



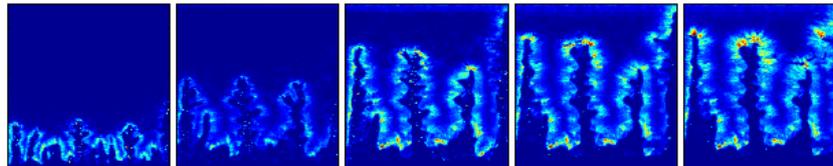
## Early Stage Researcher position available within a Marie Curie Initial Training Network Flow in Transforming Porous Media (FLOWTRANS)

A Marie Curie Fellowship (Early Stage Researcher), concurrent with registration for a doctoral degree (Ph.D.), will be available at the CNRS / University of Strasbourg, Institut de Physique du Globe de Strasbourg (IPGS, <http://eost.unistra.fr/recherche/ipgs/>), France, as part of the above Marie Curie Integrated Training Network (ITN), in cooperation with the Universities of Glasgow, Oslo, Münster, Warsaw, Copenhagen, Grenoble and the Hebrew University of Jerusalem, together with Industrial Partners Magnitude and Offshore RGE, as well as associate partners CSIRO, AMPHOS 21, EOG and IRIS.

The research themes of FLOWTRANS relate to the characterization and the understanding of rock deformation processes, fluid flow and chemical reaction within rocks and granular media. This has become an ever-increasing problem in Earth Sciences, Physics, and in many industrial applications, including natural hazards (earthquakes, landslides, volcanoes), CO<sub>2</sub> geological sequestration, hydrocarbon migration, ore deposit development, and radioactive waste disposal. One of the main problems is the **understanding of flows in transforming porous media**, where the rocks and fluid pathways evolve spatially and temporally, for example due to chemical interactions with the flow, or due to compaction of the solid matrix. The dynamic feedbacks between flow, destruction of permeability due to compaction or local precipitation, creep of the rock, and creation of permeability due to dissolution, chemical reaction or fracturing, makes understanding of such complex systems a challenge.

The specific research topic based in Strasbourg is somewhat flexible but will focus on:

***Evolution of tight rocks during fluid injections: channeling, fracturing and mechanical instabilities due to fast fluid flows.***



The aim is to develop new models to predict and control the mechanical stability of rock formations and soils during the injection or extraction of fluids. The models will be calibrated with experiments, and the associated solid/fluid flows will be monitored using geophysical techniques. The study will be carried out using hybrid granular/fluid flow models that will be extended to treat flow around injection or extraction points or wells. Different scenarios of density contrast between fluid and solid, and cohesion, will be considered and the seismic signal associated with deformation will be modeled. The project requires a physics expertise to develop the mechanical model from first principles and the analysis of shapes of channeling and fluidofracture patterns. Interest for Earth Science is also wished – a geophysics expertise will be used to parameterize the model for specific rocks and soils and the inclusion of faults in the formation.

The numerical models will be compared to experimental results, with pressure pulses triggering fast brittle deformation of rocks and soils, and monitoring of acoustic emissions and related microseismicity.

The main consequence of the research for the private sector is to control the permeability evolution in operational situations and to allow interpretation of seismic signals associated with extraction and injection. The different expertise on the modeling and the applications will be provided by the University of Strasbourg, and the ITN partners. Regular stays at the partner institutions will be organized for the secondments.

The normal eligibility requirements of Marie Curie Fellowships apply. Researchers may be any nationality but must not have resided in the country of their host organization for more than 12 months in the 3 years immediately prior to date of selection by the host institution. The applicant must also satisfy the requirements to register as a doctoral student at the University of Strasbourg, which generally involves holding an appropriate Diploma or Master degree. Marie Curie Fellowships have substantial benefits, both in salary (~30 000 EUR per year (gross) ) and in mobility and allowances (mobility allowance of ~700EUR per month). The duration of the Fellowship is 36 months.

Applications are welcome from students with any relevant physics, mechanics, earth science, engineering or materials science background. The applicant should have a good command of both written and spoken English. The Marie Curie Fellowship is planned to begin in June 2013, but a later start is also possible.

Prospective applicants should contact Renaud Toussaint either by e-mail ([renaud.toussaint@unistra.fr](mailto:renaud.toussaint@unistra.fr)) or telephone (+33 368850337, +33 673142994) from whom further information can be obtained. More information can be obtained on <http://eost.unistra.fr/renaud> and <http://www.gla.ac.uk/schools/ges/research/earthsystemsresearch/flow/>