

Women in Science: Navigating an Unconventional Path

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COMPASS AI/ML Challenge – June 3rd 2025

Why Unconventional

From hands-on scientific research on Drug delivery and Bioelectronics to a focus on Managing Scientific programs and fostering collaborative environments.

Blend technical expertise with leadership skills, adapting to new challenges

Educational Background

- Bachelor degree (2011) in Clinical Engineering and Master Degree (2014) in Biomedical Engineering at Sapienza, University of Rome
- Ph.D. in Electronic Engineering (2018), at Sapienza University of Rome

A "dynamic" PhD on exploring <u>drug delivery systems</u> using ns electric and low-intensity magnetic fields, employing both *theoretical* modeling and *experimental* setups

Research Contributions

Exposure PEMFs setup

Current Signal I (A)



Liposomal Drug Delivery Systems Activated by Electromagnetic Fields

- Use of electromagnetic fields to activate liposomal drug carriers to release drugs at targeted sites.
- In-vitro Experimental Findings:
 - Alternating (AMF), Pulsed (PEMF), and Nanosecond Electric Fields (nsPEF): Non-thermal triggers for controlled drug release, potentially minimizing side effects.
 - Intensity Levels: Effective drug release achieved at magnetic field intensities below 100 µT (using magnetoliposomes)

Frontal exposure view

(a)





Nardoni and della Valle et al., Nanomaterials, 2018

Research Contributions

- Liposomal Drug Delivery Systems Activated by ns Electric Fields
- Mechanism of Action:
 - Use of nanosecond electric pulses to trigger liposomal drug release, ensuring precision and control.
- Experimental Insights:
 - Simulation Studies: Demonstrate simultaneous cell and liposome poration potential with 12 ns pulses.
 - **Experimental Setup**: Designed a 10 ns pulsation system for liposome exposure using a custom electroporation cuvette.
 - **Preliminary Results**: Successfully porated 250 nm liposomes, achieving a 15% CF dye release at 9 MV/m field intensity.
- **Implications**: Potential for developing remote-controlled drug delivery systems integrating electric field technology.



Denzi and della Valle et al., J Membrane Biol, 2017





Research Contributions

Molecular Dynamics Simulation of Protein ^{C)} Interaction with Electromagnetic Fields

Research Focus:

• Study of electromagnetic field interaction with proteins using advanced simulations.

Key Proteins Analyzed:

- Adenosine A2A Receptor: Treatment implications in neurological disorders by alter binding site conformation with magnetic field: Implemente B field in MD Simulation
- *SOD,Cu-Zn Enzyme*: Investigating electric pul effects to understand potential catalysis modulation without structural damage.

Findings and Future Impacts:

- Predictions of protein behavior in electromagnetic environments.
- Potential developments in precision medicine: designing smarter therapeutics and uncovering new treatment mechanisms.



della Valle et al., Plos One, 2018

Transition to University of Michigan

Coming from a PhD on Drug Delivery applications I applied for a post-doc position at the **Bioelectronic Vision Lab** which focused on Retinal Prosthesis.

Did I know anything about Visual Cortex, retinal prosthesis ????



I even asked my PI at the time: Why are you hiring me?

His answer was: you have demonstrated with your PhD you are a *versatile* researcher, and I am sure you will give your best! **Challenge** yourself!

Transition to University of Michigan

- He was right!
- I had an amazing experience:
- I optimized a protocol for PtIr electroplating of carbon fiber micro-electrodes
- Learned about the retina and electrical stimulation with PtIr coated carbon fiber
- I learned lithography techniques and fabricated gold microelectrodes



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In vitro – 170 us biphasic cathodic pulse, 300 Hz, 1mC/cm²

-0.4

¹ della Valle et al., Frontiers in Neuroscience Nov. 2021



Transition to University of Michigan

 Mentoring graduate students was one of the most rewarding aspects of this role, allowing me to develop leadership skills and managing the lab allowed me to better understand policies



What's Next?

Leveraging Skills in Management

In late 2022, I <u>stepped away</u> from research:

transitioned to a **Laboratory Research Specialist role in Radiology**, which involved quality control for PET radiotracers.

This experience emphasized the importance of *attention to detail* and *quality assurance*, skills that are crucial in management

I missed research, or best being in a research environment

Thanks to a friend who introduced me to Elizabeth Peters, managing Director of the Biointerfaces Institute, I applied to be Program Manager of the Bioinnovations in <u>Brain Cancer Program</u>: **Connections** are important!

I managed a program with **32 faculties** and **2** co-directors:

Learned from policy development to financial monitoring and stakeholder communications.

I have managed several outreach activities, including STEM workshops and international symposiums, which have honed my skills in **event management and strategic planning**."



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Becoming COMPASS Managing Director | challenged myself:

Manage an international interdisciplinary Center





Overcoming Challenges

Transitioning from a research-focused role to management was **challenging** but **rewarding**.

I had to **adapt quickly** to new responsibilities and foster relationships across departments.

As **a woman in science**, I've encountered and navigated various biases, which has only strengthened my resolve to support others in similar situations.

Advice

Embrace change and **seek** opportunities to grow.

My career path was non-linear, but each step provided valuable skills and insights – never stop **learning** or say you **can't do it**!

Mentorship is crucial; I encourage women in science to seek and provide mentorship, fostering a supportive community."

Thank you!

