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07/11/2016

EINLADUNG

zu einem Vortrag im Rahmen des

Kolloquiums Thermo- und Fluidodynamik

und des

ERCOFTAC Visitors Programme

- Datum:** Mittwoch, 23. November 2016
- Zeit:** 16:15 Uhr
- Ort:** Maschinenlaboratorium ETH Zürich
Hörsaal ML H 44
- Referent:** Prof. Marco D. de Tullio
Department of Mechanics, Mathematics and Management
Politecnico di Bari, Italy
- Titel:** Numerical Assessment of Blood Damage through Prosthetic Heart Valves

Thanks to considerable improvements in prosthetic heart valve design in the last years, the surgical replacement of a diseased heart valve with an artificial one is a safe and routine clinical practice worldwide. Approximately half of the implanted devices are mechanical valves and half are bio-prosthetic. A major concern related to such devices is that blood elements might be exposed to non-physiological conditions that are responsible for high shearing and damage. In fact, existing mechanical valves, despite their lifelong durability, need anticoagulation therapy. Tissue valves are free of anticoagulation therapy, but have limited lifetime.

The aim of this seminar is to illustrate how numerical simulations can be effectively employed in solving this complex fluid-structure interaction problem, accurately predicting the flow patterns through the devices and then evaluating the blood damage. A numerical tool is presented, able to accurately reproduce the flow and structure dynamics, giving results in good agreement with experimental data obtained for similar configurations. Realistic geometries for three valves (bi- and tri-leaflet mechanical, bio-prosthetic) and ascending aorta are considered under pulsatile flow conditions. In order to evaluate blood damage, a high-fidelity hemolysis model is adopted, based on a coarse-grained description of the erythrocyte membrane spectrin cytoskeleton. In this way, under the hydrodynamic loadings, the instantaneous shape distortion of the cells and consequent damage along their trajectories are evaluated, assessing the different propensity of the prostheses to thromboembolic complications.

Host: Prof. T. Rösgen

Gäste sind willkommen!