

PHOTONIC AND NANOMETRIC HIGH-SENSITIVITY BIO-SENSING

DELIVERABLE 4.3 [HUJI, M60] REPORT ON PRESS



PRESS

Work Package 4

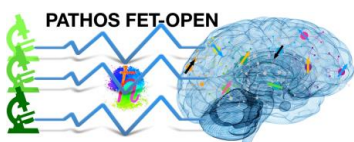
Project number: 828946

Project partners: UNIFI, Weizmann, INRiM, HUJI, TUDO



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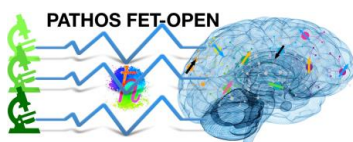
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1 Executive Summary

As deliverable D4.3 we report on the project's dissemination activities, including outreach, popular press and videos, website and more.

- We present the project website.
- We detail dissemination activities in the popular press.
- We mention various outreach activities.

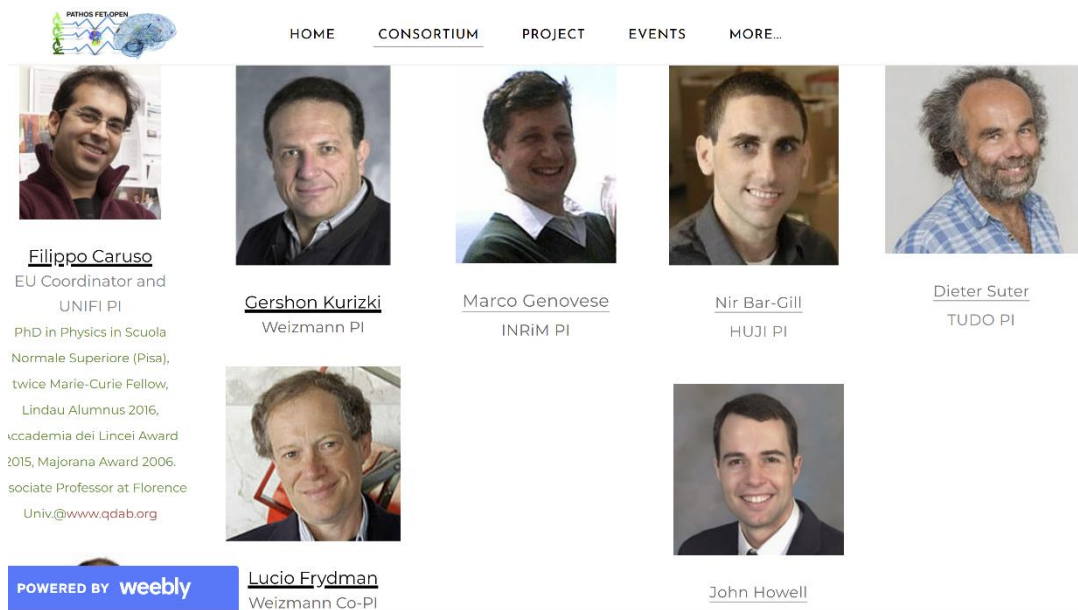


2 Website

The PATHOS website (www.pathos-fetopen.eu) provides complete information on the project. It contains details on the project itself and the consortium, accessible information on the research and outcomes in lay terms, and the publications and outreach resulting from the project.

2.1 Project information

The consortium is presented:

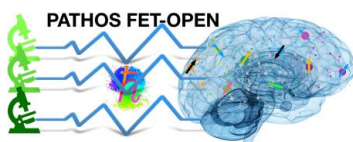


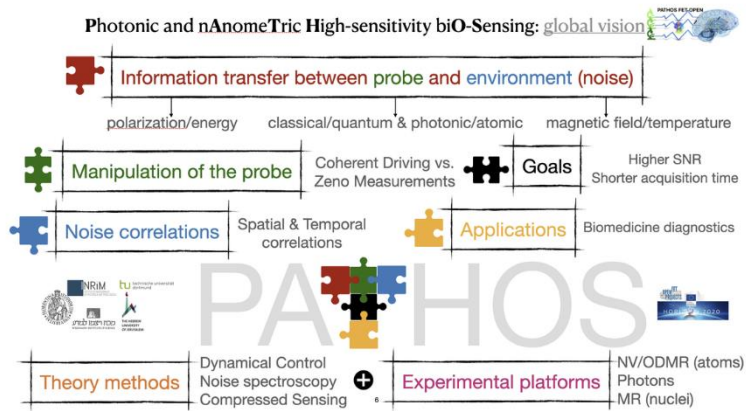
The screenshot shows the website's navigation menu with options: HOME, CONSORTIUM (selected), PROJECT, EVENTS, and MORE... Below the menu, there are six member profiles, each with a photo and text:

- Filippo Caruso**: EU Coordinator and UNIFI PI. PhD in Physics in Scuola Normale Superiore (Pisa), twice Marie-Curie Fellow, Lindau Alumnus 2016, Accademia dei Lincei Award 2015, Majorana Award 2006. Associate Professor at Florence Univ. @www.qdab.org
- Gershon Kurizki**: Weizmann PI
- Marco Genovese**: INRiM PI
- Nir Bar-Gill**: HUJI PI
- Dieter Suter**: TUDO PI
- Lucio Frydman**: Weizmann Co-PI
- John Howell**

A "POWERED BY weebly" logo is visible at the bottom left of the page.

In addition, details about the project are given, both in lay terms and for experts.

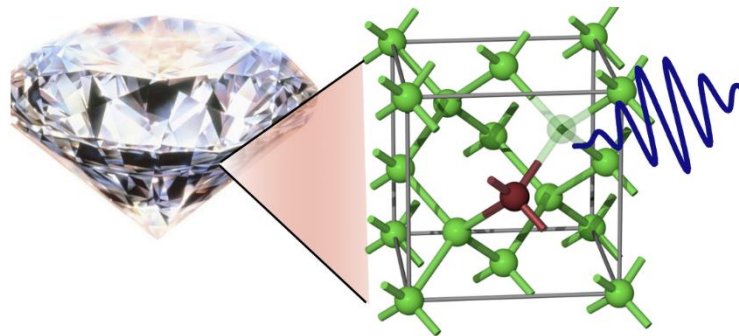




PATHOS FOR THE GENERAL AUDIENCE

During the first half of the 20th century, physicists were able to unravel the basic properties of the constituents of matter and their interactions in what became known as the quantum revolution or simply the theory of quantum mechanics. Since then quantum mechanics has been firmly established as the fundamental theory of most fields of physics and its validity has been tested successfully in a vast array of different settings.

During the last decades, the second quantum revolution has emerged: with the foundations firmly established, scientists are discovering a range of opportunities where quantum mechanics offers improvements on existing technologies and generating fundamentally new ones, such as quantum communication and quantum computing. In the context of magnetic resonance imaging, quantum mechanics has always been essential for understanding the phenomenon. Now, we are learning how quantum mechanics can be harnessed to improve the sensitivity, resolution and information content of the imaging process. In extreme cases, such as the one shown in the image above, it is possible to obtain images with atomic resolution, using atomic systems such as the nitrogen-vacancy center in diamond to emit single quanta of light (photons) and provide detailed information at the atomic scale on material properties or important biological samples.

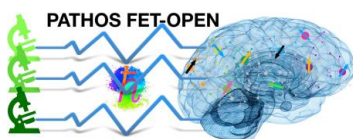


Please note that these are just excerpts, and the website contains full details.

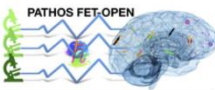
2.2 Publications and Outreach

Open-Access Publications


1. Hoang-Van Do, Cosimo Lovecchio, Ivana Mastroserio, Nicole Fabbri, Francesco S Cataliotti, Stefano Gherardini, Matthias M Müller, Nicola Dalla Pozza, Filippo Caruso. **Experimental proof of quantum Zeno-assisted noise sensing.** *New J. Phys.* **21**, 113056 (2019)
2. Nicola Dalla Pozza, Stefano Gherardini, Matthias M. Müller, Filippo Caruso. **Role of the filter functions in noise spectroscopy.** *International Journal of Quantum Information* **17**, 1941008 (2019) - [Eprint arXiv:1911.10598](https://arxiv.org/abs/1911.10598)
3. Matthias M. Müller, Stefano Gherardini, Nicola Dalla Pozza, Filippo Caruso. **Noise sensing via stochastic quantum Zeno.** *Phys. Lett. A* **384**, 126244 (2020) - [Eprint arXiv:1910.09251](https://arxiv.org/abs/1910.09251)
4. Nicola Dalla Pozza, Filippo Caruso. **Quantum Stochastic Walk models for quantum state discrimination.** *Phys. Lett. A* **384**, 126195 (2020).



The website contains lists of publications, as well as information on outreach and dissemination activities in popular media (we present here just representative screenshots, while the full information is on the website itself).




Outreach activities




Travis L. Scholten @Travis_Sch · Aug 13
"Quantum Reinforcement Learning: the Maze problem"
sccrate.com/arxiv/2108.044...
Featuring the #QuTiP package &
#QuantumMachineLearning
#QML
#MachineLearning
#QuantumComputing

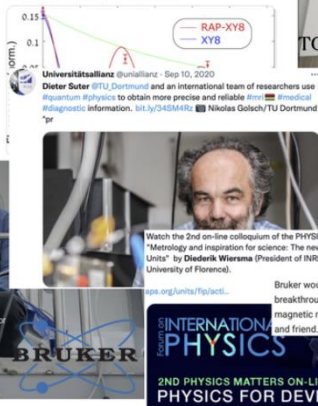
Italian National TV (RAI)



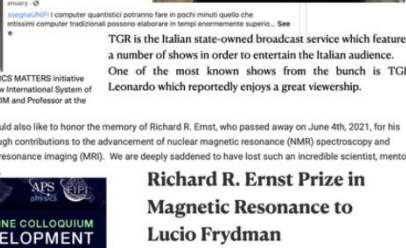
TGR Leonardo RAINEWSS24



Israel scientists collaborate to speed up Covid-19 RNA research using ultra-sensitive NMR techniques



Watch the 2nd on-line colloquium of the PHYSICS MATTERS initiative "Metrology and inspiration for science: The new International System of Units" by **Dieterik Wierama** (President of INRM and Professor at the University of Florence).



Bruker would also like to honor the memory of Richard R. Ernst, who passed away on June 4th, 2021, for his breakthrough contributions to the advancement of nuclear magnetic resonance (NMR) spectroscopy and magnetic resonance imaging (MRI). We are deeply saddened to have lost such an incredible scientist, mentor and friend.

Richard R. Ernst Prize in Magnetic Resonance to Lucio Frydman

Finally, links to open access data repositories related to the project are provided on the website.

Open Access Data

Experimental data sets of NV ODMR scans for training ML models – at the repository link <https://doi.org/10.5281/zenodo.7481960>.

ML source codes and test data sets for noise sensing – at the following repository links:

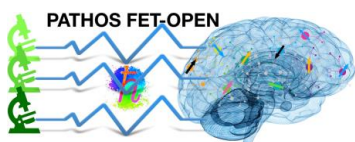
<https://codeocean.com/capsule/8363708/tree/v1>

<https://github.com/SoftwareImpacts/SIMPAC-2022-9>

NMR data are shared at the following links (also by Bruker):

https://www.weizmann.ac.il/chembiophys/Frydman_group/software

<https://www.bruker.com/en/resources/library/application-notes-mr/sensitivity-enhanced-tocsy-noesy-biomolecular-nmr.html>



3 Dissemination in popular media

Various popular media dissemination activities were carried out by the project members:

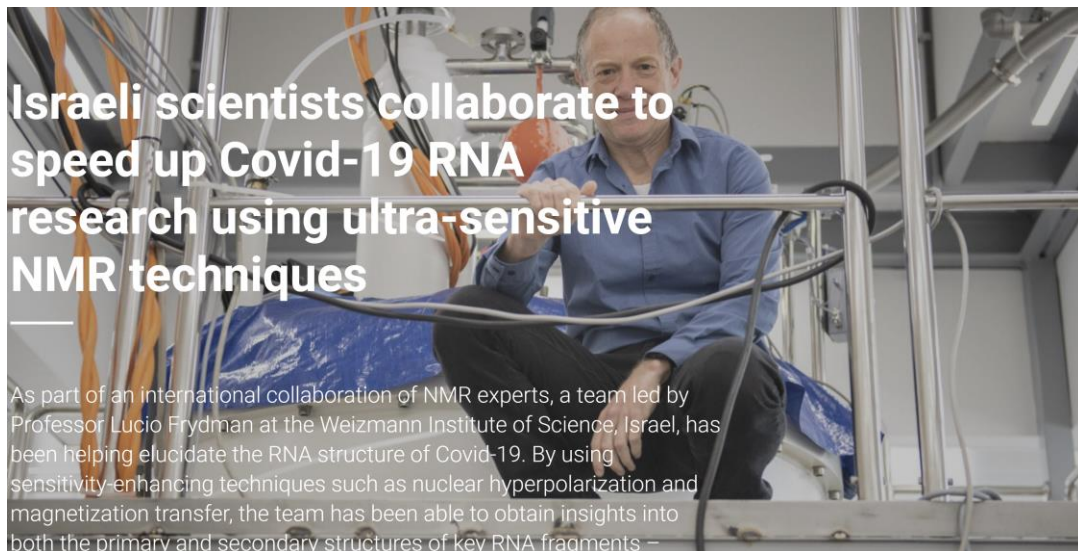
- TGR Leonardo TV show in Italy (F. Caruso):

[\(2\) Video | Facebook](#)



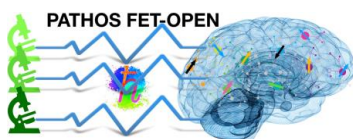
- Bruker news on COVID-related results of the project (L. Frydman)

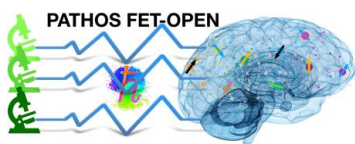
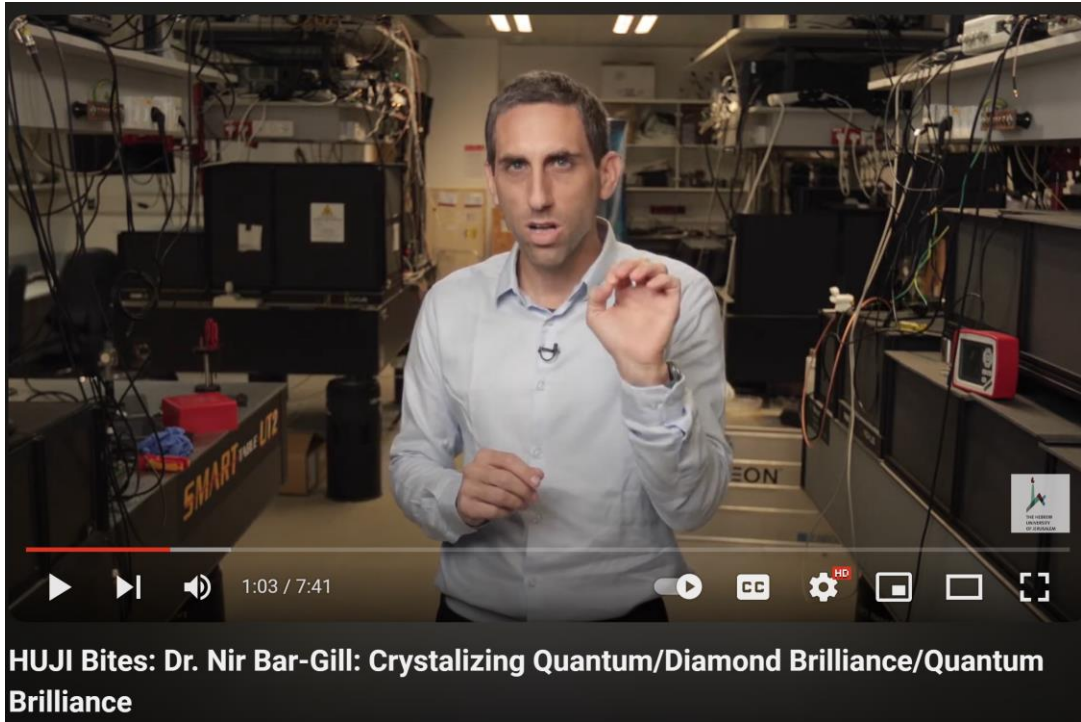
[Israeli scientists collaborate to speed up Covid-19 RNA research using ultra-sensitive NMR techniques | Bruker](#)



- Popular description of diamond-based quantum technologies through HUJI Bites (N. Bar-Gill)

[HUJI Bites: Dr. Nir Bar-Gill: Crystalizing Quantum/Diamond Brilliance/Quantum Brilliance \(youtube.com\)](#)





4 Outreach

Project members of participated in a variety of outreach activities, in the context of public lectures (to STEM high-school students), interviews and public meetings:

- WEIZMANN
 - Outreach describing the Covid-related implication of this project:
 - Spanish TVE network: video interview:
<https://www.rtve.es/play/videos/telediario/telediario-15-horas-17-09-20/5665004/?t=35m37s>, minute 35:30;
 - Israel24 TV network: https://video.i24news.tv/details/_6184883468001; from minute 5 onward
 - Bruker video interview: <https://www.bruker.com/it/products-and-solutions/mr/make-mr-more-relevant/covid19-nmr-consortium.html>,
 - Written article: <https://www.bruker.com/en/landingpages/bbio/resolution-in-a-new-dimension-for-solving-challenges-of-society/israeli-scientists-collaborate-to-speed-up-covid-19-rna-research-using-ultra-sensitive-nmr-techniques.html>.
- HUJI
 - Lecture to high-school students as part of the ALPHA excellence program, July 2021.
- UNIFI
 - PATHOS-funded research on quantum sensing has been publicly discussed by the PATHOS coordinator on the Italian state-owned broadcast TV service (RAI) and in particular in the news channel programmes as TGR Leonardo and RAINews24, enjoying a great national viewership. This was also advertised by social media, several press offices and also by our dissemination channels.
 - Invited talk on “The science of measurement and quantum standards for accurate measurement technology”, Conf. Accademia Nazionale dei Lincei - Metrology and INspiration for Science, March 2021.
 - Invited seminar on “Quantum metrology tools and smart sensors for industry and society”, Biennale Tecnologia Torino, November 2020.
 - Invited talk on “Smart materials that respond to their environment”, Invitation to Biological and bio-inspired optics, a Faraday Discussion meeting, July 2020
- TUDO
 - ‘Are Quantum Computers the Next Generation Supercomputers?’, Public lecture, Baku State University, Baku, 21.9.2022, Azerbaijan.
 - ‘Photons for Quantum Information’, SPIE chapter Kolkata, 14.3.2022, IISER Kolkata, India.
 - ‘Rechnen mit Quanten: Die Supercomputer der Zukunft’, Dieter Suter, Meet your prof, June 2020, Dortmund (Germany).
- INRIM
 - "La scienza e i suoi tempi",
<https://www.youtube.com/watch?v=4NEREdh46fc&t=454s>

