

## **HIRING ONE POST-DOCTORAL RESEARCHER IN EXPERIMENTAL GEOMECHANICS / MICROMECHANICS**

**Project:**

“Projet de recherche” (PDR) - FNRS (Fonds National de la Recherche Scientifique)

### **MICRO-MACRO STUDY OF THE CAPILLARITY EFFECTS ON MECHANICAL BEHAVIOUR OF GRANULAR MATERIALS.**

**Description of the project**

When the pore space of granular materials is filled by more than one fluid phase, liquid bridges including capillary menisci link particles together. The objective of this project is to quantify the combined effects of suction and capillary forces on mechanical behaviour of granular materials from joined microscopic (at the scale of the meniscus between grains) and macroscopic (at the scale of an assembly of hundreds of grains) approaches.

At microscale, the capillary forces will be evaluated experimentally and corroborated with numerical models based on the geometry of meniscus and surface tensions of the fluids. At macroscale, experimental tests will be developed to follow the compressibility as well as shear strength of granular materials under partial water saturation.

The computational development carried out at the small scale will be extended to a larger scale by taking into account the tri-dimensional grain organizations through a granular microstructure generator tool previously developed. A computational homogenisation technique will manage the transition between micro- and macro-scales that will allow to perform numerical predictions of geomechanical structural problems.

This project encompasses various expertises in a unified research framework: the physics of capillarity, the experimental geomechanics of unsaturated geomaterial and the computational mechanics of porous media.

**Description of the task**

The candidate will be **in charge of the experimental part of the project**, while the computational aspects will be addressed by another researcher. The tasks include the experimental characterization of the capillary effects in granular materials at two different scales. At micro-scale, advanced micro-mechanical techniques will be used to follow the geometry of meniscus and the inter-particle forces between a limited numbers of particles. At macro-scale, dedicated experimental tests specific to unsaturated soil mechanics will be developed to deduce the hydro-mechanical responses of unsaturated granular media.

**Work environment:**

This project is a collaborative project between different research teams of ULB:

- Building Architecture and Town Planning Department (BATir):

Prof. B. François and Prof. P. Gerard from the Laboratory of GeoMechanics (LGM):

<http://batir.ulb.ac.be/index.php/research/lgm-geomchanics>

Prof. T.J. Massart from Structural and Material Computational mechanics research unit (SMC):

<http://batir.ulb.ac.be/index.php/research/smc-computational-mechanics>

- Bio, Electro And Mechanical Systems Department (Beams):

Prof. P. Lambert from Micro and biomedical engineering research unit.

<http://beams.ulb.ac.be/research-units/micro-and-biomechanical-engineering>

[www.micromast.be](http://www.micromast.be)

**Sought profile:**

We are looking for one postdoctoral researcher with **skills in experimental (geo-)mechanics able to set up experimental devices** dedicated to the mechanical characterization of porous and granular materials.

The successful candidates will be familiar with the concepts of conventional mechanics and continuum mechanics. Knowledge of the framework of unsaturated soil mechanics is an asset, as well as experience in computer-aided design softwares. Close interactions with the researcher in charge of the computational aspects of the project will require basic knowledge in computational mechanics.

The candidate should hold a PhD in geomechanics, micromechanics, continuum mechanics, mechanical engineering or equivalent fields. Knowledge of French is an asset but not mandatory.

In his/her research team, the successful candidate is also expected to participate actively to the other research and/or teaching activities.

**Dates:**

The contract will be proposed for a duration of 2.5 years (30 months). The position is opened from April 1, 2015, and, eventually, will remain open until filled.

**Contact:**

For more information, please contact:

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Please send your applications, including a CV, a summary of the PhD thesis and a cover letter, by e-mail to [bertrand.francois@ulb.ac.be](mailto:bertrand.francois@ulb.ac.be)

