

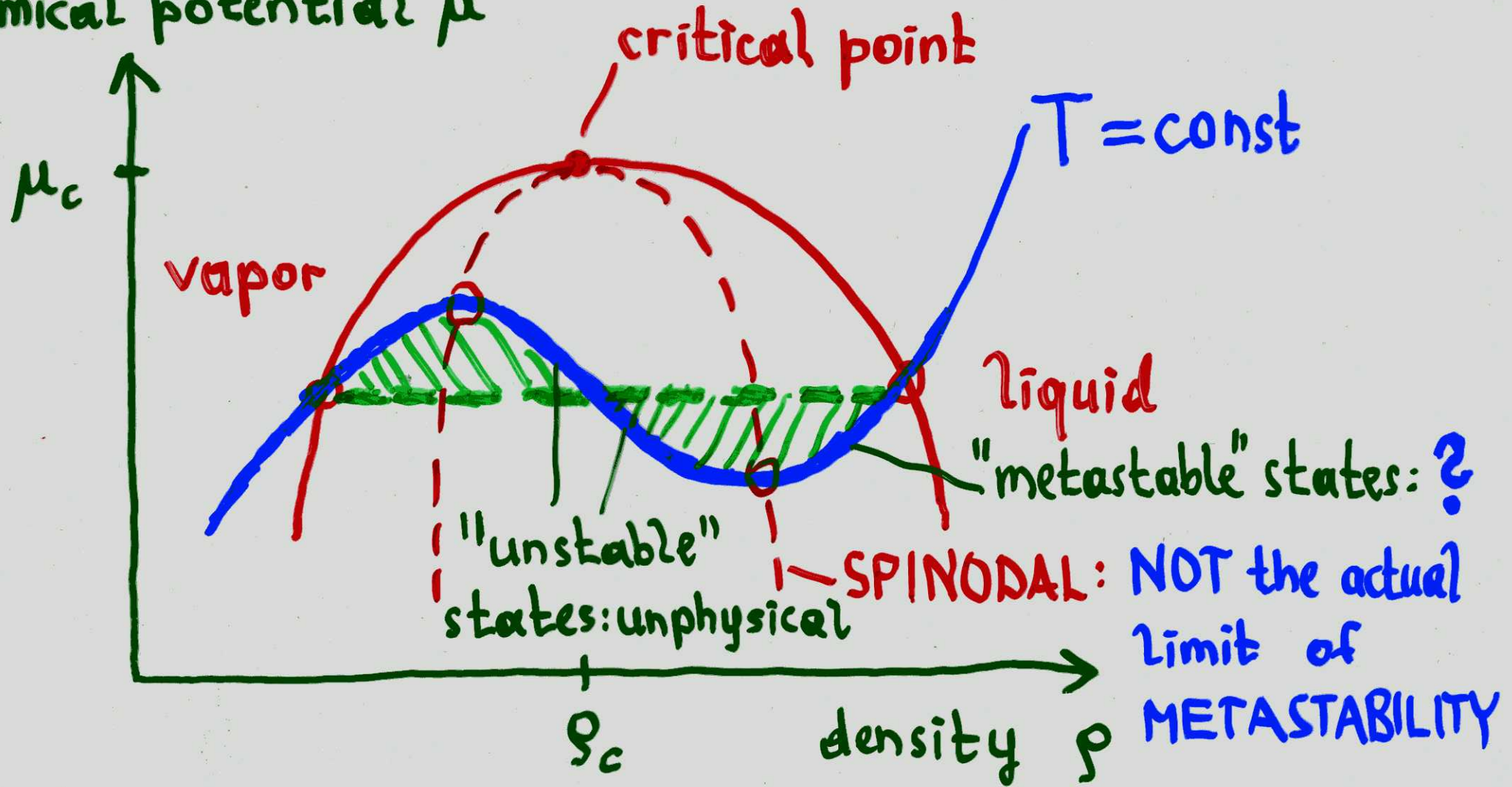
NUCLEATION PROCESSES AND THEIR STUDY BY SIMULATIONS

Kurt Binder

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H. Furukawa, D.W. Heermann, L.G. MacDowell,
M. Müller, P. Virnau, L. Yelash

van der Waals theory: MEAN FIELD!

chemical potential μ

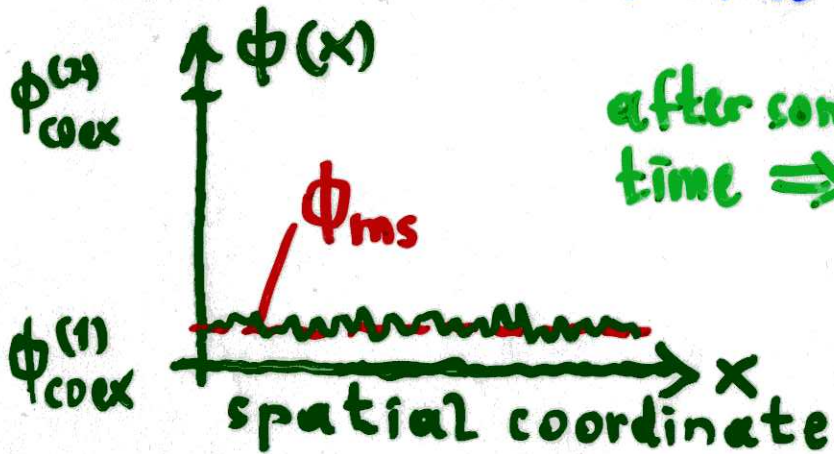
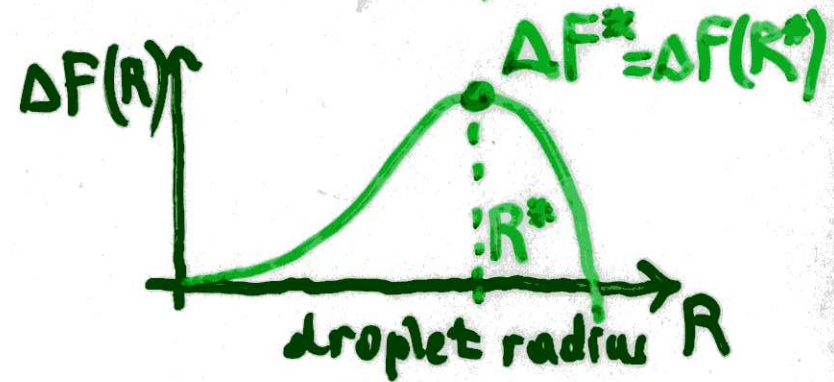


PHASE COEXISTENCE ?

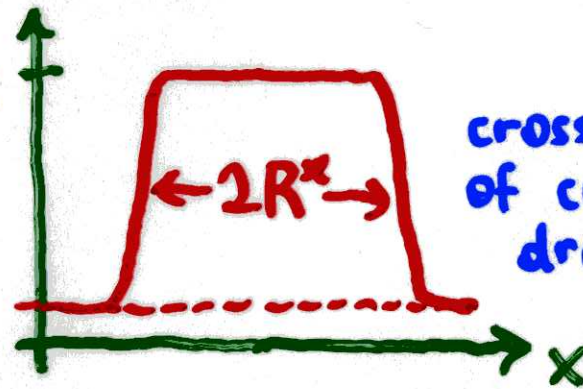
Maxwell construction is ad hoc!

MECHANISMS for the INITIAL STAGES of PHASE SEPARATION KINETICS (mean field theory: CAHN-HILLIARD 1959)

in between coexistence curve and spinodal;
NUCLEATION BARRIER must be overcome.
CRITICAL DROPLET must be formed



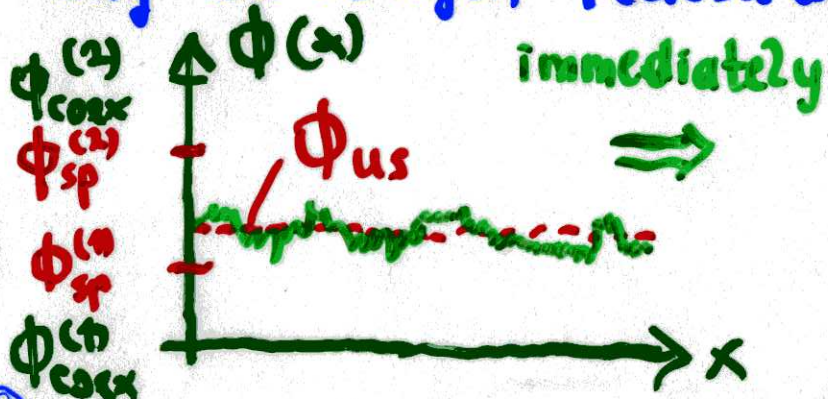
after some time \Rightarrow



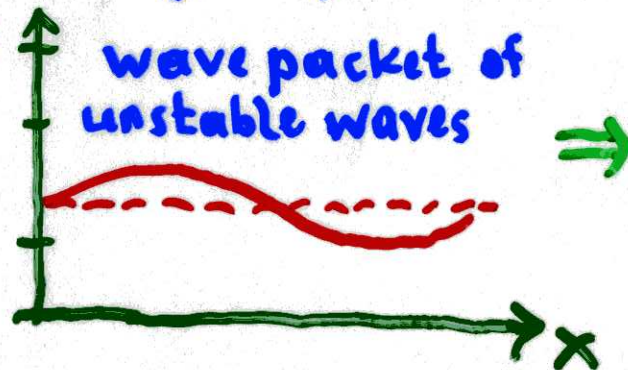
cross section of critical droplet \Rightarrow

droplet growth

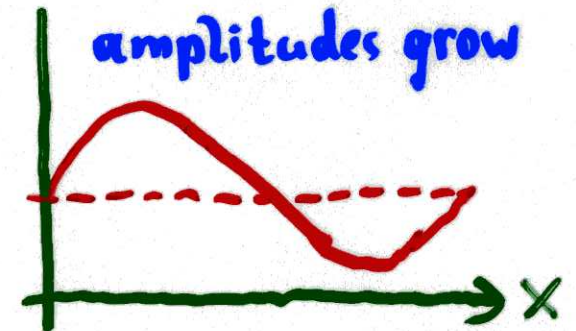
inside the spinodal region: $\phi_{sp}^{(1)} < \phi < \phi_{sp}^{(2)}$ **SPINODAL DECOMPOSITION**
 long wavelength fluctuations get spontaneously **AMPLIFIED**



immediately \Rightarrow



wave packet of unstable waves \Rightarrow



amplitudes grow

