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BIOLOGICAL VALVE FUNCTION AND DYNAMICS

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MINI-SYMPOSIUM PROPOSAL

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Valves play an essential role in the human physiology ensuring uni-directional flow in the cardiovascular and lymphatic system. Malfunction of these valves has an immediate effect on the health of the patient. Studying valves from a (solid and/or fluid) mechanics perspective can provide additional insight in their behaviour. Hence, this mini-symposium invites those who work in the area of valve modelling using FEA, CFD, or FSI.

Heart Valve Mechanics The analysis of the mechanical behavior of the extra-cellular matrix structural proteins and underlying cellular function can give an insight into the initiation and progression of valvular disease. Cellular responses are also important in the field of tissue engineering. The development and benchmarking of new tissue models for valves is therefore an important area that is welcomed here.

Heart Valve Dynamics Bileaflet mitral valves have the chordae attached, trileaflet aortic valves are subject to high pressure gradients and mechanical valves cause separation of the flow field inducing high shear. Hence, capturing the interactions between the valve with the blood flow is essential for studying the performance of the valve computationally. This translates into analysis of geometry, boundary conditions and material behaviour for every valve within an FSI framework. Hence, any developments regarding the methodologies, computational models or clinical applications related to heart valve performance are of interest.

Heart Valve Prosthetics Tissue engineered, mechanical or bioprosthetic heart valves all have their own challenges. Especially, TAVR is currently changing the way we think about valvular intervention, but many questions are still unanswered. Modelling has a big role to play in the development of new valvular stent designs. Stent deployment, stent-wall interactions and valve efficiency are some of the areas where mechanical and fluid dynamics models can provide answers.

Other Biological Valves Most computational work on valves is focused on the heart valves and their replacements. However the venous system and the lymphatic system contain many valves as well. Their performance can be related to diseases like DVT or lymphoedema, respectively. Hence, any submission of work regarding these less popular valve types is encouraged.