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Weakly vs Highly nonlinear front dynamics OLIVIER PIERRE-LOUIS, Labo. Spectro. Phys. UJF Grenoble, France. — We analyse the nonlinear dynamics of one-dimensional unstable fronts. Our main finding is the existence of two types of dynamics weakly, or highly nonlinear, which respectively lead to continuous or discontinuous morphological transitions. Based on a multi-scale analysis, we list the possible weakly nonlinear equations and determine some of the most relevant ones. We then show that dynamics is not weakly nonlinear, but highly nonlinear in many cases relevant to specific systems (e.g. when an instability occurs in the vicinity of thermodynamic equilibrium in a conserved system). Highly nonlinear equations are explicitly derived, and exhibit unexpected symmetries. The resulting dynamics is discussed. Explicit applications to pattern formation during Molecular Beam expitaxy are presented.

Olivier Pierre-Louis
Labo. Spectro. Phys. UJF Grenoble, France.

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