

VACANCY OF ACADEMIC POSITION AT ULg

Full-time academic position at the Department of Architecture, Geology, Environment and Construction (ArGEnCo) in the field of **Scale issues for materials and structures in civil engineering**, including teaching activities, development of researches in the field and services to the Community.

Description of the position

See next page.

Information

Specific information for this position is available on the web site of ArGEnCo Department (www.argenco.ulg.ac.be). Any question regarding the content of the call can be addressed to:

- **Professor Alain DASSARGUES**, Chairman of ArGEnCo Department - Tel.: + 32 4 366 23 76 - Alain.Dassargues@ulg.ac.be
- or to **Professor Jean-Pierre JASPART**, Vice-Chairman of ArGEnCo Department - Tel.: + 32 4 366 92 47 - Jean-Pierre.Jaspart@ulg.ac.be

Any further information can be obtained from the Faculty of Applied Sciences: **Ms. Eva ZEIMETZ** - Tel.: + 32 4 366 94 21 - Eva.Zeimetz@ulg.ac.be

Applications

The selected candidate (M/F) will be either:

- designated for a fixed-term contract. The duration of the term or the cumulative terms cannot exceed five years, at the end of which a final appointment will be considered;
- or designated for a final appointment.

Salary scales and their conditions of application are available from the human resources administration of the University: **Ms. Ludivine DEPAS** - Tel.: + 32 4 366 52 04 - Ludivine.Depas@ulg.ac.be

The candidates are requested to send, **by registered mailing**, to **Prof. Rentier**, Rector of the University of Liège, Place du 20 Août, 7, B-4000 Liège, before April 30, 2011:

- their application with two copies of their curriculum vitae and their list of publications;
- a brief document (maximum 3 pages), in two copies as well, stating the specific directions that they intend to give to their research
- a copy of their publications

Scale issues for materials and structures in civil engineering

The current international research context promotes integrated approaches for the analysis of every issue related to the life of a civil engineering structure. In these approaches, the integrity of the structure must be considered during its building phase, its service life and under unexpected loadings. The global stability of the structure must always be checked. However, local details may also be responsible for the failure: assembly, discrete cracking, damage, anti-corrosion coating, very heterogeneous fatigue behavior due to local residual stresses from the welding or the forming process, influence of knots in wooden parts... A multiscale approach permits to analyze these problems from the global loading, defined at the scale of the structure (order of magnitude ranging from m to cm) to the local behavior of the material (order of magnitude ranging from mm to micrometer). The academic position is intended to cover the area of the structural design from the micro-mechanical behavior of civil engineering materials. Nowadays, this type of position is present in many universities (Univ. of Cambridge, MIT, Northwestern Univ., Duke Univ., Columbia Univ., the Hong Kong Univ. of Science and Technology...).

Research in the field of civil engineering structures at the University of Liège is widely acknowledged internationally. It is approached by materials: metals, composite materials, wood, masonry, rocks and concrete. Transversal approaches constitute another angle of attack in this field: earthquakes, vibrations, fire, robustness, sustainable construction.

The University of Liège wants to amplify its expertise for any kind of material and loading by connecting the behavior at the scale of the structure with the local behavior of the material. Understanding the phenomena on a microscopic scale promotes the development of macroscopic models based on the underlying physics and the definition of adequate assumptions to solve the problems at the level of a structure.

On the experimental point of view, the selected candidate will exploit the available equipment for the characterization of materials and structures, including a biaxial testing machine, an impact ramp, a testing bench for bolts of large dimensions, many presses (from 10 to 250 kN) without forgetting the testing slab of the Materials and Structures laboratory. Interactions with other laboratories of the ArGEnCo Department and the Faculty as well as the support in microscopy from the CATMU (Cellule d'Appui Technologique en Microscopie) enable him to tackle the experimental aspects, covering all scales.

On the numerical point of view, multi-scale civil engineering approaches can be exploited both to the transition from the crystal plasticity of a metallic material to its macroscopic behavior, to the transition between the local analysis of an connection and its moment-rotation curve or to the integration of the properties of the brick and cement in the study of the masonry mechanical response. The candidate must be familiar with numerical homogenization methods and be able to solve numerical and algorithmic problems inherent in these techniques. His contributions will be integrated into finite elements as well as in alternative methods (XFEM,

meshless, natural elements...), in adaptive meshing, homogenization techniques (self consistent, Voigt, CPFEM, Taylor FC, Taylor RC, Sachs...), square finite elements (FE²) or the integration of complex constitutive laws. Interactions with other researchers in numerical methods from the University of Liège will contribute to a harmonious development of the multiple objectives of the multi-scale approaches in modern engineering.

In addition to the above scientific objectives, the selected candidate will contribute to the lectures provided by the ArGEnCo Department in the field. He will participate to the life of the Department, of the Faculty of Applied Sciences and of the University of Liège.