

Post-Doc Fellowship:

MECHANICAL CHARACTERIZATION OF SOFT TISSUES USING DIGITAL IMAGE CORRELATION

**Center for Health Engineering
Ecole Nationale Supérieure des Mines
Saint-Etienne, FRANCE**

Keywords: Biomechanics, experimental testing, soft tissues, photomechanics, full-field measurements, digital image correlation, inverse methods, Matlab.

Description: This post-doc fellowship is supported by a grant from the French Research Agency. It will take place within the *Center for Health Engineering* at “Ecole Nationale Supérieure des Mines”, Saint-Etienne, France (www.emse.fr). The general goal of this research project is to enhance the constitutive equations used for modeling the mechanical behavior of soft tissues in the human body. A specific target is the mechanical identification of *plaques* in the human carotid. Plaques are lipid deposits that reduce locally the diameter of the carotid. The flow of blood induces shear stresses on them, which may result in ripping off of fragments that carried downstream will result in infarction and death of brain tissue and a clinical stroke. The derivation of these shear stresses requires the knowledge of the mechanical properties of the plaques. For that, it is necessary to test tissues of arterial walls and plaques taken from bodies (*ex vivo* tests). These tissues can be collected after surgical interventions: Carotid plaques are removed from the body. *Ex vivo* characterization of plaques is still an open issue, because the material is very tiny. The idea will be to carry out tensile tests onto samples of the plaques and to measure the deformations using digital image correlation. Eventually, the properties will be derived from the measurements using a dedicated inverse approach such as the one developed by Prof. Stéphane Avril (www.emse.fr/~avril). Experience regarding tissue collection and handling will be brought by the Department of Cardiovascular Surgery of the University Hospital of Saint-Etienne, lead by Prof. Jean-Pierre Favre. The objective at the end of the post-doc period of 12 months is to have a database of mechanical properties for carotid walls and plaques. Such results will be used for modeling, using FEA, the fluid-structure interactions and the shear stresses on different geometries of plaques. This is believed to bring an insight on how the plaques may fail and rip off, and thus to help physicians in anticipating strokes for diseased patients.

Salary: 1800 €/month

Contacts and how to apply: Send a CV by email to Prof. Stephane Avril (avril@emse.fr)