- Declaration: Oct 4,2024
- Project supervisor: Emilia Witkowska, `ewitk@ifpan.edu.pl`
- Consultation: Oct 15, 2024 (Tuesday) at 13:15, hall D
  If needed – another meeting in the week Oct, 14-18
- Presentation: Dec. 6, 2024

Nuclear magnetic resonance (NMR) is a physical phenomenon in which nuclei in a strong constant magnetic field are disturbed by a weak oscillating magnetic field (in the near field) and respond by producing an electromagnetic signal with a frequency characteristic of the magnetic field at the nucleus. This interaction happens near the resonance, when the oscillation frequency matches the intrinsic frequency of the nuclei, which depends on the strength of the static magnetic field, the chemical environment, and the magnetic properties of the isotope involved.

NMR results from specific magnetic properties of certain atomic nuclei. Nuclear magnetic resonance spectroscopy is widely used to determine the structure of organic molecules in solution and study molecular physics, crystals, and non-crystalline materials. Nuclear magnetic resonance is also regularly utilized in advanced medical imaging techniques, such as **Magnetic Resonance Imaging (MRI)**.

While the concept and mathematical description of NMR will be introduced during the lecture, the task aims to present and discuss NMR applications in various scientific disciplines.

(a) Start by searching the literature on a description of the resonance effect, recall the first experiments by Rabi in 1939, next by Bloch and Purcell in 1945.

(b) List as many applications of NMR as possible.

(c) Choose three applications and describe them in more detail.