

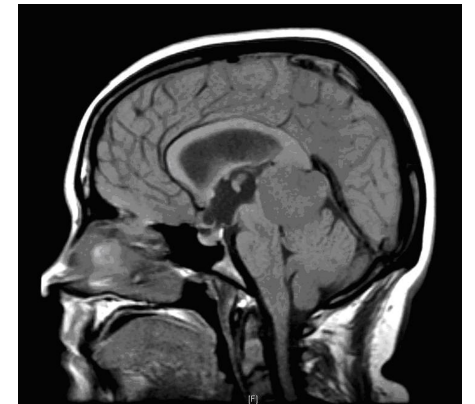
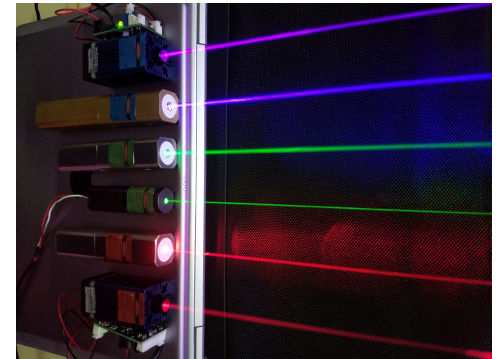


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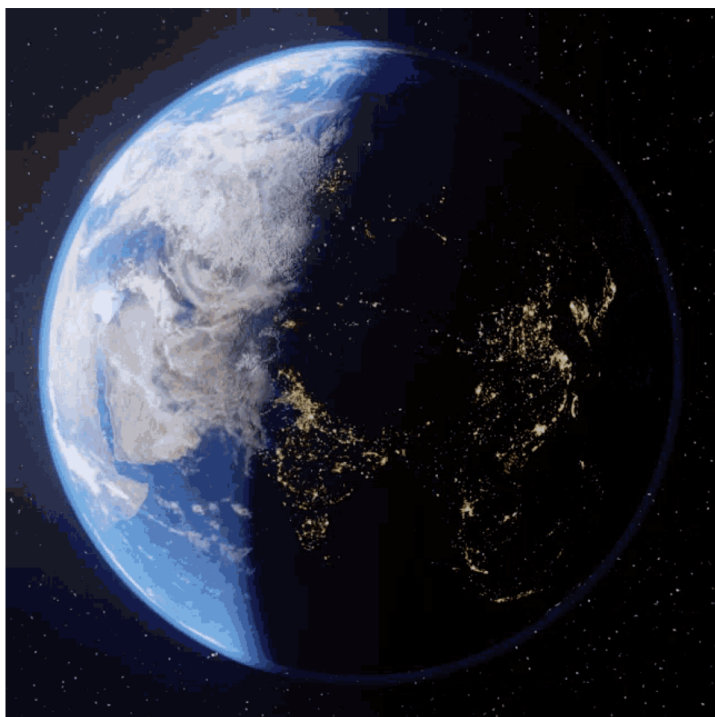
World is Spinning

The Office of Postdoctoral Affairs
The Graduate School | Florida State University



<https://quantum.fsu.edu/>

World



World is Spinning is my title,
next few minutes, will be vital.

Five minutes are more than enough,
you just need to be **Kenough**.
For those who have **Barbenheimer** seen,
a truly remarkable combination unforeseen.



In the picture here, the Earth rotates,
but there is another **Quantum World**, that awaits.
Today, I will tell you story about **Spin**,
a **quantum property**, that has always been.

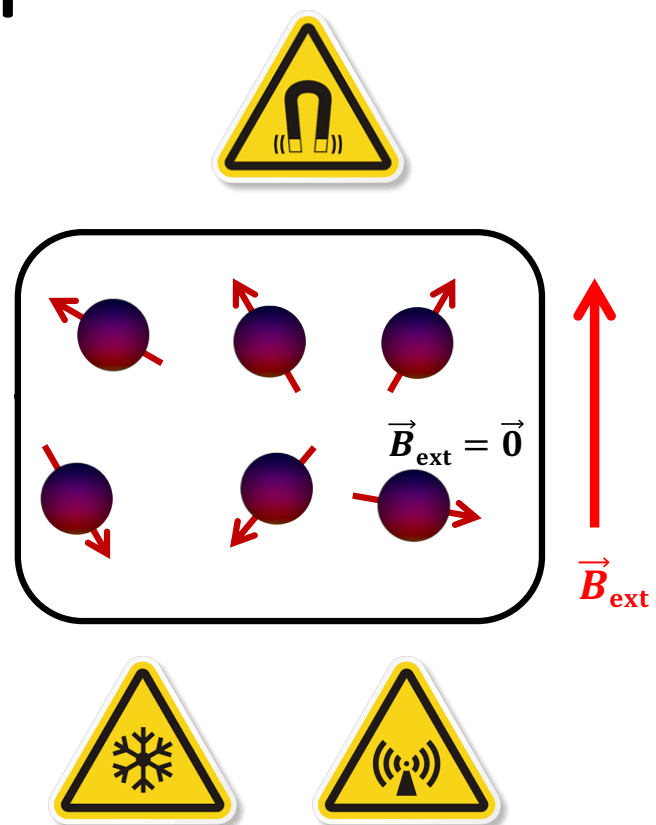
Let me show you the nanoscale world I study,
electron spin resonance is my buddy.
Information about the **magnetic properties** you obtain,
as well as spin dynamics insight, you gain.

Electron

Electrons along with nuclei atoms make, many arranged atoms, molecule bake.
Paramagnetic system with unpaired electron is, in no magnetic field the electrons randomly fizz.

To study the molecule of nuclei and **electrons** in peel, we place them into a **magnetic field** that they feel.
Cool them down to **cryogenic temperature** and apply **microwave**, that is the **resonant condition** they crave.

You just learned the **magnetic resonance** base, let us look a bit deeper into the special case.

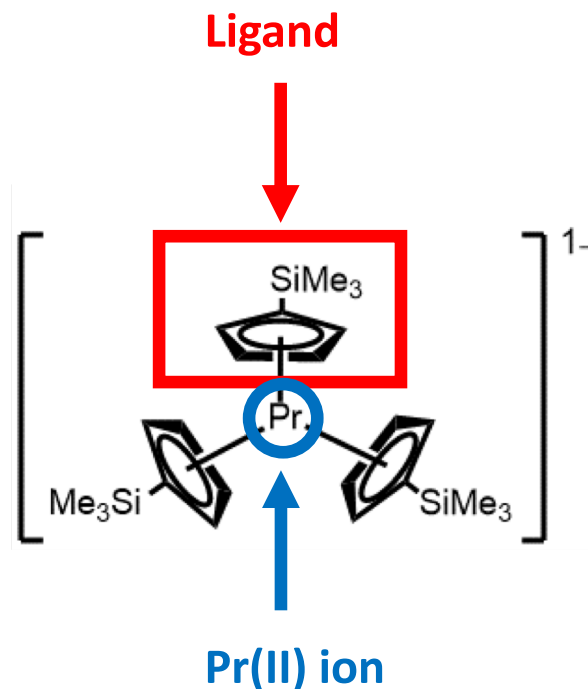


Chemistry

The colleagues from chemistry like to play,
alter the surrounding **ligand** as a foreplay.
When the right ligand clicks,
happiness is seen on our lips.

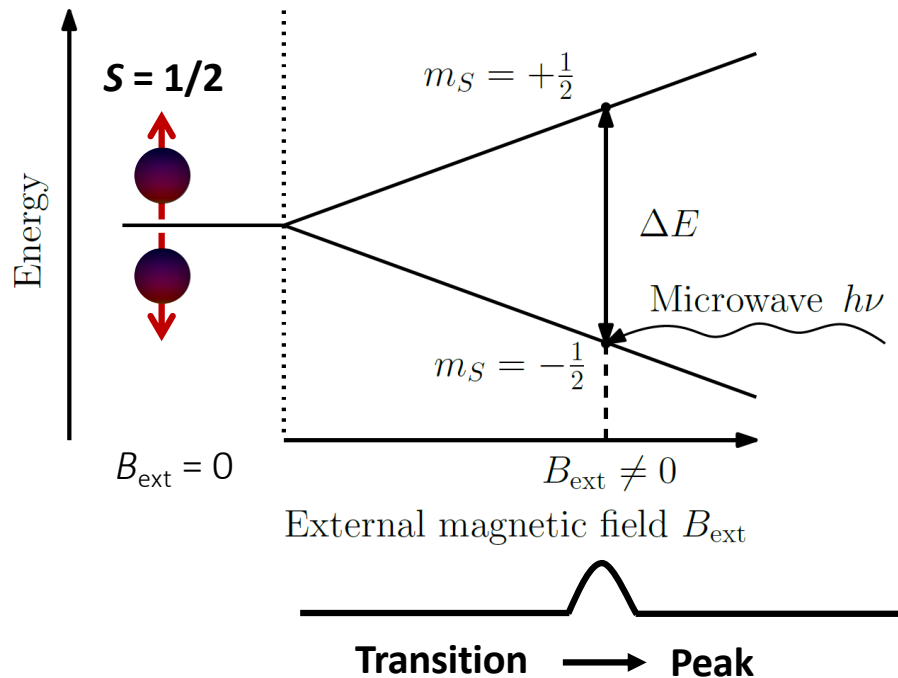
If you take electrons from an atom in pair,
a positively charged **ion** forms in despair.
Scheme shows **Praseodymium(II) ion**,
the chemical bonds are stronger than a lion.

Black powder from synthesis comes,
all the effort from preparation sums.
The result is coordination **compound**,
coming to measurements, safe and sound.



Energy

$$\Delta E = h\nu = g_e \mu_B B_{\text{ext}}$$



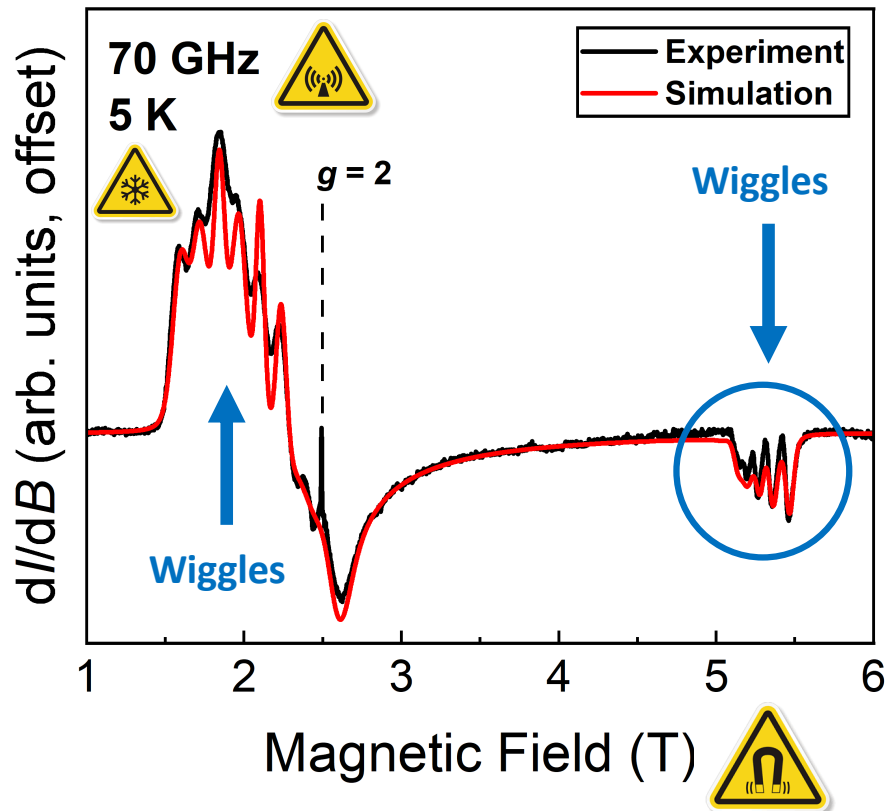
$$\Delta E = h\nu = g_e \mu_B B_{\text{ext}}$$

The spin of an electron gives you **two energy levels**, the difference gives you **transition** with levels. **Energy** of molecule is what we look for here, kinetic and potential terms will adhere.

The energy between the levels is **quantized**, equals to **Planck constant (h)** times **frequency (ν)** stylized. That is the **Bohr constant (μ_B)** times **magnetic field (B_{ext})**, with the electron **g -factor (g_e)** as **magnetic property** yield.

Nature always likes the state of the **lowest energy**, this way it will let you reveal its inner synergy. This transition gives you spectrum to simulate, **quantum world** nature you emulate.

Spin



The electron with spin one half **signal** gives, nearby **nuclear spin** never forgives, the electron-nuclear interaction is seen, by these **Wiggles** on the screen.

By the **electron spin resonance** we see, the **quantum world**'s deepest sea, the world we do not understand much, that is why we study it as such.

From all these terms the head might spin, you all are part of quantum world we live in. In these few minutes you learned what I do, Take care, I hope you enjoyed it too.