

LadHyX Seminar – September 7, 10:45

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Numerical analysis in biofluid dynamics: eye, nose and blood vessels

The multi-disciplinary research approach is becoming increasingly popular since aspects from different fields of science are accounted for simultaneously. In various physiological flows an increased knowledge of the mechanics and fluid dynamics can help clinicians to understand some fundamental aspects as well as guide them to make certain decisions. Interestingly, there are still fundamental questions to be answered where an analysis of the fluid dynamics can be of help: What is the best shape of a scleral buckle to improve healing after retinal detachment surgery in the human eye? How do we measure well being during breathing in the upper airways in order to guide the surgeons in the case of Nasal Breathing Difficulties? What is the effect of blood flow in small vessels on the quercetin release in bioprosthesis implants? With current technology the fluid flow can be computed with high accuracy, and without approximations if needed, using High-Performance Computing centres on large clusters with multiple processors. Simultaneously we can afford to create three-dimensional geometries directly from patient specific MRI or CT scans. With these capabilities different aspects can be analysed on realistic geometries. Moreover, virtual surgery, combining the efforts of engineers and medical doctors might be achievable. Examples of numerical analysis of biofluid dynamics regarding the human eye, upper airways and prosthesis of small blood vessels, will be given during the talk.