

## Wigner - Seitz - Elementarzelle

### Advanced

- For a given lattice, there is a simple way of constructing an unique elementary cell, avoiding all the difficulties with primitive and non primitive elementary cells, Bravais lattices that show all the symmetry or only parts, and so on.
  - The catch is, you may lose everything that makes a lattice special. The resulting elementary cells may appear downright ugly.
  - That's why they are rarely used as long as we look at crystal lattices in normal space. But whenever we consider *electronic properties*, we will construct lattices in some other space - in particular wave vector or momentum space - and that's when we use *Wigner - Seitz cells*, as they are called, exclusively.
- Well - here is the recipe:
  - Choose a zero point of your lattice.
  - Draw lines from your zero point to all neighboring lattice points; take as many as you want - nearest neighbors, second-nearest neighbors, etc.
  - Draw a plane (two-dimensional a line), that exactly bisects all of your lines at a right angle.
- That's it. A subset of all your planes will form some closed body, and that is your Wigner Seitz elementary cell, That it is an **EZ** is easy to see: just repeat it all over space - it will produce your crystal if you put your base - the atoms - at the right positions inside your Wigner-Seitz **EZ**.
  - Below it is done for a two-dimensional lattice.

