Low-density lipid (LDL) transport in arteries – experiment and modeling

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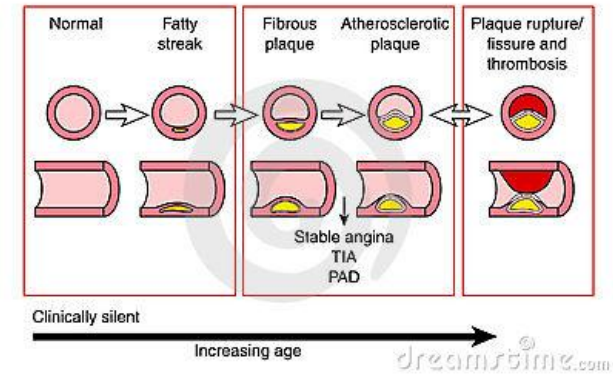
Atherosclerosis is a medical condition preceding stenosis;

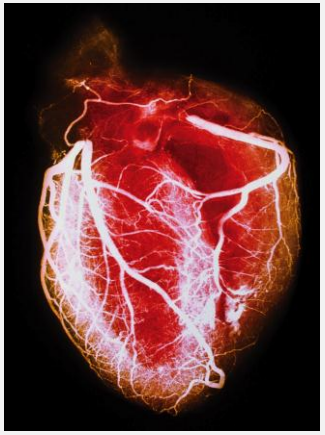
Is usually localized to the areas of arterial walls with higher concentrations of low density lipids (LDLs):

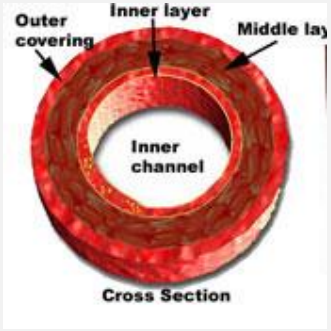


A comprehensive model of LDL accumulation within the arterial wall is crucial to better understanding of the involved processes leading to atherosclerosis.

Where engineering and medicine come together?

scaling concept

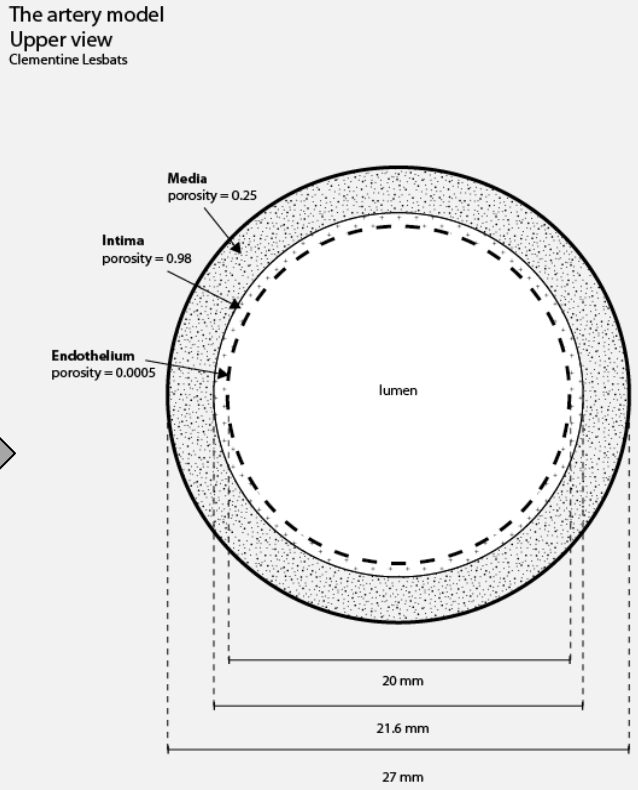




small

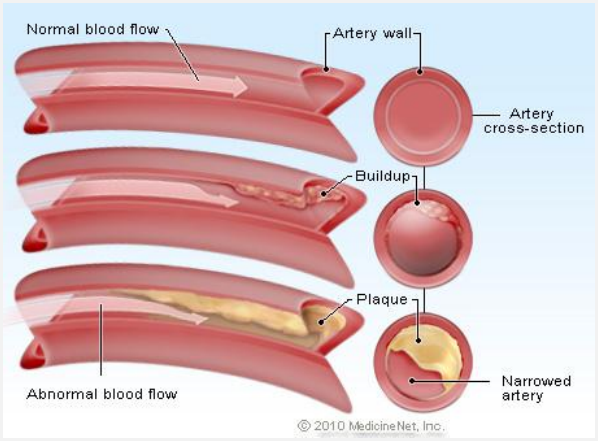
Length scales

large



Where do engineering and medicine come together?

scaling concept



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Length scales

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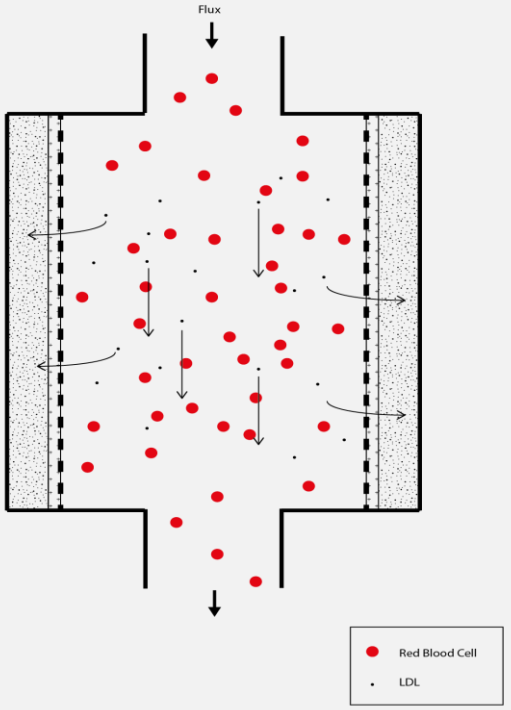
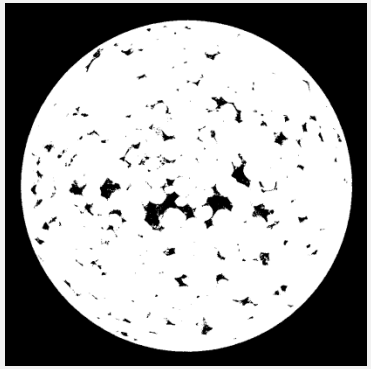
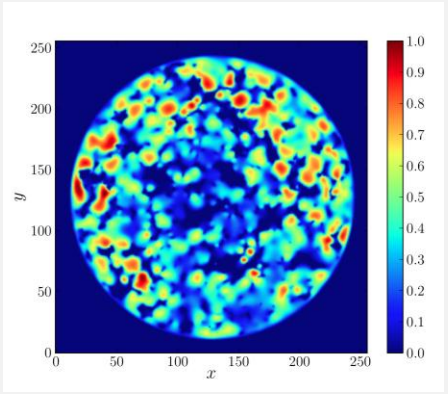


How efficient is our modeling: artificial media

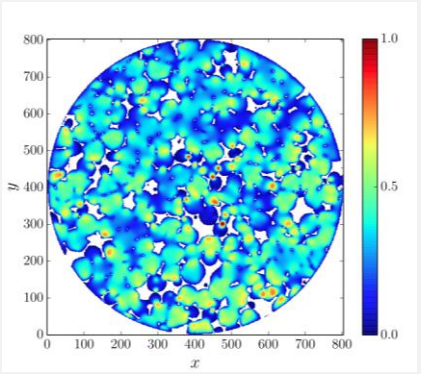
structure

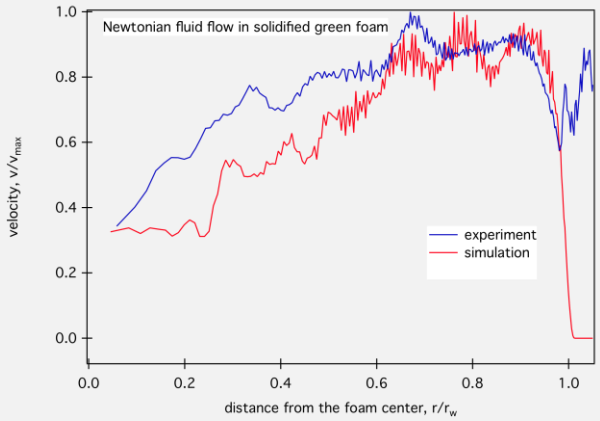


simulation



experiment

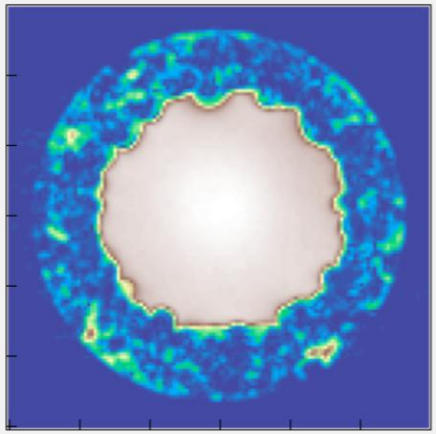




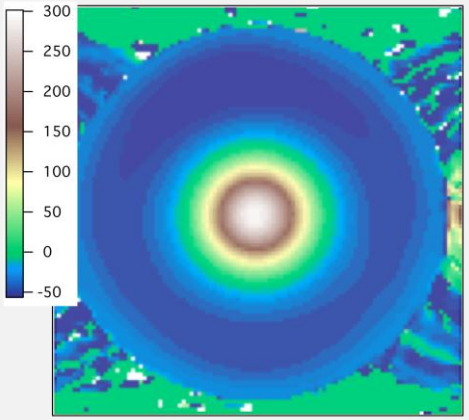
Dimensionless variables

How efficient is our experiment: artificial media

Non-invasive MRI fast RARE methods:



structure

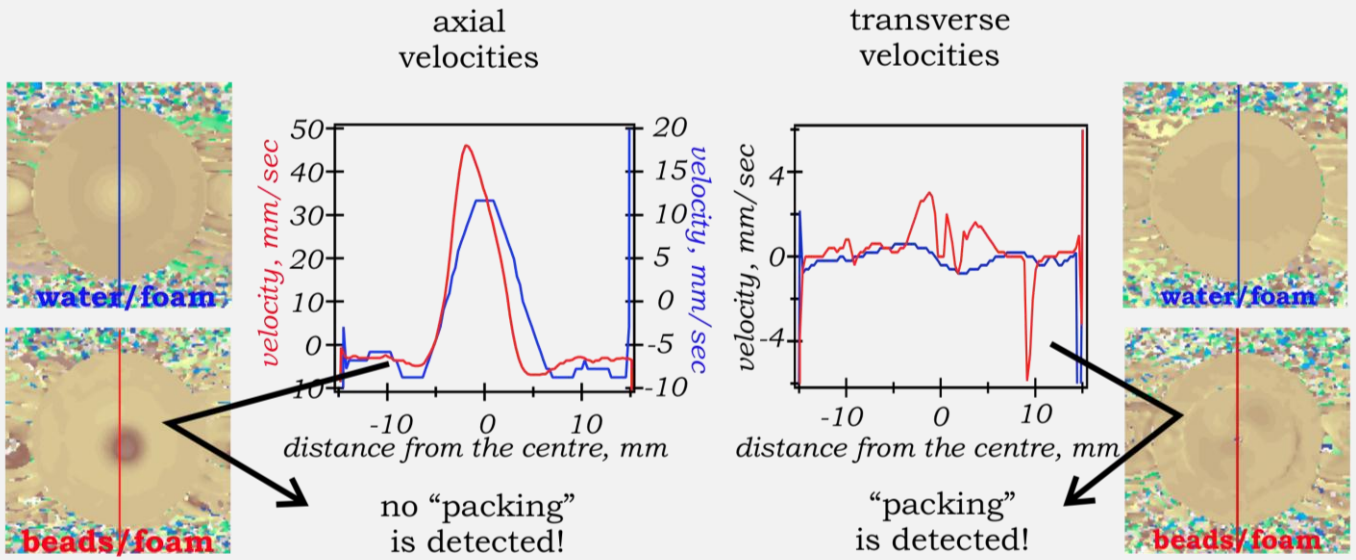


peak velocity match

3D data velocity collection is under 2 min

How efficient is our experiment: model media and fluids

Non-invasive MRI fast RARE methods:



non-invasive biomarkers

3D data velocity collection is under 2 min

Work in progress: manuscript in preparation.

Further perspectives: to compare experimental and computational outcomes of our model with velocity data obtained in patients.

Outcomes – value for money:

- conference presentation (ICMRM, 2013,Cambridge, UK);
- industrial studentship – Johnson Matthey;
- EPSRC grant application - submitted;
- manuscript – submitted Applied Catalysis A.

UNICAS experience:

- Jump starts higher impact interdisciplinary projects;
- Networking;

What kind of project would likely to be funded:

- Interdisciplinary nature of the project;
- Feasibility;
- Originality!

Thank you very much for your attention!