Alexander Mielke
WIAS and Humboldt-Universität, Berlin

To Carthage then I came
T. S. Eliot, The waste land

Wednesday 18th May
9:30 (Tunis time – GMT+1, UTC+1)

Gamma convergence for evolutionary problems:
using EDP convergence for deriving nontrivial kinetic relations

Many differential equations can be written as a gradient flow, which means that there is an energy functional that drives the evolution of the the solutions by flowing down in the energy landscape. The gradient is defined in terms of a dissipation structure, which in the simplest case is a Riemannian metric. We emphasize that associating a gradient structure with a given differential equation means additing nontrivial physical information.

Considering a family of gradient systems depending on a small parameter, it is natural to ask for the limiting (also called effective) gradient system if the parameter tends to 0. This can be achieved on the basis of De Giorgi's Energy-Dissipation Principle (EDP). The notion of "EDP convergence" combines this principle with the theory of Gamma convergence, but now on spaces of trajectories. By examples we show that this theory is flexible enough to allow for situations where starting from a linear kinetic relation (or quadratic dissipation potentials) we arrive at physically relevant, nonlinear effective kinetic relations. The connections between macroscopic kinetic relations and microscopic non-equilibrium steady states will be discussed.