ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

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SEMINAR OF NUMERICAL ANALYSIS

- **FRIDAY 26 APRIL 2013 - ROOM CM 011 - 9h00**

***Dr. Diane de Zélicourt**, (University of Zürich, Institute of Physiology, Switzerland)* will present a seminar entitled:

"*A pilot multi-scale numerical framework for brain mechanics*"

Abstract:

In this study, we present a multi-scale simulation-based pilot framework for brain mechanics based on the homogenization theory. The brain's structure is classified into meso- and macroscale domains. The mesoscale considers fiber tracts and surrounding interstitial fluid, while the macroscale differentiates between brain tissue and cerebrospinal fluid. We explicitly model the mesoscale mechanics, and apply the homogenization theory to derive the mean macro-scale material properties and mechanical behavior. If one assumes porous material properties to remain constant throughout the deformation, our formulation reduces to the consolidation theory of Biot. However, while assuming constant properties is often valid in soil mechanics, it does not hold for brain mechanics where deformations can be large. In contrast, our multi-scale formulation allows for the dynamic adjustment of the local material properties without additional parameter fitting.
In this talk we will present the mathematical formulation of the problem and homogenization procedure, followed by preliminary results in idealized settings. In particular, we will compare our results to Biot theory and assess the impact of the meso-scale structure on the macro-scale deformations.

Lausanne, 20 March 2013/AQ/cr
