Physics with neutrons 2

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Exercise sheet 1
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EXERCISE 1.1

1. With which part of matter do neutrons and photons interact, respectively? What are the differences between light and neutron scattering?
2. What gives rise to coherent / incoherent scattering? Which information can be extracted from each of them?
3. Recall the most important facts about the structure factor $|S|^2$ and the form factor $|F|^2$.

EXERCISE 1.2

[1]Verify the diffraction patterns of Fig. 1. The atomic positions of NaH and NaD in the fcc unit cell are defined by

$$\mathbf{b}_{Na} = a(0,0,0), a(1/2,1/2,0), a(1/2,0,1/2), a(0,1/2,1/2)$$
$$\mathbf{b}_{H/D} = a(1/2,0,0), a(0,1/2,0), a(0,0,1/2), a(1/2,1/2,1/2)$$

[1]Furrer A. et al., Neutron scattering in condensed matter physics, Singapore: World Scientific, 2009

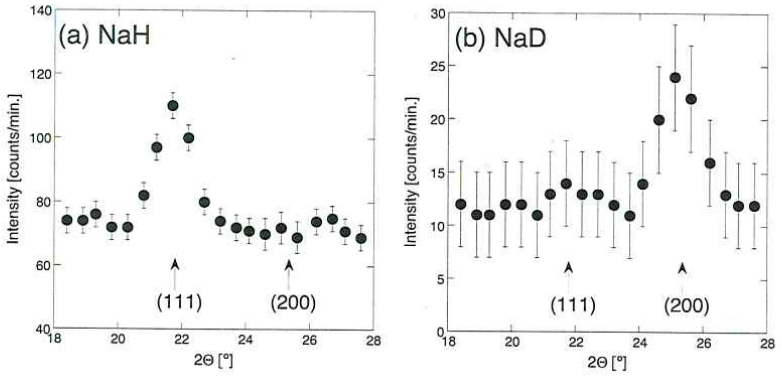

Figure 1: Neutron diffraction patterns obatined for NaH and NaD at room temperature (Shull *et al.*, 1948)