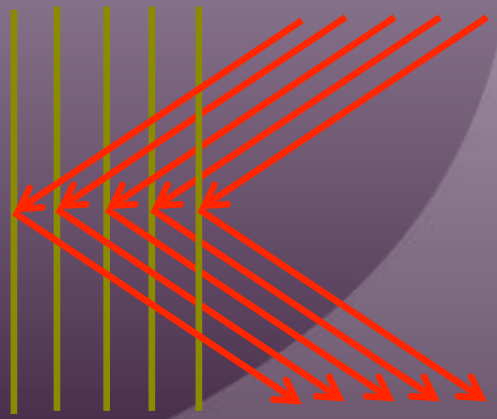
Electron Diffraction with Crystals

Bragg and Thompson

- Bragg was using X-rays, and looking at the interference between crystal planes at different depths.
- Thompson was using high energy electrons and a polycrystalline foil was also seeing contributions from many crystal planes (with many orientations).
- cf. E&R pg 59



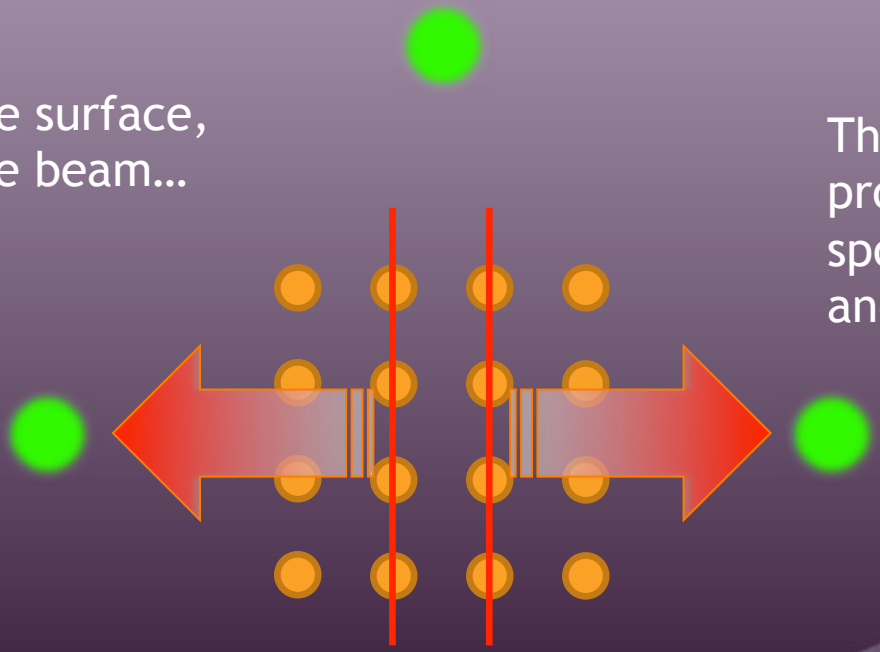
Davisson-Germer Experiment

- Used low-energy electrons (54 eV)
- This technique, later developed into Low-Energy Electron Diffraction (http://en.wikipedia.org/wiki/Low-energy_electron_diffraction), only samples the surface layer of the target material
- So, why the diagonal spots?
- And why there?

Horizontal and Vertical Spots

- Separation between vertical and horizontal planes is D
- Angle of spot (due to constructive interference) is θ

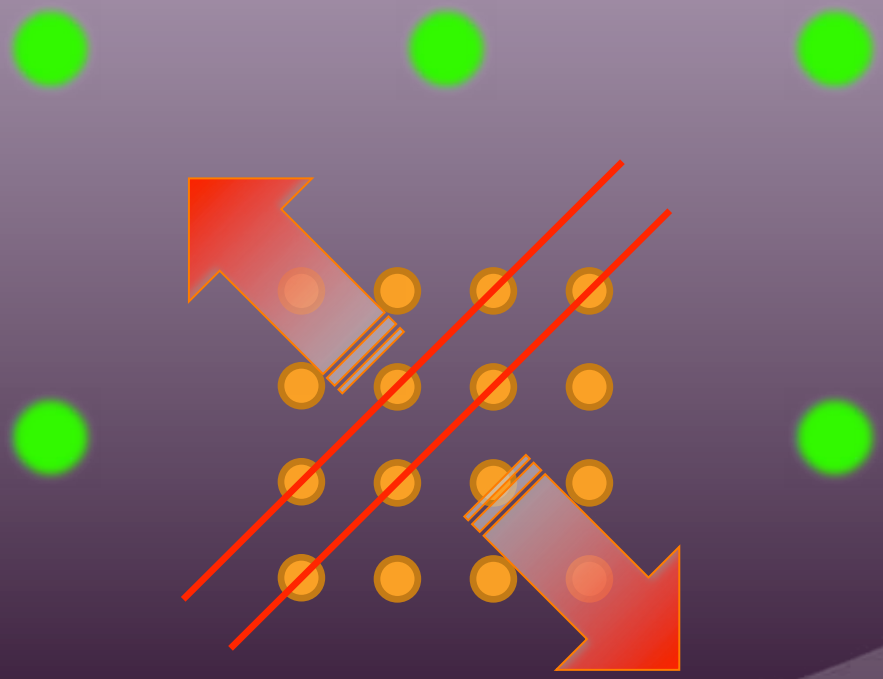
Looking at the surface, as seen by the beam…



The vertical planes produce the bright spots to the left and right.

Diagonal Spots

- Separation between diagonal planes is D/√2
- The planes are closer together than the vertical and horizontal planes, so θ is larger by √2



8.04 Quantum Physics I

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