



The applied mechanics laboratory: A virtual guided visit and examples of collaboration with industry

Division of Applied Mechanics
Ångström Laboratory, Uppsala University
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Who?



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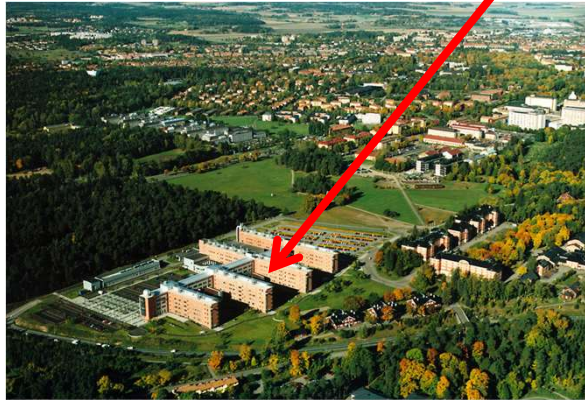
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Where?



Ångström Laboratory: House 4, floor 2



Where?

House 4, floor 2! The door is open.





Why?

- Industrial need



- Things should be designed not to break

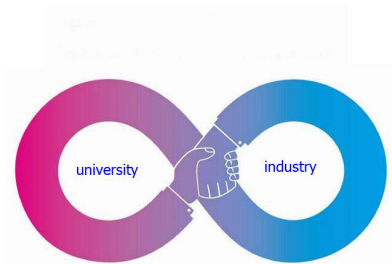


- Fundamental in engineering education



Industrial collaboration

1. Contract work...
2. Thesis projects (Bachelor or Master):
your place or my place?
3. Project work
4. Long-term projects (post-doc, PhD's)
including external funding



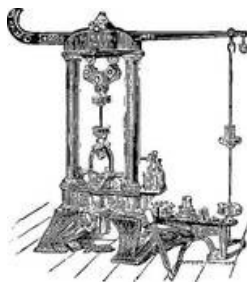


Examples of collaborative projects

- Cracking in coated packaging materials (Tetra Pak)
- Deformations in cellulose insulation materials (Hitachi Power Grids)
- Fracture in mechanics in packaging materials (SCA)
- Design of a new support structure for the Vasa ship



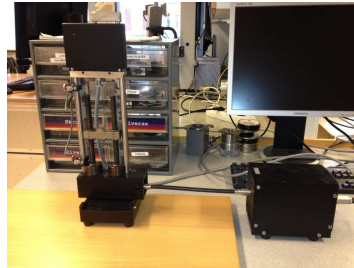
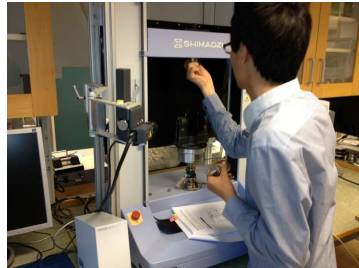
Laboratory equipment





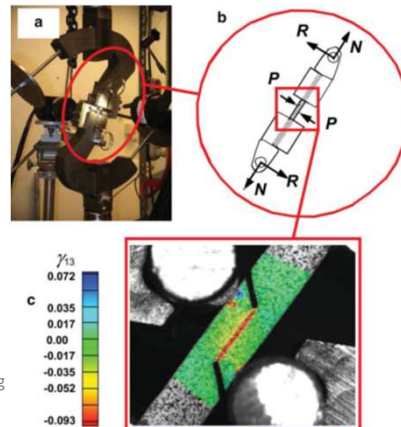
Mechanical testing

100 kN, 50 kN, 200 N, 50 N, 20 N load cells, optical extensometry
Instron (servohydraulic), Shimadzu, Scientific Rheometric



Strain fields from Digital image correlation

Aramis 3D from GOM



Pettersson, Neumeister, Gamstedt, Öberg
Composite Structures 2006

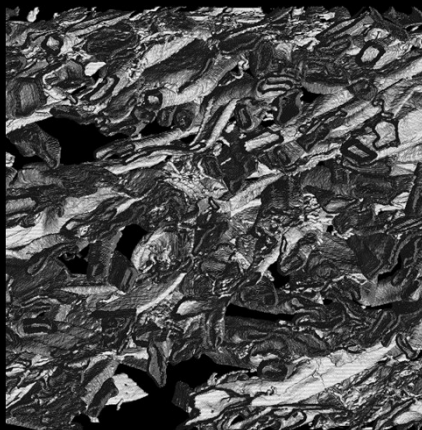


X-ray micro-computed tomography

Skyscan 1172, voxel resolution $\approx 1 \mu\text{m}^2$



3D μ CT image of wood fibre composite





In-situ mechanical testing in SEM

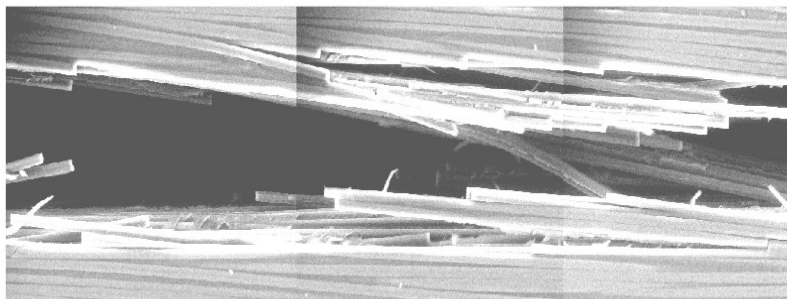
Hitachi 1000 SEM + ESD + 300 N tensile stage



Delamination in unidirectional continuous-fibre composites:



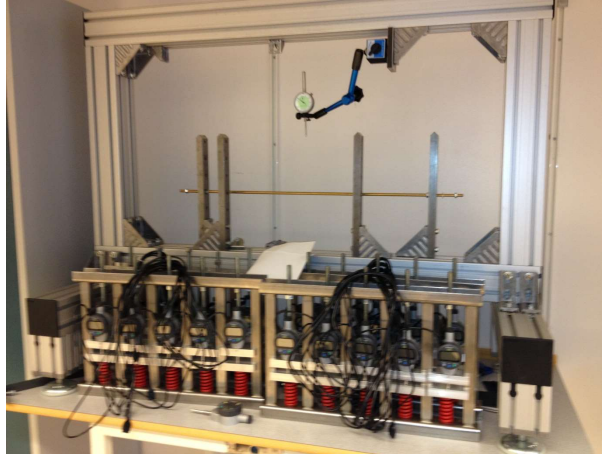
Cross-over fibre bridging



50 μm
↔

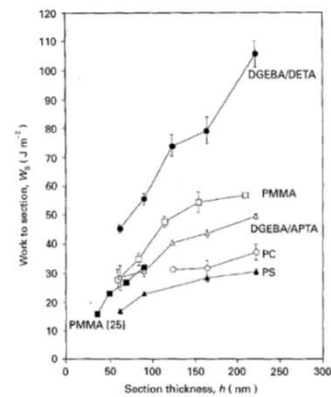
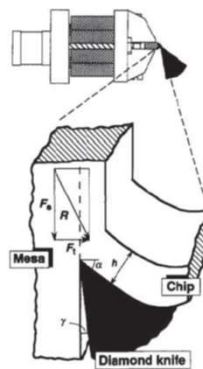
[Sørensen, Gamstedt, Østergaard & Goutianos, *Mechanics of Materials*, **40**, 220-234]

Creep rigs



Instrumented ultramicrotome

Nano/microscale fracture energy



Sun, Lindberg, Gamstedt 2016



3D imaging, in-situ testing and modeling



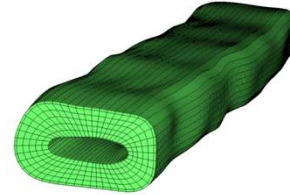
ESRF synchrotron, Grenoble



Skyscan 1172, in-situ tensile



Wood-fibre composite, μm res.



Numerical simulations

Joffe, Wernersson, Miettinen, Luengo Hendriks, Gamstedt, *Compos. Sci. Technol.* **74** 52-59.



Now over to...



Reza Afshar's camera!



UPPSALA
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