

# Session 15 ~ 16 Many-Electron Atoms

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## Goal

1. Introduction of electron spin
2. What is the exclusion principle and how this principle governs the many electrons in atoms.
3. Fine structures of atomic spectra

## Scenario

- ✓ To complete the description of the hydrogen atom, it is indispensable to take into account electron spin and the exclusion principle.
- ✓ We look into the role of electron spin in atomic phenomena and into why the exclusion principle is the key to understanding the structures of atoms with more than one electron.
- ✓ The theory of the atom developed in the previous chapter cannot account for a number of well-known experimental observations
- ✓ Fine structures of spectra  
ex.). Balmer series  $n=3 \rightarrow n=2$ .

656.3 nm  $\rightarrow$  split by 0.14 nm.

Anomalous Zeeman effect

- Electron spin

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Year 1922. O. Stern und W. Gerlach.

"Der experimentelle Nachweis des magnetischen Moments  
des Silberatoms"

"Experimental detection of the magnetic moment of the Ag atom"

No word of "Spin"

Year 1925. G. Goudsmit and G. E. Uhlenbeck

Naturwissenschaften 13, 953 (1925); Nature 117, 264 (1926).

Spin hypothesis  $\Rightarrow$  Splits of spectra

Anomalous Zeeman effect.