Nuclear Magnetic Resonance

All of the matter around us is made of atoms, which contain atomic nuclei. Nuclei are too small to see. But they behave like little magnets, and we can detect them with nuclear magnetic resonance (NMR).

In our NMR experiment, we first align the nuclear “magnets” in one direction. For this, we use an electro-magnet. Then we set them all together “spinning”, using a radio-wave pulse. Finally, we measure their signal as they return to random orientations. The lifetime of the signal – the time before it has “relaxed” – tells us about the substance that we are measuring.

Our NMR signal comes from liquids. Its lifetime depends among other things on how thick the liquid is. You can measure different foods and compare their NMR signal. You can also listen to the sound of the NMR signal. You will hear a high-pitched sound at the beginning, and only noise once the nuclear “magnets” have relaxed.

With NMR, we can look inside of objects. Here, we are telling apart different drinks without opening the can. NMR is much more powerful than this simple experiment.

At the hospital, a radiologist can use NMR to measure an image from inside of our body.

In the laboratory, we can use NMR to find out about the composition and geometry of molecules.