1172-35-142 **Peter W Bates*** (bates@math.msu.edu), **Giorgio Fusco** and **Georgia Karali**. *Gradient-like dynamics in a valley: Slow motion in nonlinear singularly perturbed PDEs.*

The dynamics of a gradient system is obviously determined by the geometric structure (landscape) of the graph of the energy functional. In certain cases, for instance in some singularly perturbed PDE problems, the energy depends on a parameter d and, for 0< d and very small, the graph exhibits special features that have peculiar dynamical counterparts. A quite striking phenomenon in this context is the occurrence of Slow Motion. The geometric structure of the landscape responsible for this phenomenon can qualitatively be described as follows: there exists a region M of almost minimal energy in the sense that, in a neighborhood of M, the energy rapidly grows when moving away from M. Moreover, M is a set of quasi-equilibria and the energy is almost constant on M. I will give hypotheses that correspond to a quantitative description of the landscape in a neighborhood of M and prove that, provided a certain condition is satisfied, if the initial condition is sufficiently close to M and has energy of the order of that of typical values on M, then the solution of the gradient system stays near M for a long time or even forever. Thus, a sort of variational maximum principle is manifest. (Received August 23, 2021)