



Mechanobiology and biomechanical modeling of atheroma plaque initiation and development

Speaker: Estefanía Peña, Professor of Solid and Structural Mechanics, PhD
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Where: Stanley Quek Hall, Trinity Biomedical Sciences Institute

Atherosclerosis is the process in which plaques—consisting of deposits of cholesterol and other lipids, calcium and large inflammatory cells called macrophages—are built up in the walls of the arteries causing narrowing, hardening of the arteries and loss of elasticity. Cyclic stretch, laminar and oscillatory shear stress, effects of vessel compliance, curvature, pulsatile blood flow or cardiac motion are considered the main mechanical triggers of atherosclerosis initiation. The fundamental cause of plaque development is believed to be the abnormal enlargement of the intima by the infiltration and accumulation of macromolecules such as lipoproteins and the associated cellular and synthetic reactions. This seminar focuses on studying in depth the mechanical environment of atherosclerotic lesions and consequently identifying high risk atheroma plaques. Finally, a computational model based on reaction–convection –diffusion equations coupled with blood-wall mass transport of the main biological species which lead to atheroma plaque development will be presented.



Estefanía Peña Baquedano: She is currently Full Professor of Structural Mechanics at the Department of Mechanical Engineering, University of Zaragoza. She was visiting scholar at University of Southampton (UK) and Joseph Fourier University-CNRS of Grenoble (France). Prof. Peña has published more than 90 papers in ISI journals and has supervised 6 Ph.D. Theses. Fruit of that work, she received the individual prize for excellence in research of Spanish ECCOMAS Association for the Best Ph.D. Thesis in 2004 and Juan Carlos Simó Award of the Spanish Society of Numerical Methods in Engineering (SEMNI) in 2011 and Spanish Royal Academy of Engineering in 2015. Prof. Peña has coordinate several research topics in bioengineering field. She is an expert in computational mechanics with special emphasis in numerical modeling of soft biological tissues (cardiovascular tissue). She also has worked in multiscale modeling of inelastic effects of biological tissues and vascular disease and interaction with medical devices. Last years she focused her research on experimental methods in biomechanics.