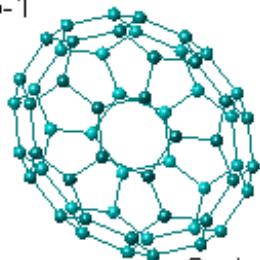
Irrep dimension: 1
This is 1-1
 $I_h : A_u(1)$



Serial No:92

Wave Num.:
795
 cm^{-1}

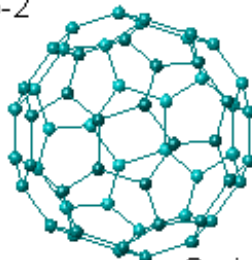
Irrep dimension: 5
This is 5-1
 $I_h : H_g(1)$
Raman



Serial No:7

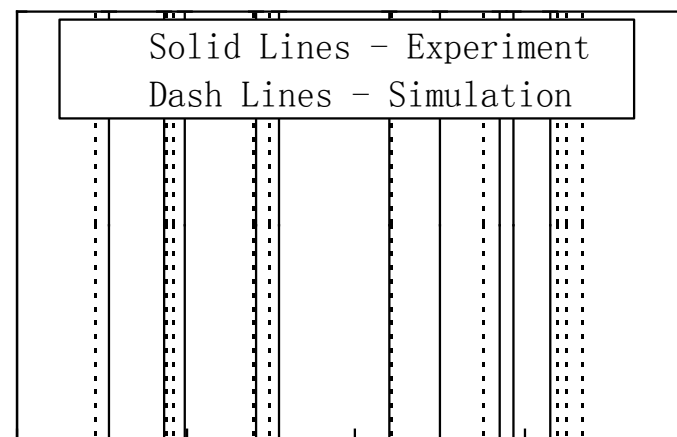
Wave Num.:
232
 cm^{-1}

Irrep dimension: 5
This is 5-2
 $I_h : H_g(1)$
Raman



Serial No:8

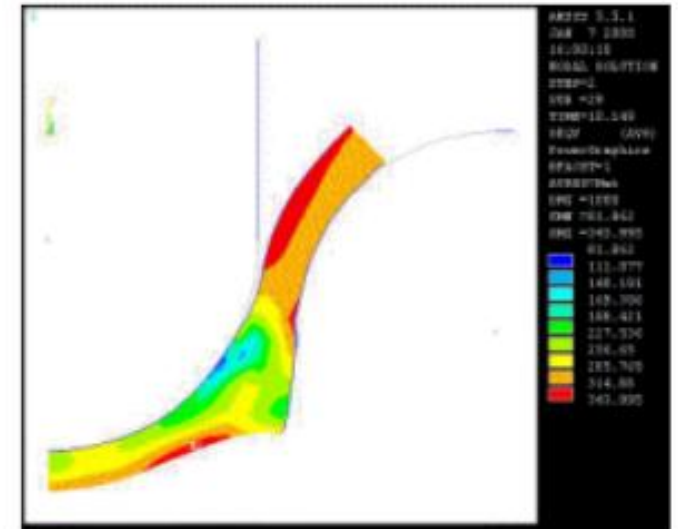
Wave Num.:
232
 cm^{-1}



0 500 1000 1500 2000
Frequency (1/cm)

Raman Spectrum

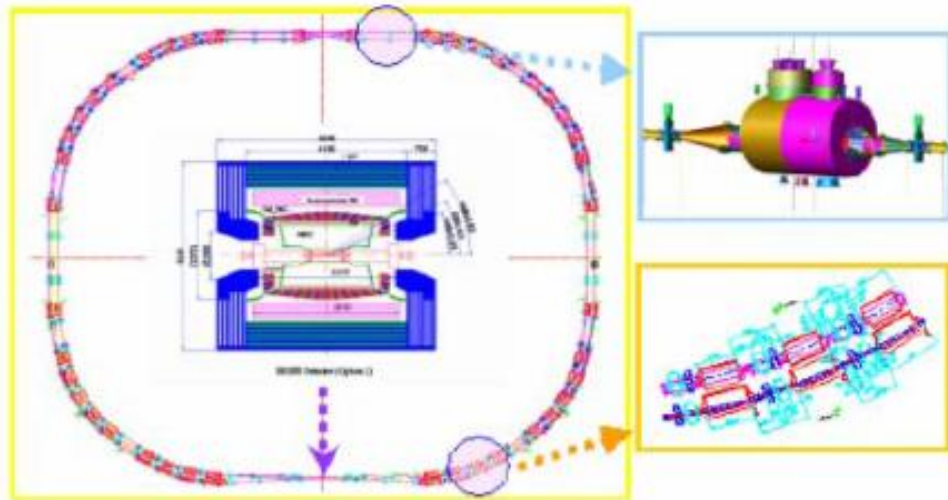
Forging Process and Contact Problem



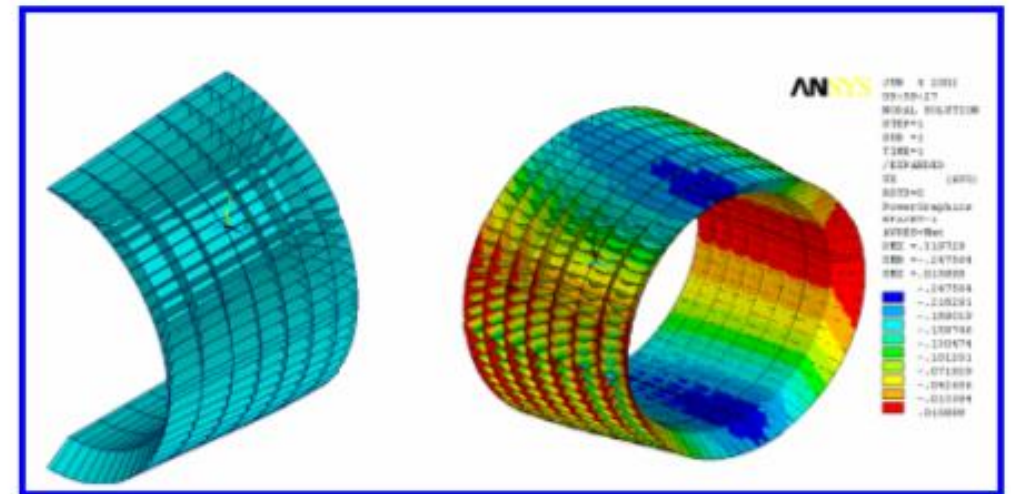
Nuclear Power Pressure Container Cap
(Weight of 3 tons)

FEM of the Forging Processes

High Energy Physics and Element Birth and Death

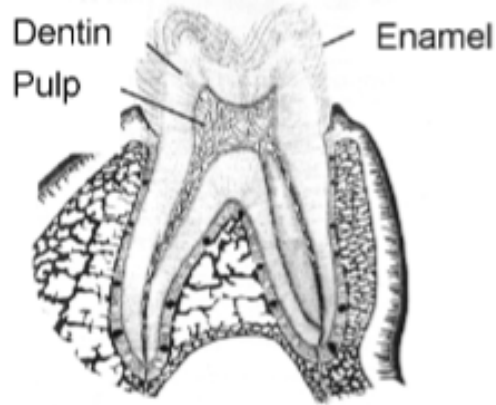


Large Electron Collider BESIII

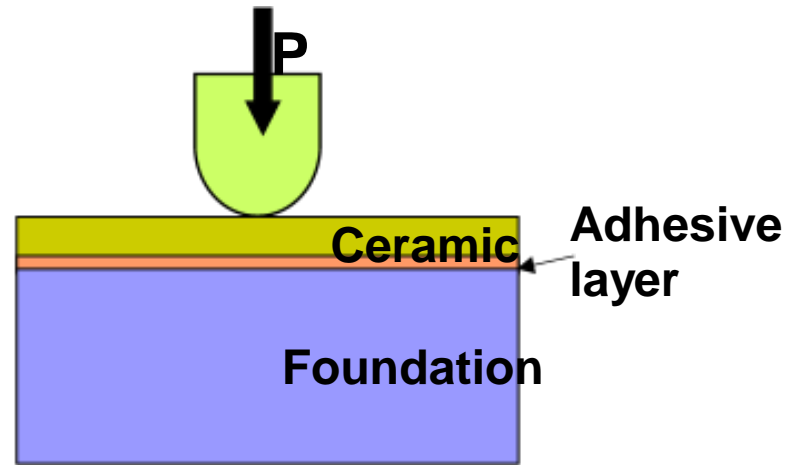


FEM with Element Birth and Death Techniques

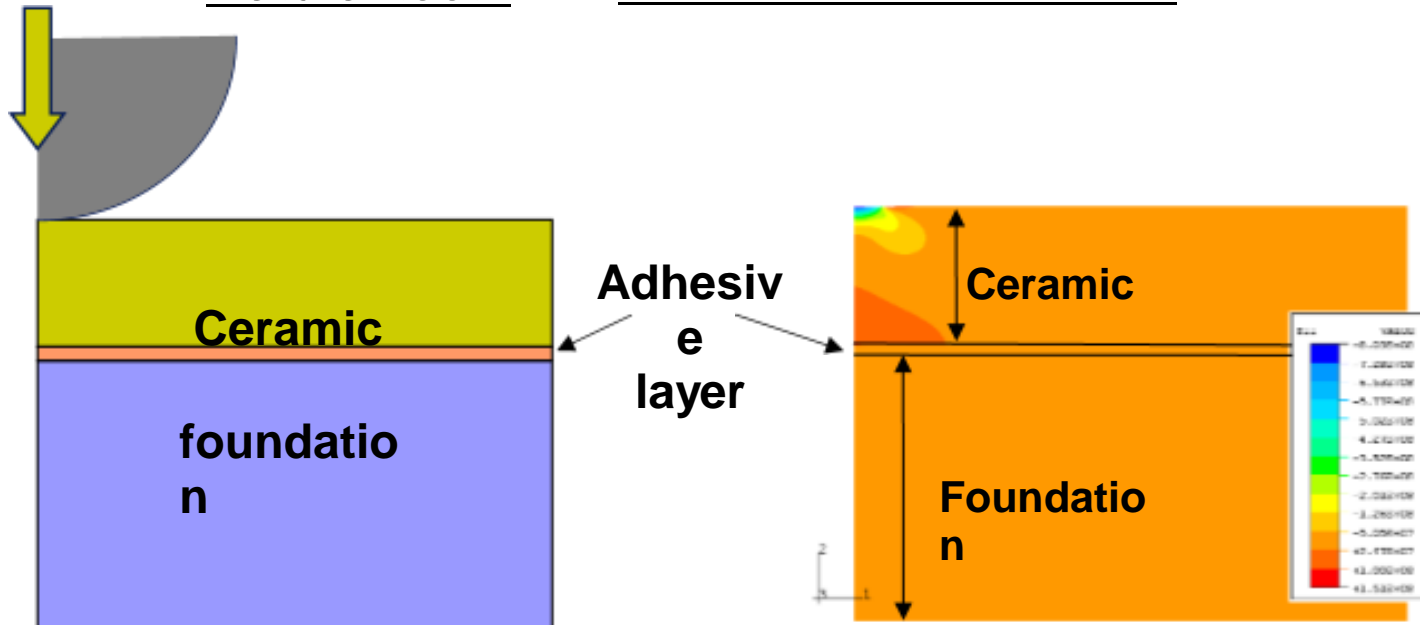
Dental Multilayers Design



Natural tooth



Model: Hertzian contact

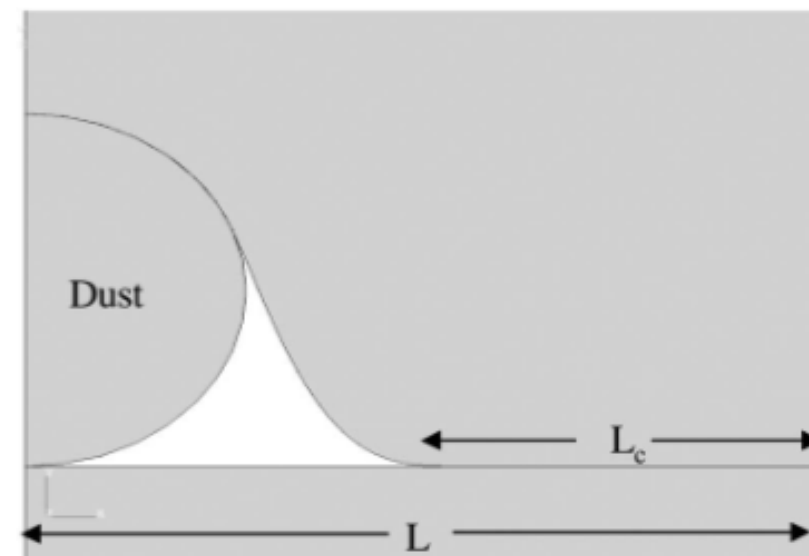
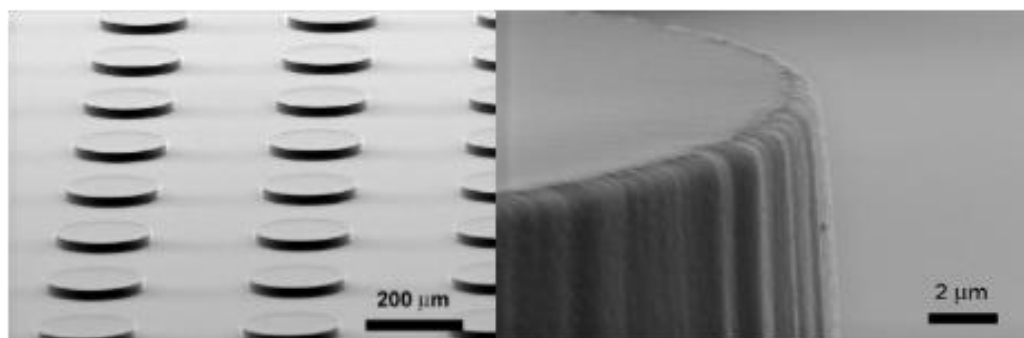
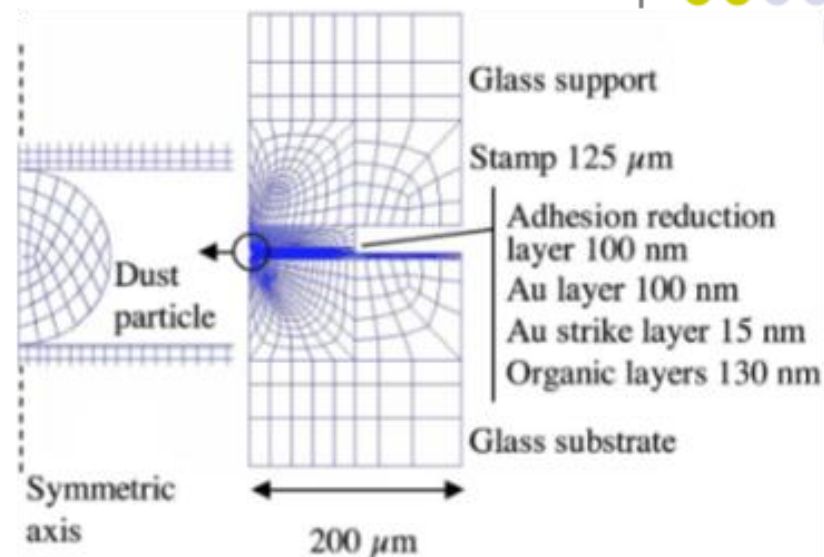
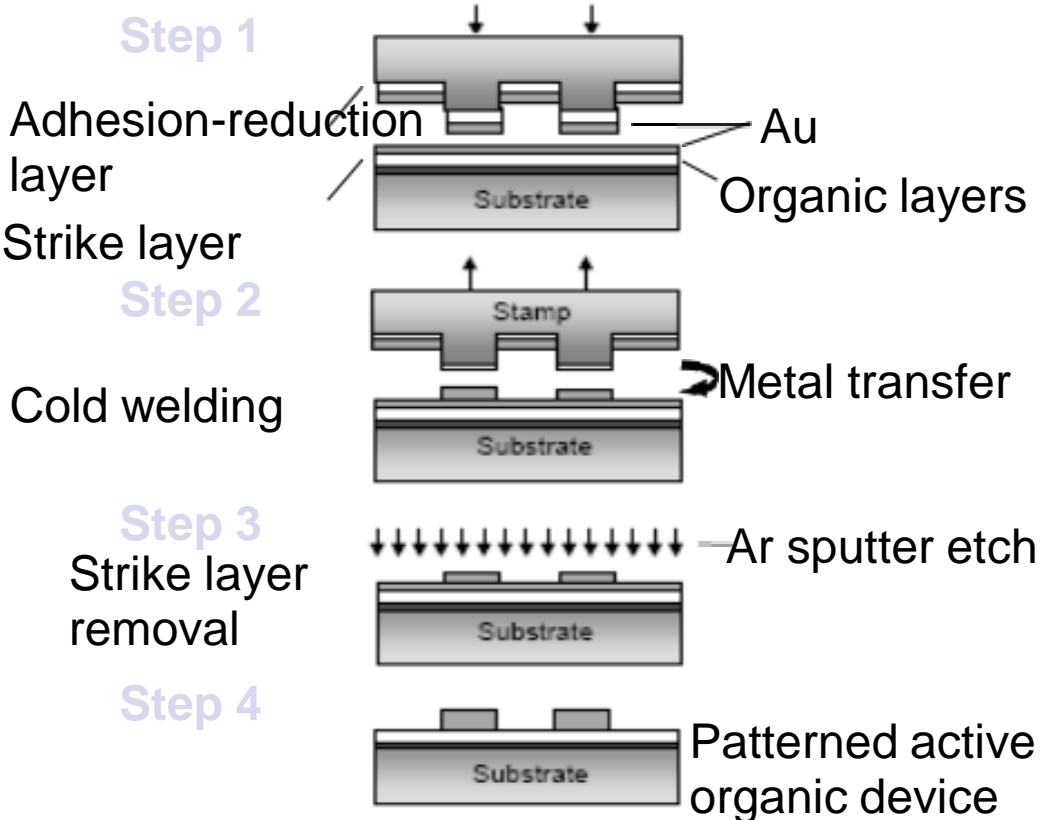


Cone crack



Subsurface crack

Processing of Organic Electronic Devices

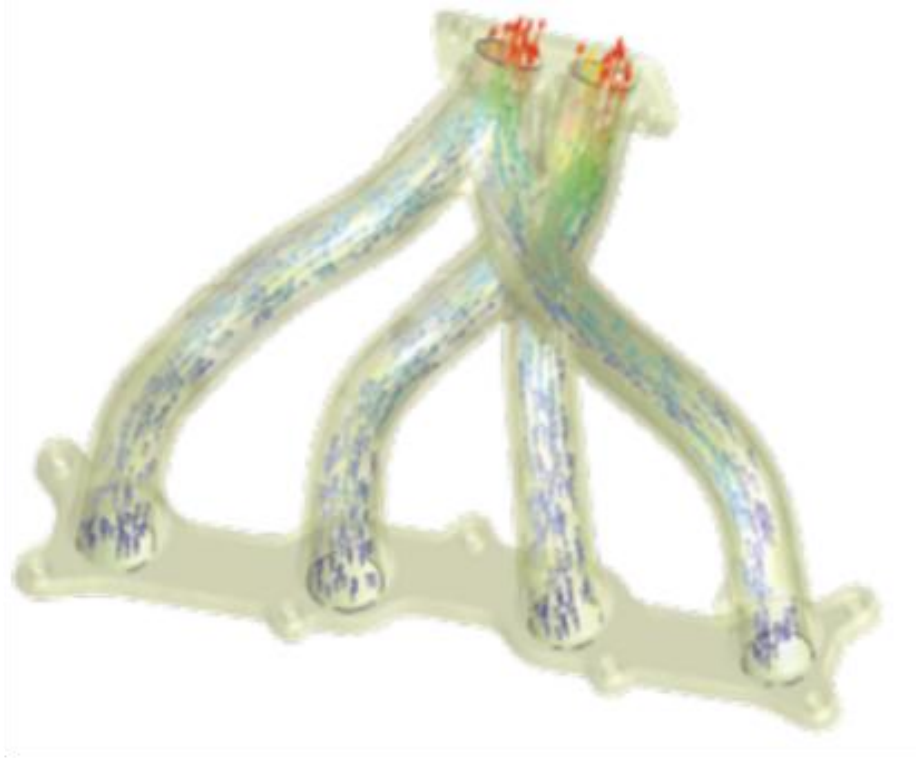


(Kim and Forrest, *Adv Mater*, 2003)

(Cao et al., *J Appl Phys*, 2005)



Heat and Fluid Dynamics



Manifold in an automobile engine

Smoothed Particle Hydrodynamics: A Meshfree Particle Method

