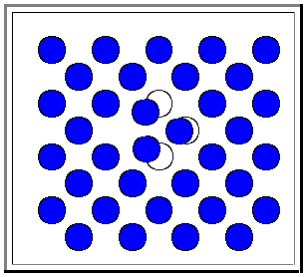
Extended Vacancy

- The question "How extended (how large) is a vacancy?", addresses the following concept:
  - The atoms next to a vacancy move to some extent into the free areas, their neighbors do the same. Eventually, the vacancy is kind of smeared out over a relatively large volume.
  - The vacancy would then appear like a little amorphous region or a little droplet of liquid material - we may have **26** atoms in a volume usually occupied by **27**.

Illustration

- The vacancy then would be hard to notice on a schematic drawing, this is shown below for the case of four atoms removed, three put back in.



  - If the three blue atoms would assume the position shown and not the position of the empty circles, the vacancy would be hardly noticeable
- Does this happen? As a rule: No! - at least as far as we know.
  - Vacancies and interstitials are (for entropic reasons) sharply localized, and we know that from measurements. The reason is that extended vacancies change the vibrations frequencies of many atoms and thus add more entropy than necessary for thermal equilibrium.
  - There is, however, one exception to this rule - it is, like always **Si**. There is reason to believe that at high temperature both vacancies and interstitials are extended to some degree. But the last word on this is not yet in.