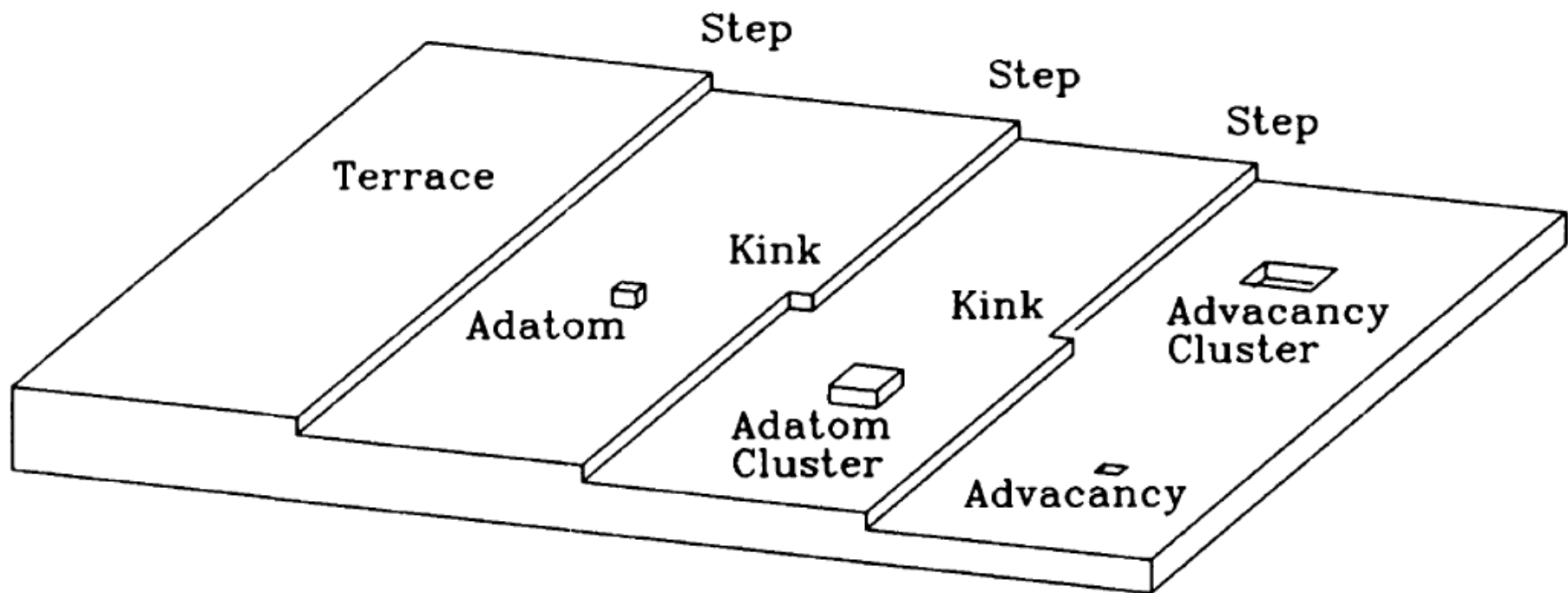
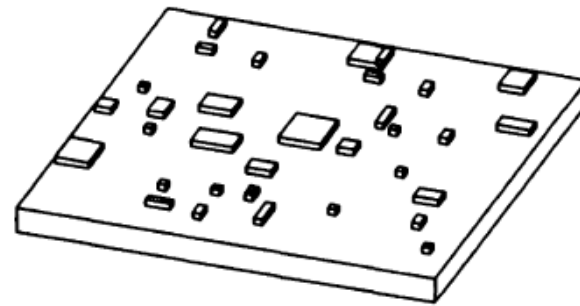


Surface morphology

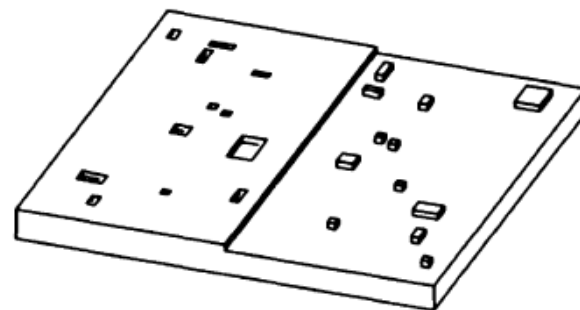
Surface morphology



Atoms on a singular surface

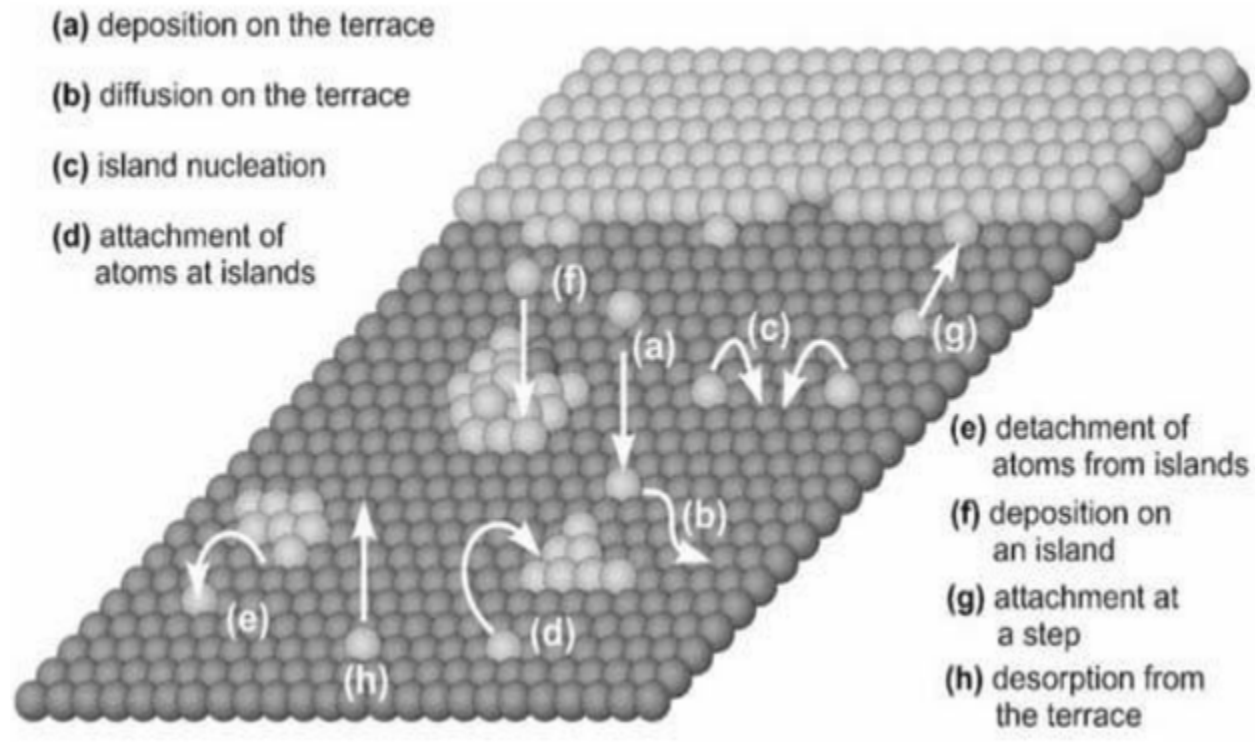


Rough



Phase Separated

Roughening of the terraces



<https://steemit.com/science/@diracdnb/low-dimensional-semiconductor-devices-part-4-manufacture>

Kinks in isolated steps

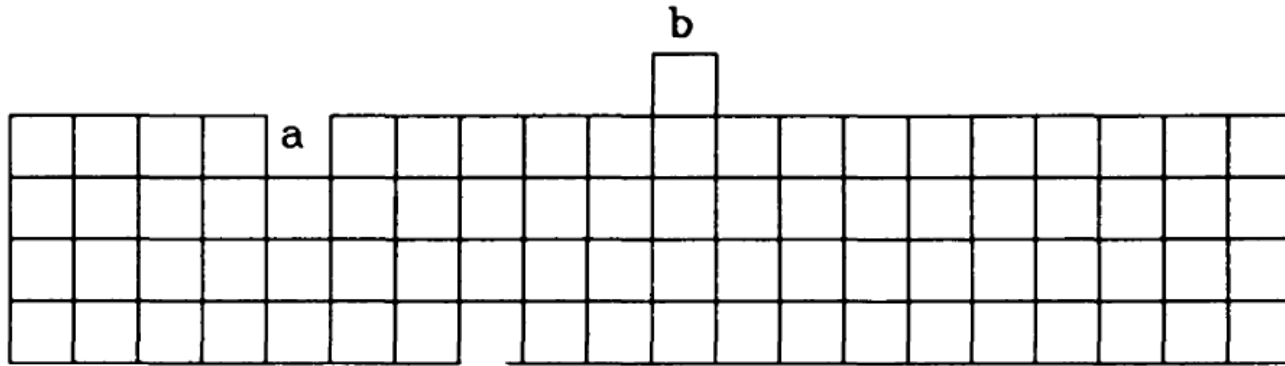
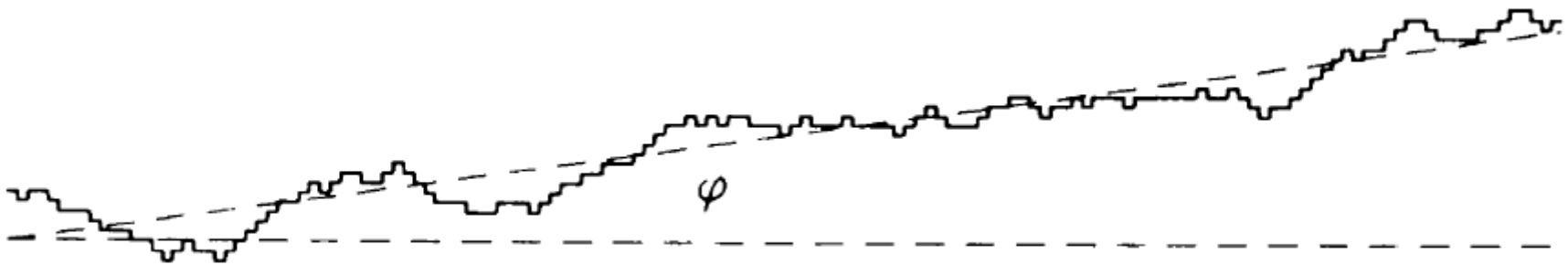
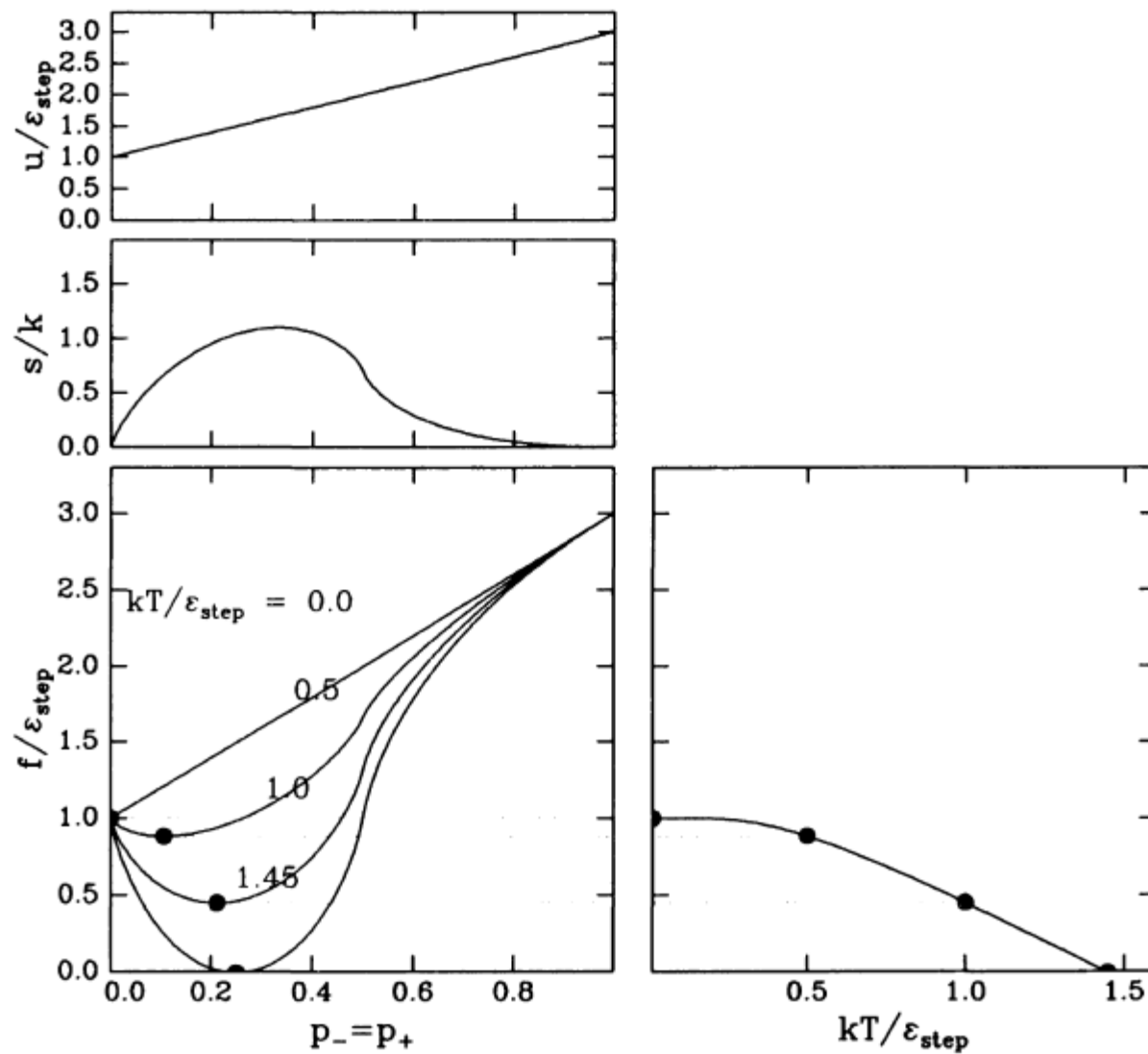


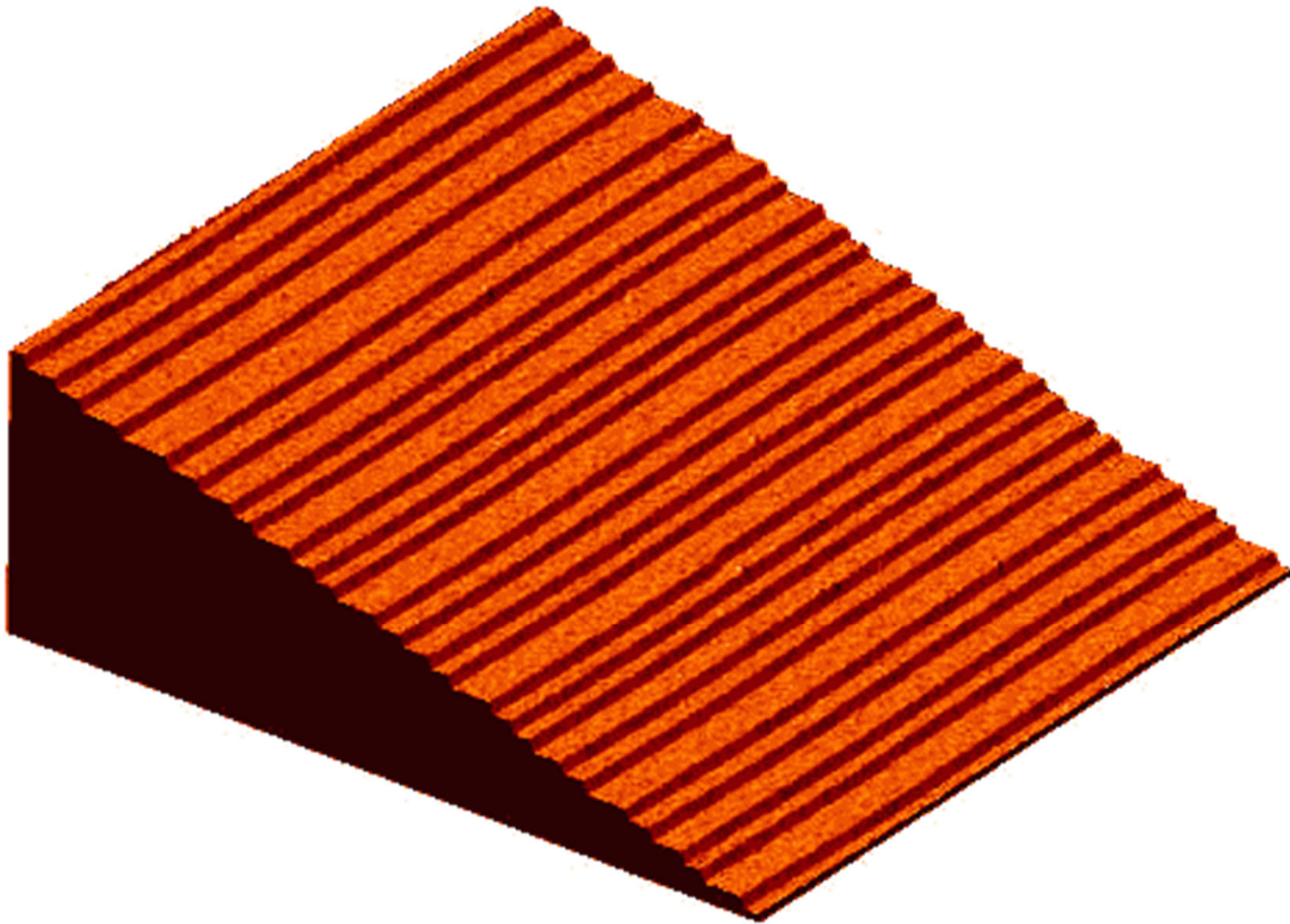
Figure 6.4: In moving an atom from position a to position b, two net bonds are broken, but four kinks are formed. If the bond energy is w , then the energy per kink is $\epsilon_{\text{kink}} = 2w/4 = w/2$.



Kinks in isolated steps



Example of miscut wafer, vicinal surface



Kinks in vicinal surfaces

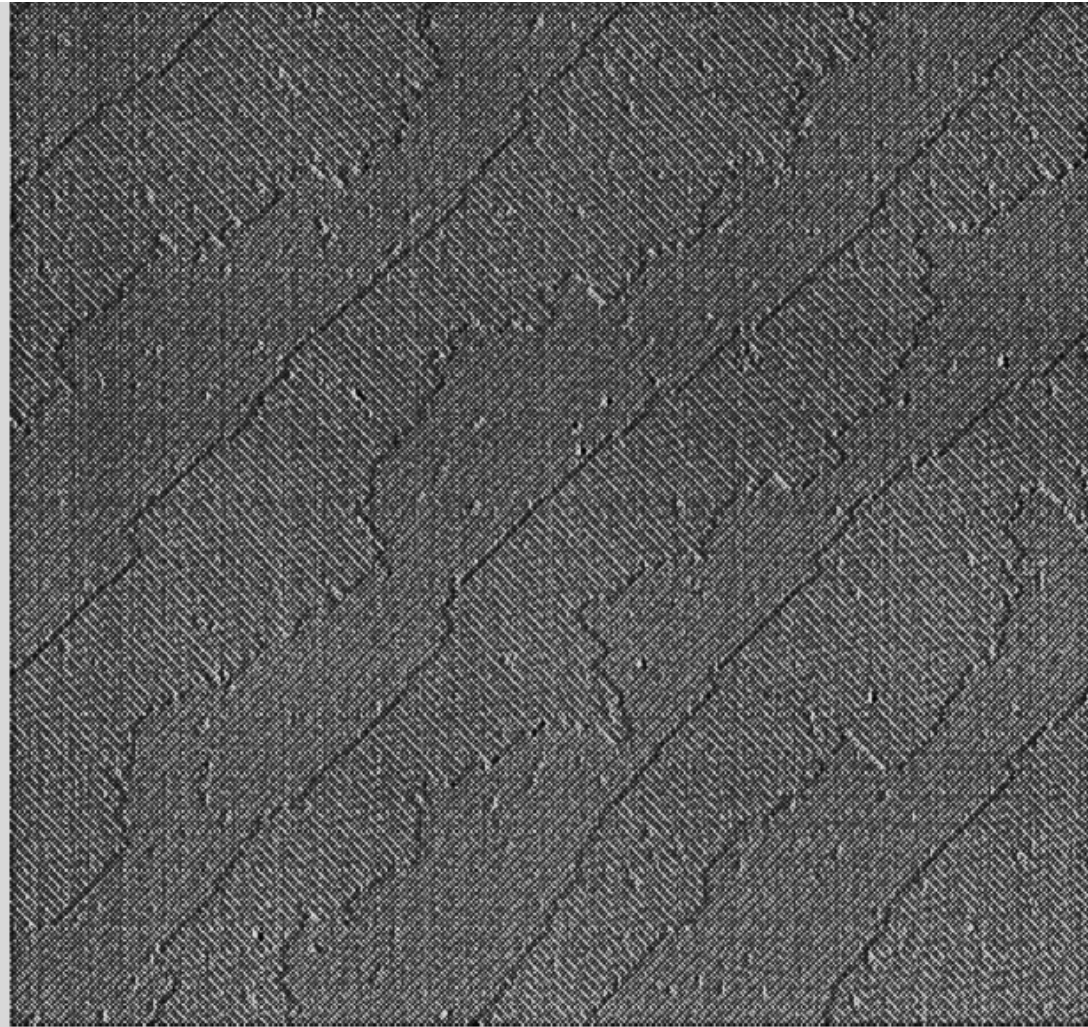
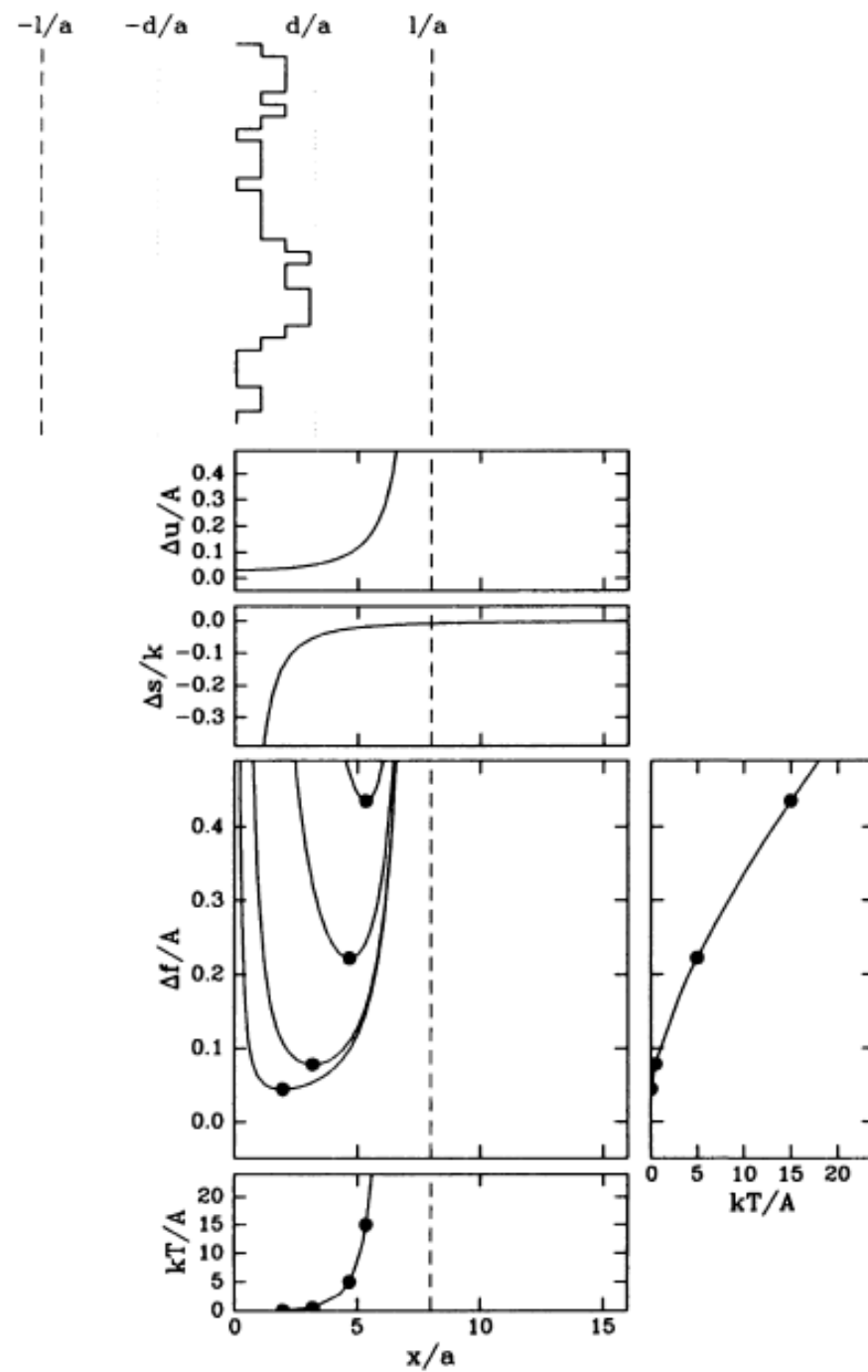
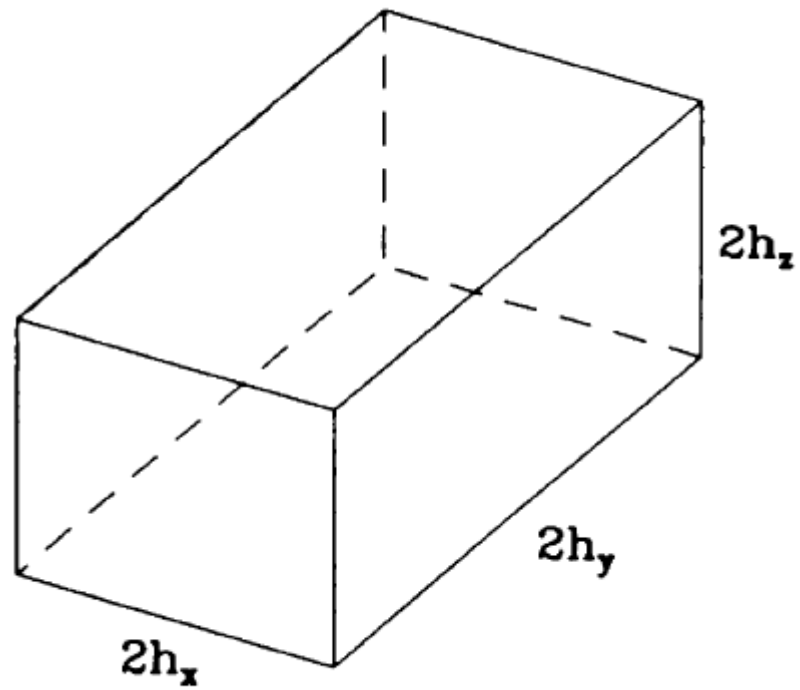


Figure 6.5: Scanning tunneling micrograph of a Si surface misoriented 0.5° from (001) toward [110]. The surface height decreases from upper left to lower right.^a On this surface, alternate single-height steps are referred to as type *SA* and *SB*, and are smooth and rough, respectively, reflecting the relative energies of kink formation.

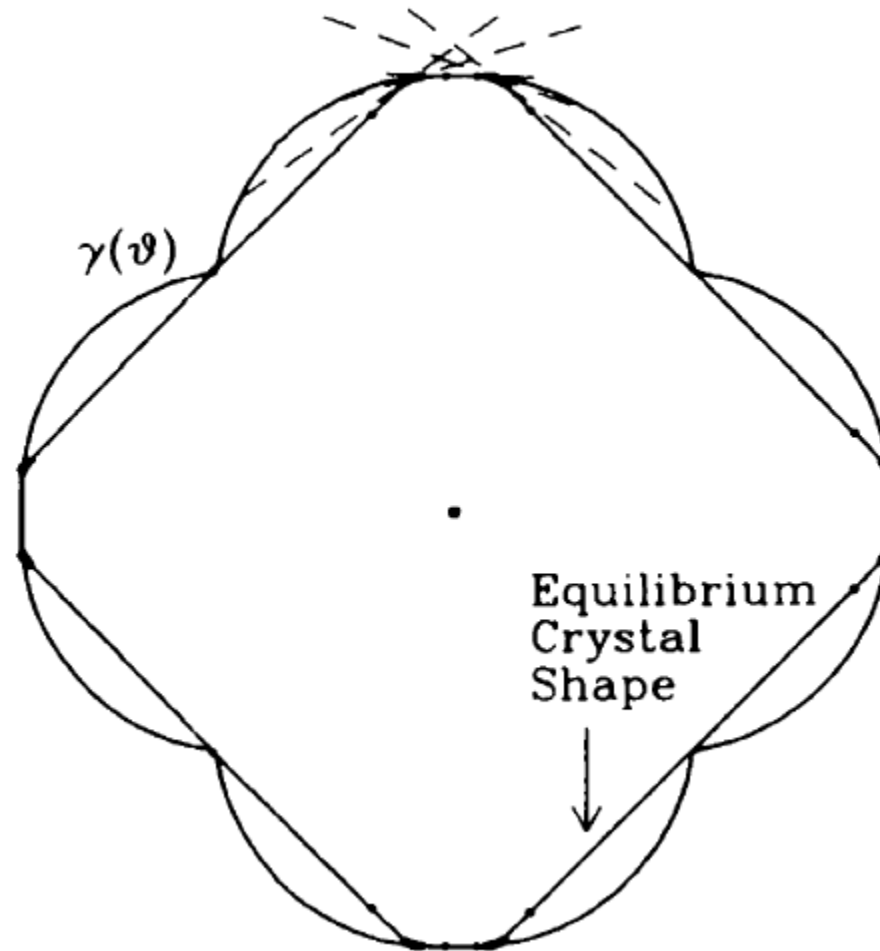


Equilibrium morphology

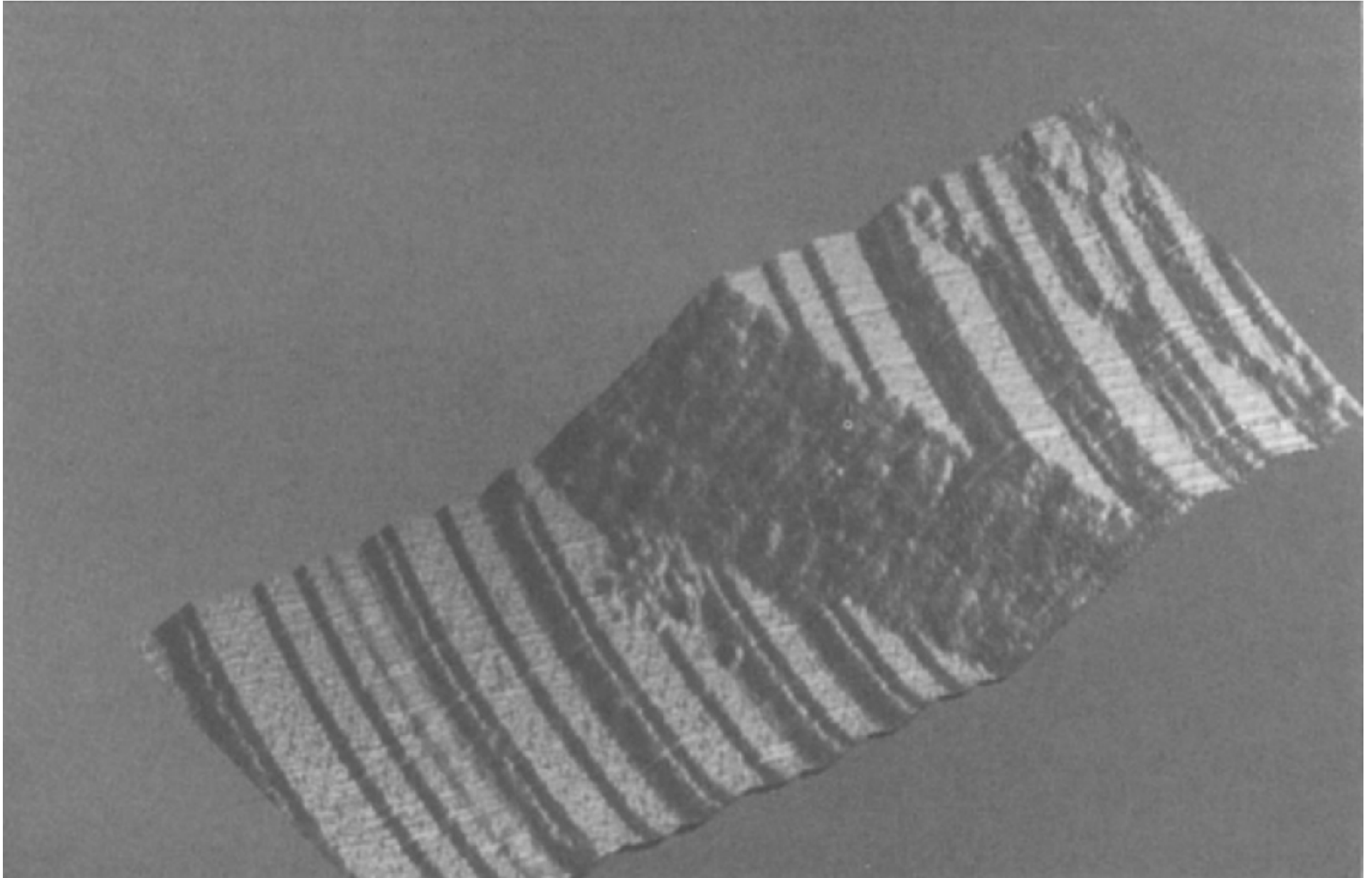
Wulff's Theorem



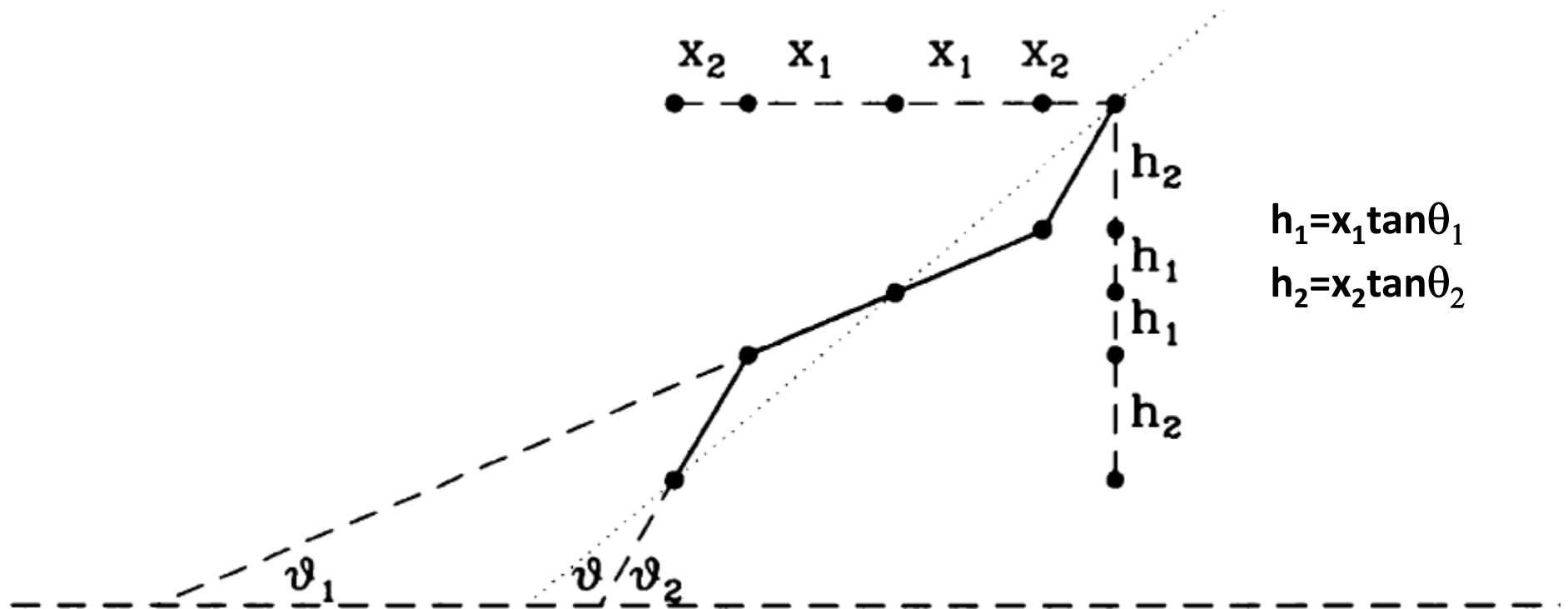
Wulff's construction for a 2-D crystal of fixed volume and minimum surface energy



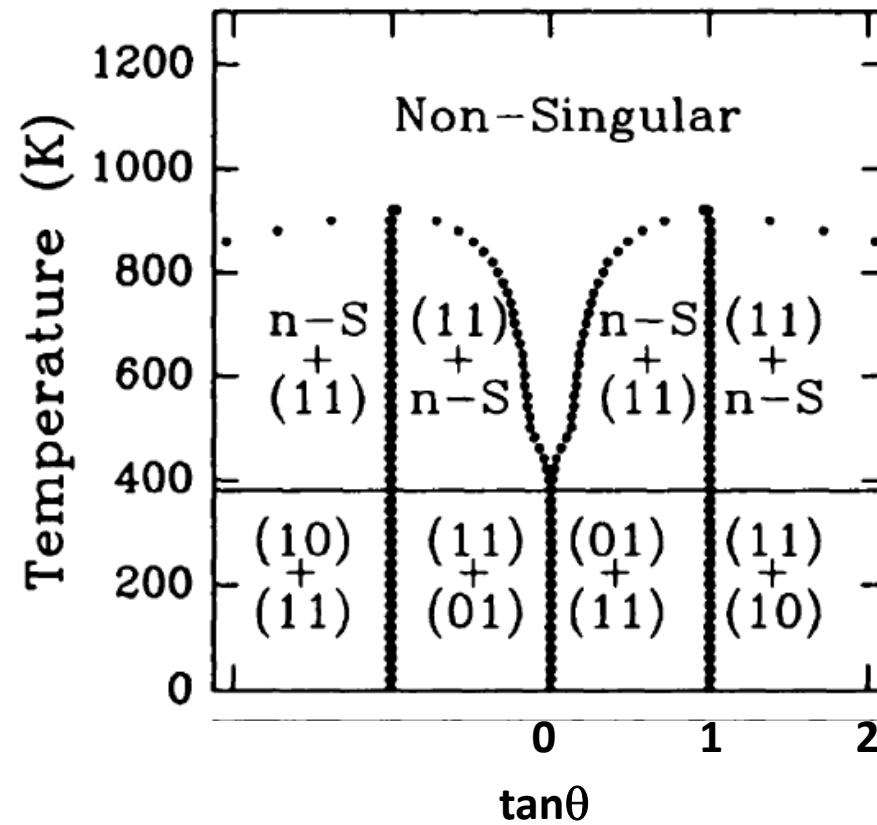
Stability of a surface against facetting



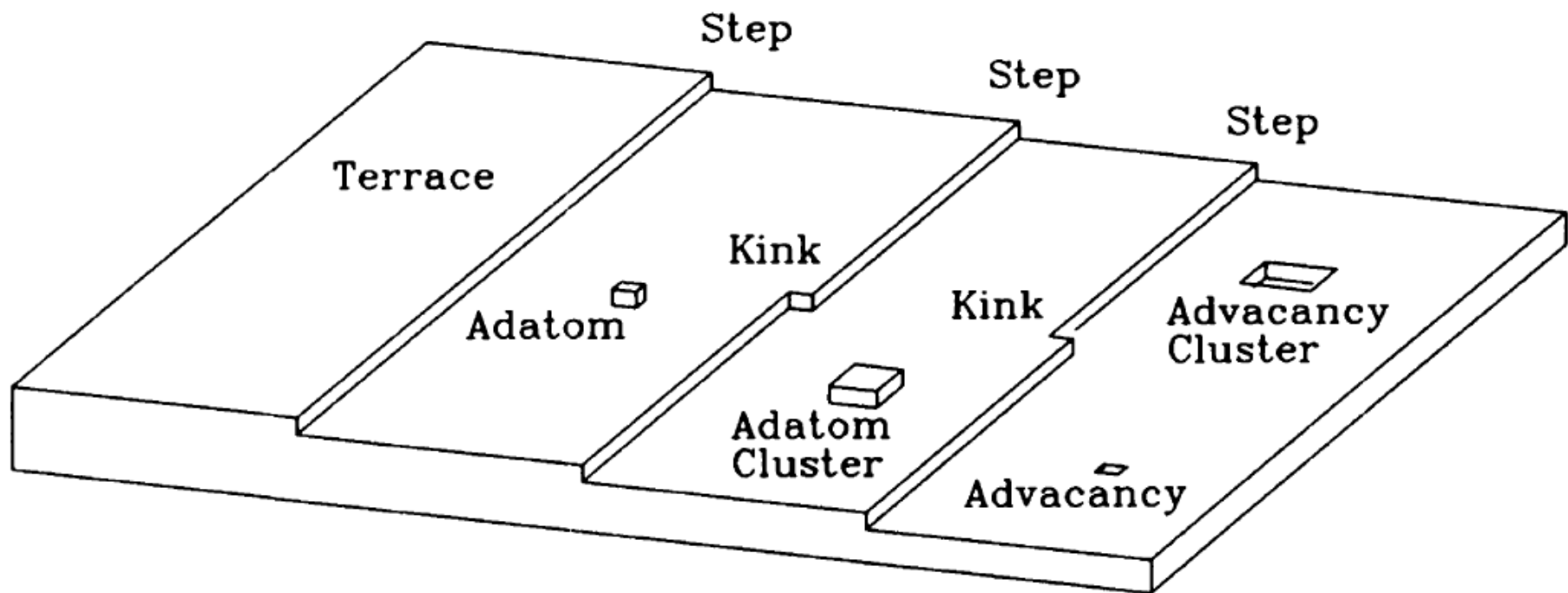
Stability of a surface against facetting



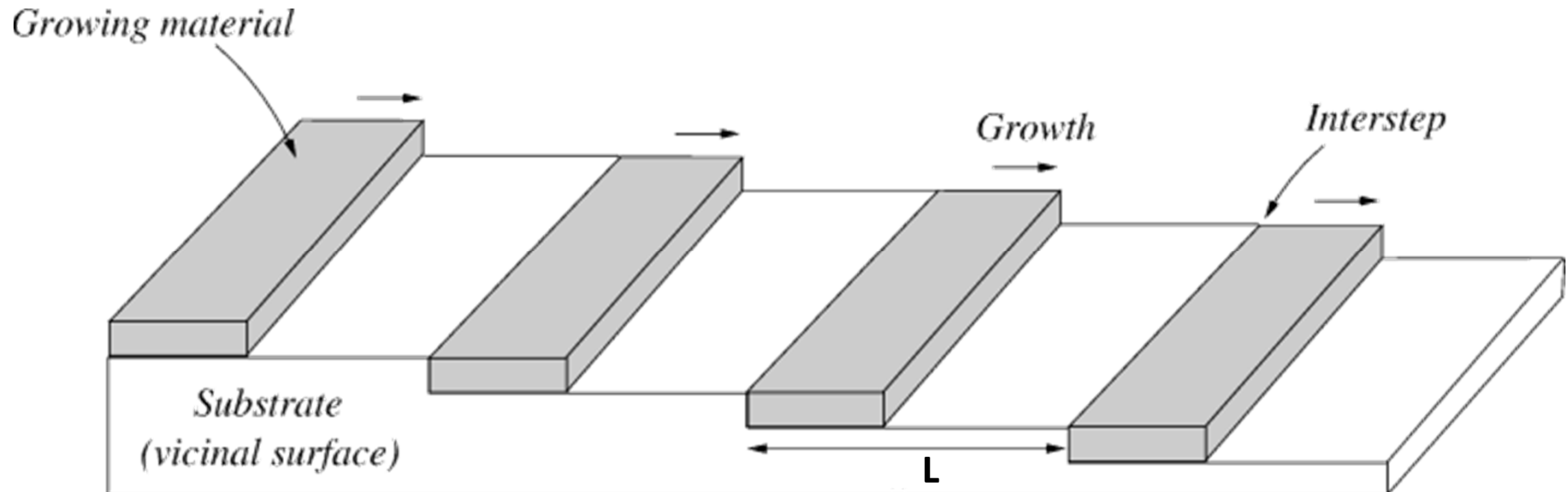
Orientation phase diagrams in 2D crystals



Surface morphology



Time evolution of the surface morphology



j growth rate

D diffusivity of adatoms

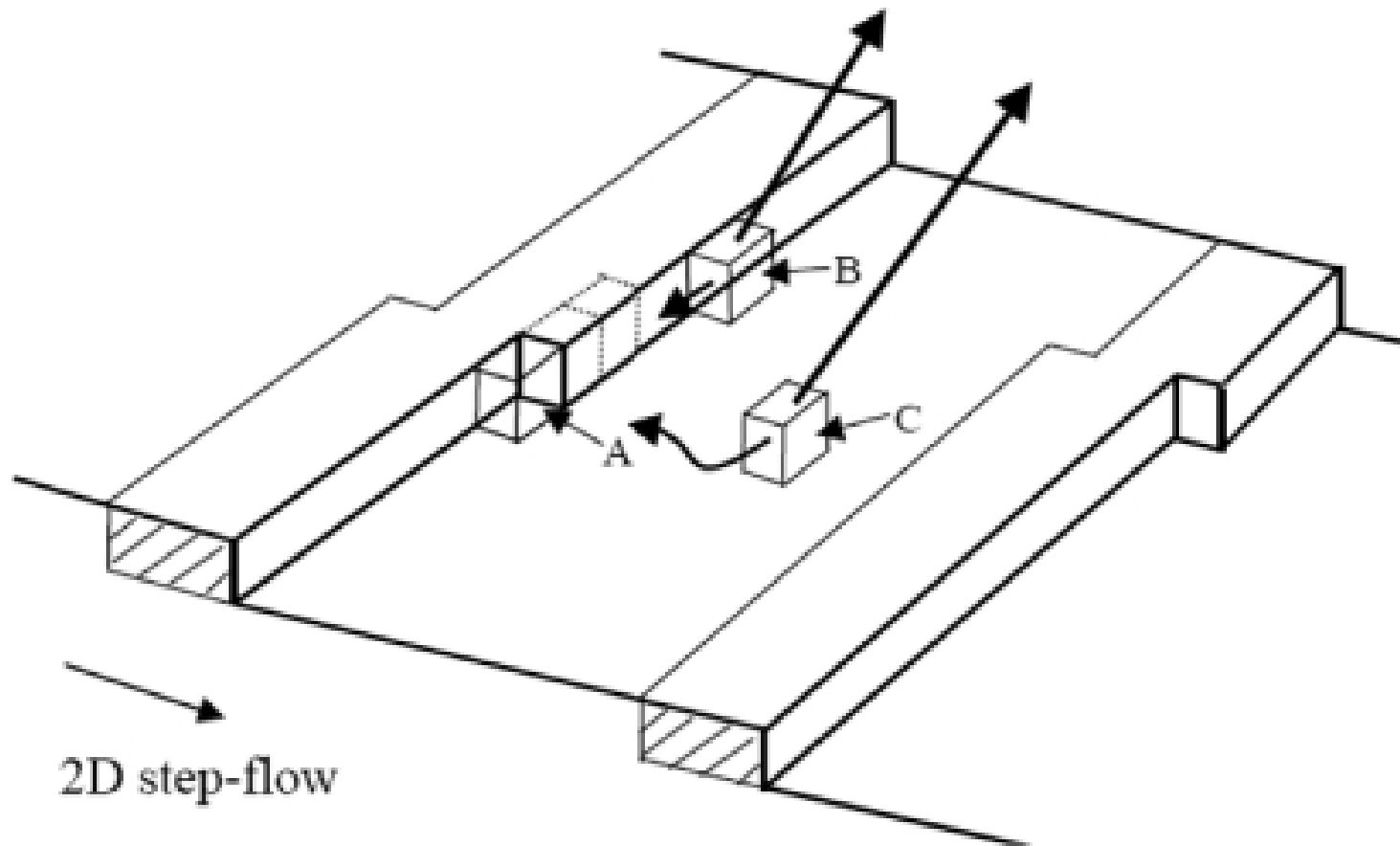
L average distance between terraces

$$\frac{L^2 j}{D} \quad \text{Péclet nr}$$

EPL **82** 28007 (5pp)

doi:10.1209/0295-5075/82/28007

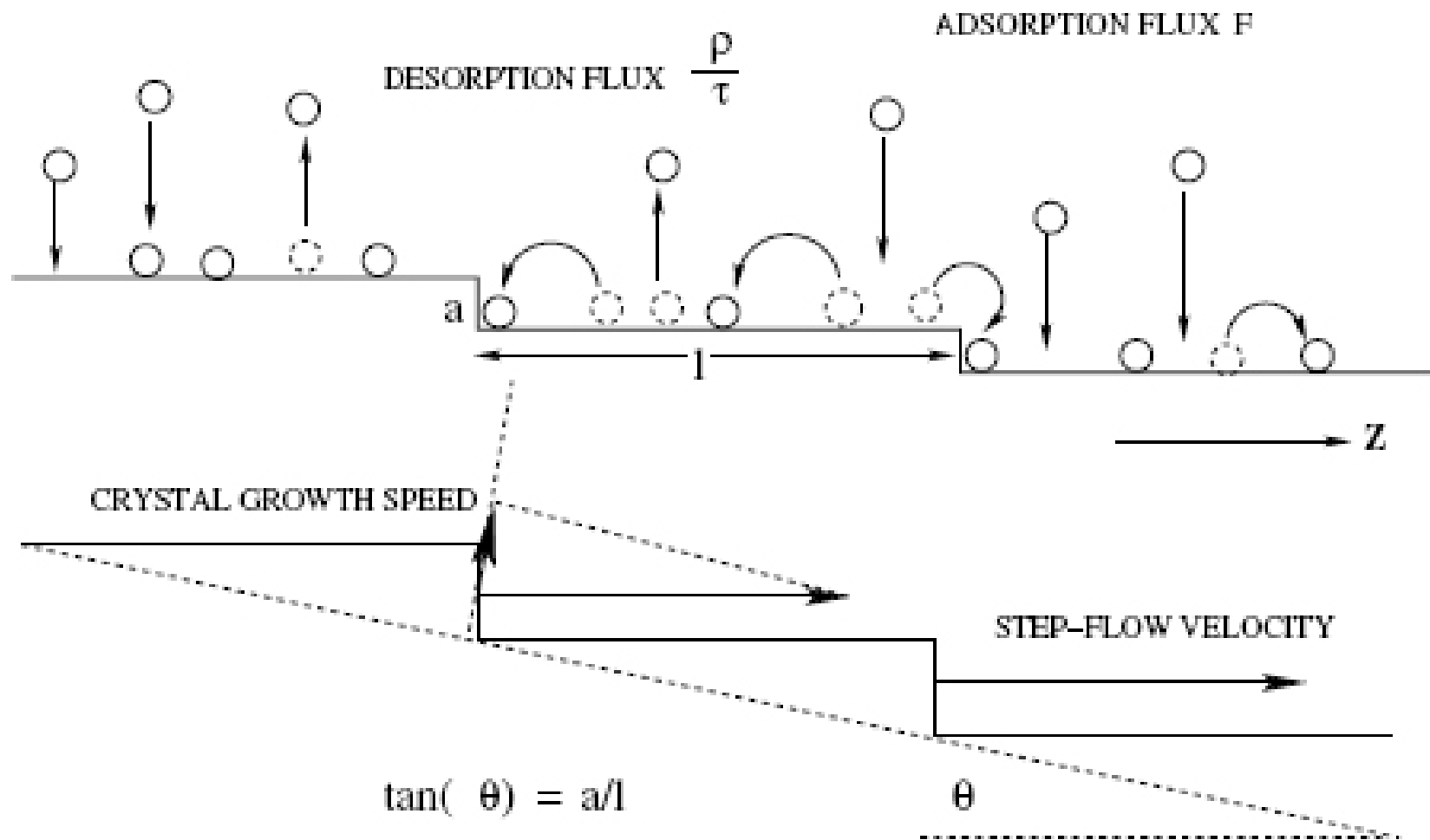
Time evolution of the surface morphology



EPL **82** 28007 (5pp)

doi:10.1209/0295-5075/82/28007

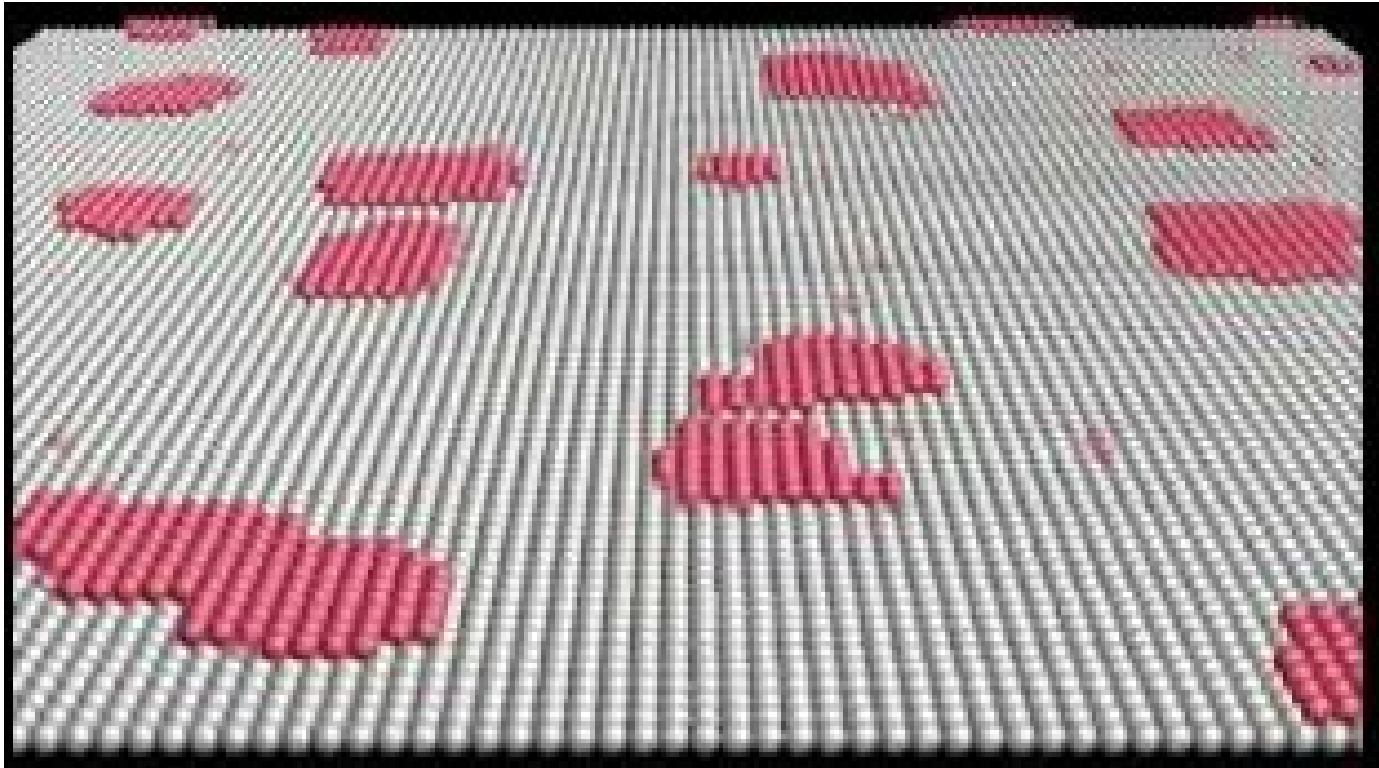
Convective step flow



EPL **82** 28007 (5pp)

doi:10.1209/0295-5075/82/28007

2D cluster nucleation, growth and coalescence



Matteo Salvalaglio, E6–E14, doi:
10.1073/pnas.1421192111