

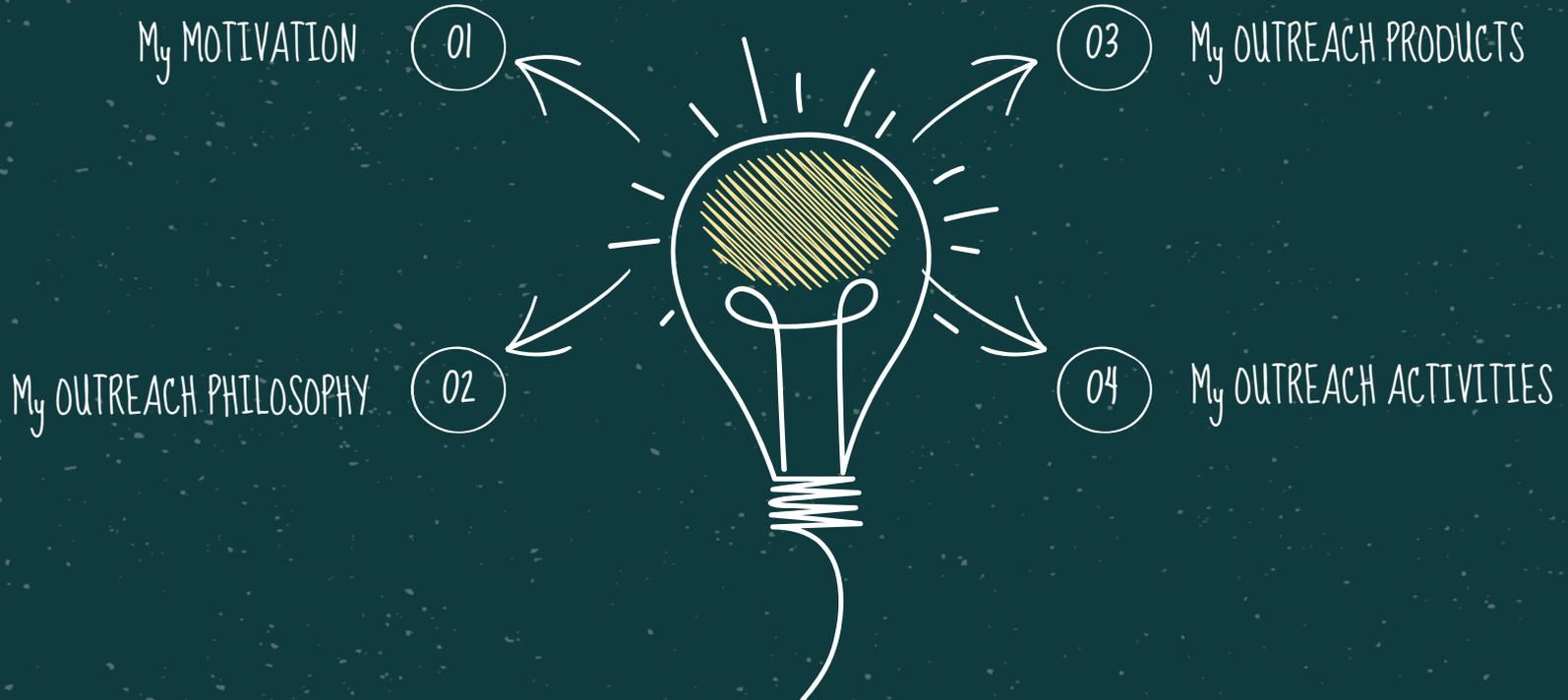
# Who am I?

I am Marwa, a physicist from TTI-SQUTEC, Stuttgart.

I work on the transfer of quantum-based sensing using diamonds to real-world applications.

I dream of the day when you can image magnetic fields as easily as you take photos nowadays!

# My outreach Portfolio



## FOR ME OUTREACH IS ABOUT...

1

SHARING

---

my love of science

2

GIVING BACK

---

to society, so they know  
what is the research money  
spent on

3

MOTIVATING

---

women to take up careers in  
physics

# My OUTREACH PHILOSOPHY

## Use of Graphics

A picture is worth a thousand words



## Use of analogies

from everyday life and experiences



## Mention perspective of the research to society

Impact, novelty, need

# My Outreach Products

BLOG



VIDEO



INFOGRAPHICS



POSTER





## What, Why and How of my research

Target audience: High-school students



Uploaded on the QUSCO website :

[https://qusco-itn.eu/2019/10/21/marwa\\_blog/](https://qusco-itn.eu/2019/10/21/marwa_blog/)

From seeking the origins of the universe to designing next generation technologies...

## It's all about sensing

Marwa Garsi

*The wonder is, not that the field of the stars is so vast, but that man has measured it.*

— Anatole France [1]

### Who has never dreamt about discovering the origin of the universe or even life?

Our understanding of the world and intrinsically scientific advances rely on our capabilities to see ever further, far beyond the limit of our vision. No matter if we try to observe single molecules or distant objects in the sky, the fundamental problem is the same: we need tools with better accuracy and precision. The current state of scientific research is such that we are able:

- o to manipulate microscopic objects using optical tweezers, *i.e.* displacing very small objects using light (see the [Nobel Prize in Physics 2018](#) );
- o to image individual molecules using super-resolved fluorescence microscopy, *i.e.* imaging tiny object with a spatial resolution beyond the limit imposed by light (see the [Nobel Prize in Chemistry 2014](#));
- o and even to detect [gravitational waves](#), *i.e.* ripples in space that need to travel so long distances until reaching the Earth, they are very weak and inherently hard to observe (see the [Nobel Prize in Physics 2017](#)).

And this is only to name a few. Even so, a lot of challenges are still remaining. To understand this, we can have a look at two distinct parts of the scale right below.

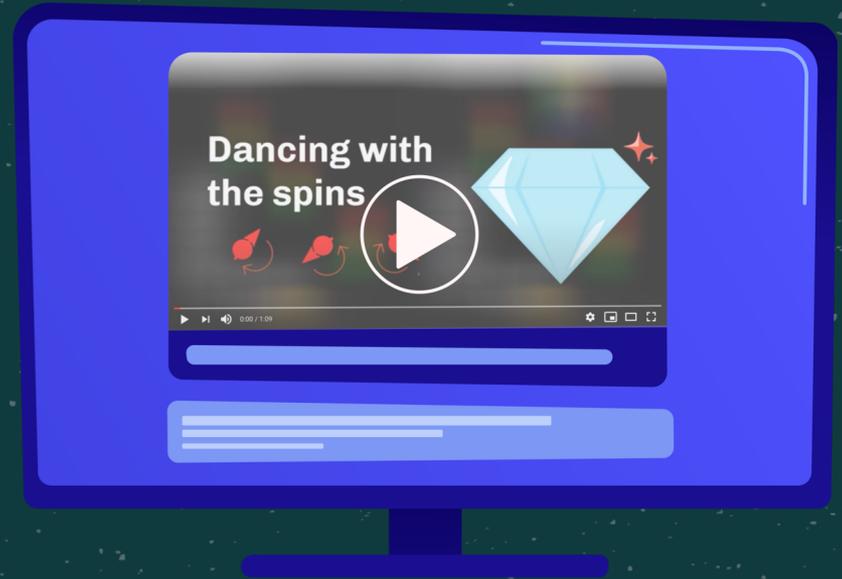


**Short animation to summarising how my system works  
and how we can use Optimal Control to better control it.**

Target audience: wide audience including High-school  
students

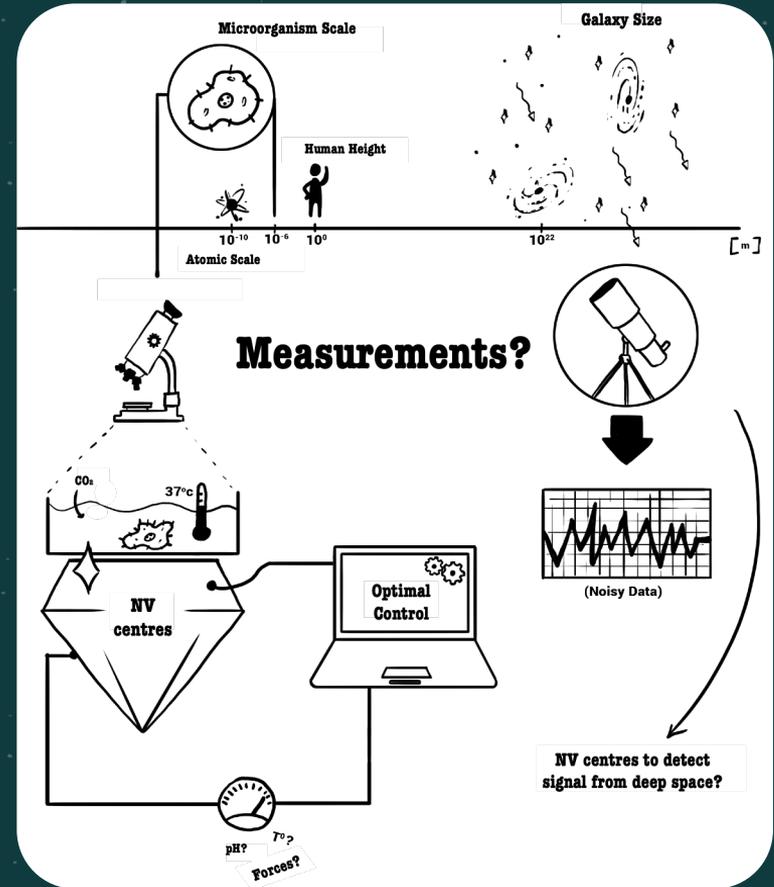
**Uploaded on the QuSCo youtube Channel:**

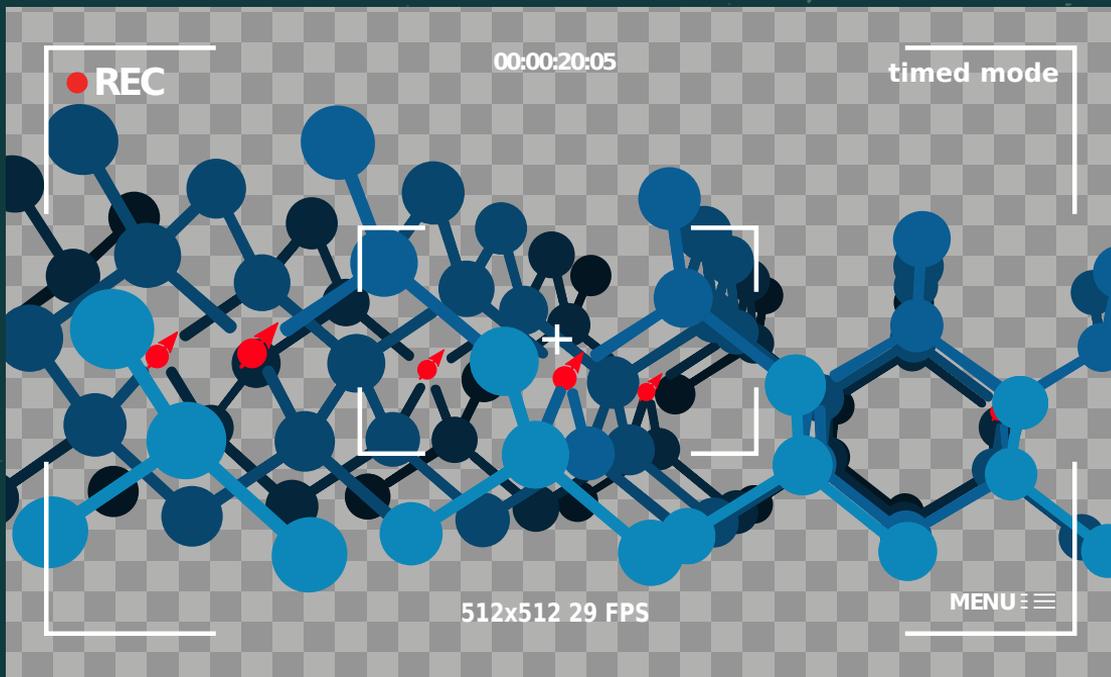
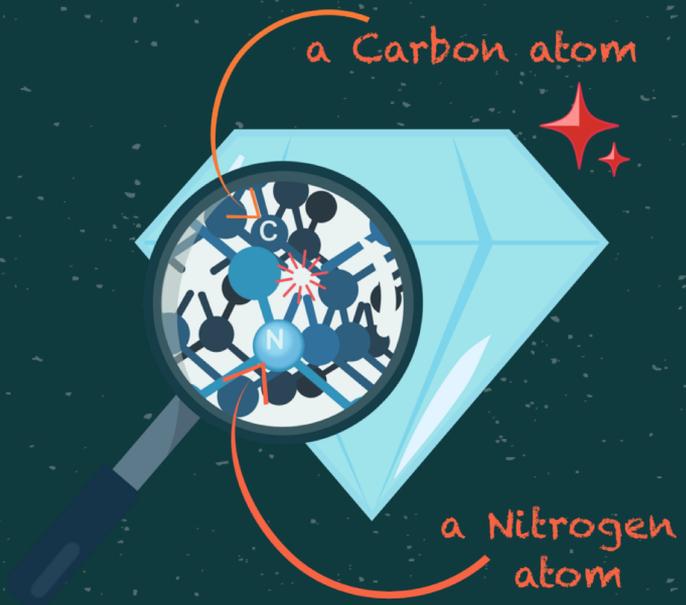
[https://www.youtube.com/watch?v=B8le1tT\\_CRo](https://www.youtube.com/watch?v=B8le1tT_CRo)



# My Infographics

The idea here was to show how versatile diamond-based sensing is: we can use it to seek the microscopic and nanoscopic worlds, with various conditions (e.g. ambient conditions). We can also think of using it to detect signals from the universe. The sky is the limit!





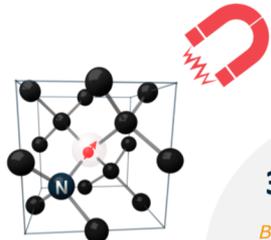
and my Poster...

# NV-based widefield imager : *tomorrow's pocket magnetic field microscope*

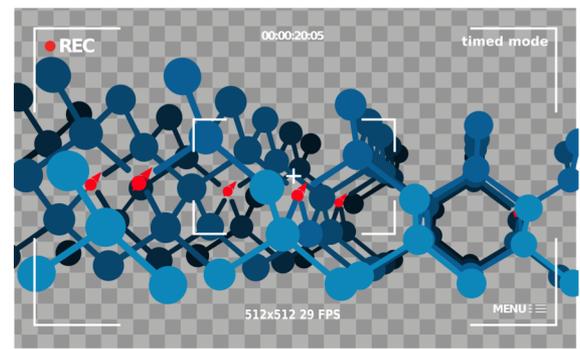


## 1. NV-based?

Triplet ground state  
 ⊕  
 Spin state dependent  
 fluorescence  
 |0⟩ = "bright"  
 |±1⟩ = "dark"  
 ↓  
 Optically Detected  
 Magnetic Resonance



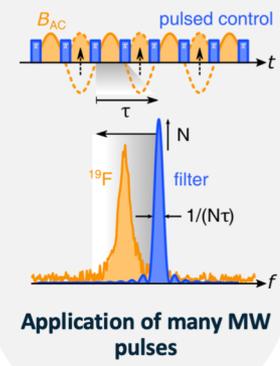
## 2. Widefield imager? *using a CCD camera!*



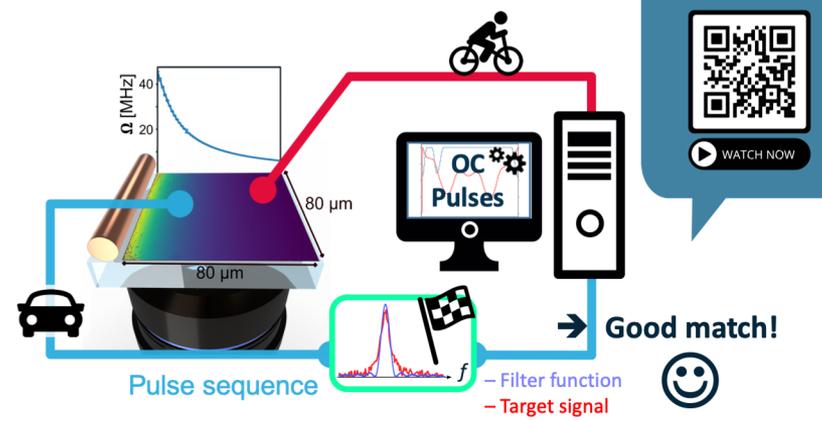
Imagine a day you could analyse the chemical composition of water on the back of your smartphone... That would be amazing!\*

This would be possible by performing NMR\*\* sequences with NV centres! However, they are performed by applying a bunch of microwave (MW) pulses to the sensor (NVs) synchronously with the oscillating signal to probe. This can result in inhomogeneous outcomes and hinder good performances! 😞  
 To overcome this, one solution is to use...

## 3. How?



## Optimal control (OC) theory!



For more details, check out: F. Ziem *et al.*, *Scientific Reports* volume 9, 12166 (2019)

A hand is shown in a dark teal, textured style, holding three glowing lightbulbs. The lightbulbs are white with yellow filaments and radiating lines, hanging from thin white strings. The background is a dark teal night sky filled with small white stars and a larger, faint star pattern. The text "My Outreach activities" is written in a white, handwritten font across the palm of the hand.

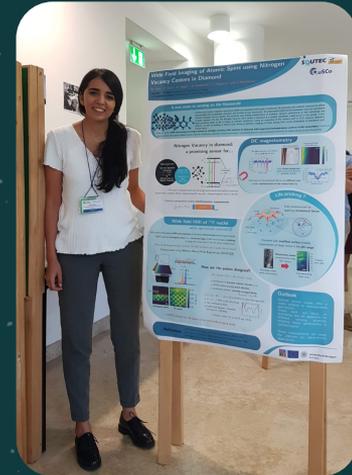
# My Outreach activities

# Outreach is a big adventure and it continues...



Organised by the University of Nice Sophia Antipolis

Many other events like teaching, lab tours to undergraduate students and even industrial partners!



$\sqrt{123}$



THANKS!

Do you have any questions?

[marwa.garsi@gmx.de](mailto:marwa.garsi@gmx.de)

CREDITS: This presentation template was created by **Slidesgo**, including icons by **Flaticon**, and infographics & images by Freepik.

Please keep this slide for attribution.

+ x ÷