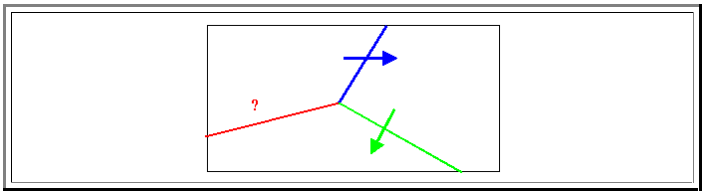
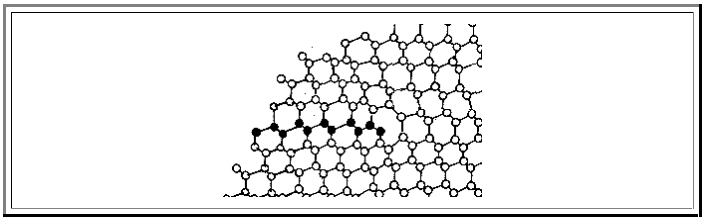
Exercise 5.1-3

Quick Questions to 5.1: Dislocations - Basics

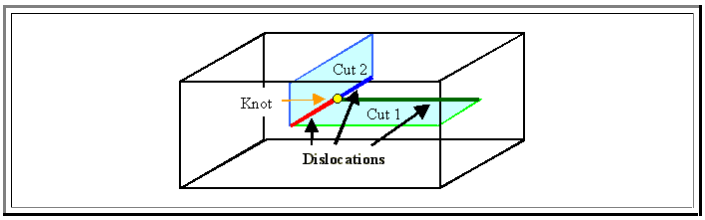
- Here are some quick questions:
  - The *answers* are sometimes (and possibly only indirectly) contained in the links.



- Draw a schematic lattice fringe picture of a screw dislocations by sketching the planes above and below the dislocation line
- Produce the dislocation arrangement shown in the picture by Volterra cuts and determine the Burgers vector of the third dislocation.
- Enumerate at least 5 basic properties of dislocations.
- What do you know about the free enthalpy and so on of a dislocation? What is the source of the enthalpy (or energy) of a dislocation? Give a number and discuss consequences for (global and local) equilibrium.
- What is the difference between an edge and a screw dislocation?



- Determine the Burgers vector of the dislocation shown. Here are some hints.
  - Try to identify the unit cell first.
  - The picture shows a projection of a **fcc** lattice along a <**110**> direction
  - The crystal is of the diamond type
  - If all else fails - use this link



- The thee dislocations shown (in black, red and blue) were made by two successive Volterra cuts.
  - Three dislocations = three Burges vectors. How can you determine the three Burgers vectors by the properties of the two cuts?
  - Can you obtain this basic geometry by just *one* cut?
  - If yes, what would kind of Burgers vector would you find in this case for the red line?

- Dislocation loops
  - Draw a schematic cross -section and a top view of an edge type dislocation loop. Draw in the Burgers vector. Discuss apparent inconsistencies
  - What is the glide plane of a dislocation loop with edge type character (make a drawing)
  - Can you draw a screw-type dislocation loop?
  - Produce an interstitial type and a vacancy type the dislocation loop with the Volterra construction
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