# Post-Doctoral Fellowship
# "Dedicated computational approaches for multiscale hyperbolic conservation laws"

Ecole Nationale des Ponts et Chaussées & Team-project Matherials at Inria
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Applications are invited for a postdoctoral fellowship to work on the development of efficient computational approaches in the context of multiscale materials.

Computing the properties of heterogeneous materials and media is a challenging issue. Our research team has a long-term experience in contributing to the theoretical foundations of such problems and the improvement of the corresponding computational approaches. The latter are often based on finite elements that are adapted to the precise microstructure of the media, in order to appropriately encode the fine-scale features.

The post-doc position will address some of the many relevant aspects, at the intersection between theoretical developments on homogenization problems and multiscale computational approaches. The focus of the work will be the prototypical multiscale hyperbolic conservation law

$$\frac{\partial u_\varepsilon}{\partial t} + \operatorname{div} F\left(\frac{x}{\varepsilon}, u_\varepsilon\right) = 0,$$

where $u_\varepsilon$ is a scalar-valued function and the so-called *flux* $F$ is a vector-valued function, supposedly depending upon the small scale $\varepsilon$ and thus highly oscillatory. The equation is supplied with an initial condition, and possibly boundary conditions. Approaches in the spirit of Multiscale Finite Element (MsFEM) approaches, but specifically of finite volume type, will be explored and developed.

The candidate is expected to have a PhD in applied mathematics or computational mechanics, with a focus either on homogenization theory or on computational techniques for engineering problems, a good publication record and/or a solid expertise in programming.

Funding for the position is provided by a Grant of the European Office of Aerospace Research and Development. The anticipated start date for the postdoctoral position is January 2025. The successful candidate would be based at Ecole Nationale des Ponts et Chaussées, 77455 Marne La Vallée (RER A, station Noisy-Champs) and/or Inria Paris, 48 rue Barrault, 75013 Paris (Metro 6, station Corvisart).

**Keywords:** Homogenization, multi-scale problems, Model reduction, Finite element methods, Finite Volume methods.

**Supervision:** Claude Le Bris and Frédéric Legoll (Ecole Nationale des Ponts et Chaussées and Inria Matherials project-team).

See `https://team.inria.fr/matherials/` for more details on the activities of our research team.