



**EuCAPT**

# **EuCAPT**

## updates & outlook

**Silvia Pascoli & David Marsh**

EuCAPT Symposium 2024

16 May 2024

# First, a big thank you to CERN

## 4th EuCAPT Annual Symposium

14–16 May 2024  
CERN  
Europe/Zurich timezone

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**Contact**  
✉ [Eucaptsecretariat@cern...](mailto:Eucaptsecretariat@cern.ch)

The European Consortium for Astroparticle Theory (EuCAPT, <https://www.eucapt.org>) is a young initiative, with central hub at CERN, that aims to bring together the European community of theoretical astroparticle physicists and cosmologists. Our goals are to increase the exchange of ideas and knowledge; to coordinate scientific and training activities; to help scientists attract adequate resources for their projects; and to promote a stimulating, fair and open environment in which young scientists can thrive.

We are delighted to announce the fourth edition of the EuCAPT annual symposium, the flagship event of our consortium, that aims to provide an interdisciplinary Europe-wide forum to discuss opportunities and challenges in Theoretical Astroparticle Physics and Cosmology. The symposium will take place at CERN, with online participation possible. We invite all scientists (PhD students, postdocs, and staff) active in these fields of research to join us remotely or in person from May 14 to 16, 2024. The symposium will feature invited presentations, and young scientists will have the opportunity to present their work with lightning talks and in a poster session.

We invite young scientists to submit abstracts for lightning talks and posters by February 15. There is no conference fee for this event.

**Invited speakers:**  
Jose Luis Bernal (Institute of Physics of Cantabria)  
Simone Blasi (DESY Hamburg)  
Christopher Eckner (University of Nova Gorica)  
Giulio Fabbian (University of Cardiff)  
Gaetan Facchinetti (Bruxelles University)  
Damiano Fiorillo (Niels Bohr Institute)  
Alexander Jenkins (University College London)  
Juraj Klaric (Louvain University)  
Valeriya Korol (Max Planck Institute for Astrophysics)  
Eva-Maria Mueller (University of Sussex)  
Enrico Peretti (Universite Paris Diderot)



## First EuCAPT Annual Symposium

5–7 May 2021  
CERN  
Europe/Zurich timezone

Enter your search term

- Overview
- Timetable
- Scientific Programme, Confirmed Speakers and Area Conveners

## Second EuCAPT Annual Symposium

23–25 May 2022  
CERN  
Europe/Zurich timezone

Overview

## Third EuCAPT Annual Symposium

31 May 2023 to 2 June 2023  
CERN  
Europe/Zurich timezone

Enter your search term

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- Contribution List
- Registration
- Call for Abstracts: Lightning Talks and Posters
- Scientific Advisory Committee
- Local Organising Committee
- EuCAPT Code of Conduct
- Accommodation
- Directions
- Computer access

The European Consortium for Astroparticle Theory (EuCAPT, <https://www.eucapt.org>) is a young initiative, with central hub at CERN, that aims to bring together the European community of theoretical astroparticle physicists and cosmologists. Our goals are to increase the exchange of ideas and knowledge; to coordinate scientific and training activities; to help scientists attract adequate resources for their projects; and to promote a stimulating, fair and open environment in which young scientists can thrive.

After two online meetings in 2021 and 2022, we are delighted to announce the third EuCAPT annual symposium, the flagship event of our consortium, that aims to provide an interdisciplinary Europe-wide forum to discuss opportunities and challenges in Theoretical Astroparticle Physics and Cosmology. The symposium will take place at CERN, with online participation possible. We invite all scientists (PhD students, postdocs, and staff) active in these fields of research to join us remotely from May 31 to June 2, 2023. The symposium will feature invited presentations, and young scientists will have the opportunity to present their work with lightning talks and in a poster session.

For EuCAPT council members, please note that there will be a council meeting on May 31 at CERN.

**Invited speakers:**  
Alexandra Amon (Kavli Institute for Cosmology, Cambridge)

## **Organising team:**

Vedran Brdar  
Andrea Caputo  
Enea Di Dio  
Valerie Domcke  
Miguel Escudero  
Mauro Pieroni

## **Conveners:**

Ruth Durrer  
Georg Raffelt  
Mar Bastero Gil  
Diego Blas  
Geraldine Servant

## **Scientific program committee:**

Vedran Brdar  
Chiara Caprini  
Andrea Caputo  
Enea Di Dio  
Valerie Domcke  
Miguel Escudero  
Gabriele Franciolini  
Alberto Mariotti  
Antonio Morais  
Mauro Pieroni  
Paul Saffin  
Marco Taoso

## **Administrative support:**

Michelle Connor  
Marie Gauthier  
Julie Dal Gobbo  
Elena Gianolio



+ EuCAPT Symposium taskforce and Steering Committee.



***Thanks to all  
speakers,  
poster presenters  
and participants!***

**What has changed in the field from the 1st to 4th EuCAPT Symposium?**  
(according to ChatGPT4o)

# What has changed in the field from the 1st to 4th EuCAPT Symposium?

(according to ChatGPT4o)

**“Integration and Multimessenger Approaches:** There's a stronger emphasis on multimessenger astrophysics, integrating gravitational waves, neutrinos, and electromagnetic signals. This reflects advancements in observational technology and the importance of cross-disciplinary data to understand complex cosmic events.

**Advanced Dark Matter Research:** Dark matter research has become more sophisticated, with new experimental techniques and refined theoretical models being prominent.

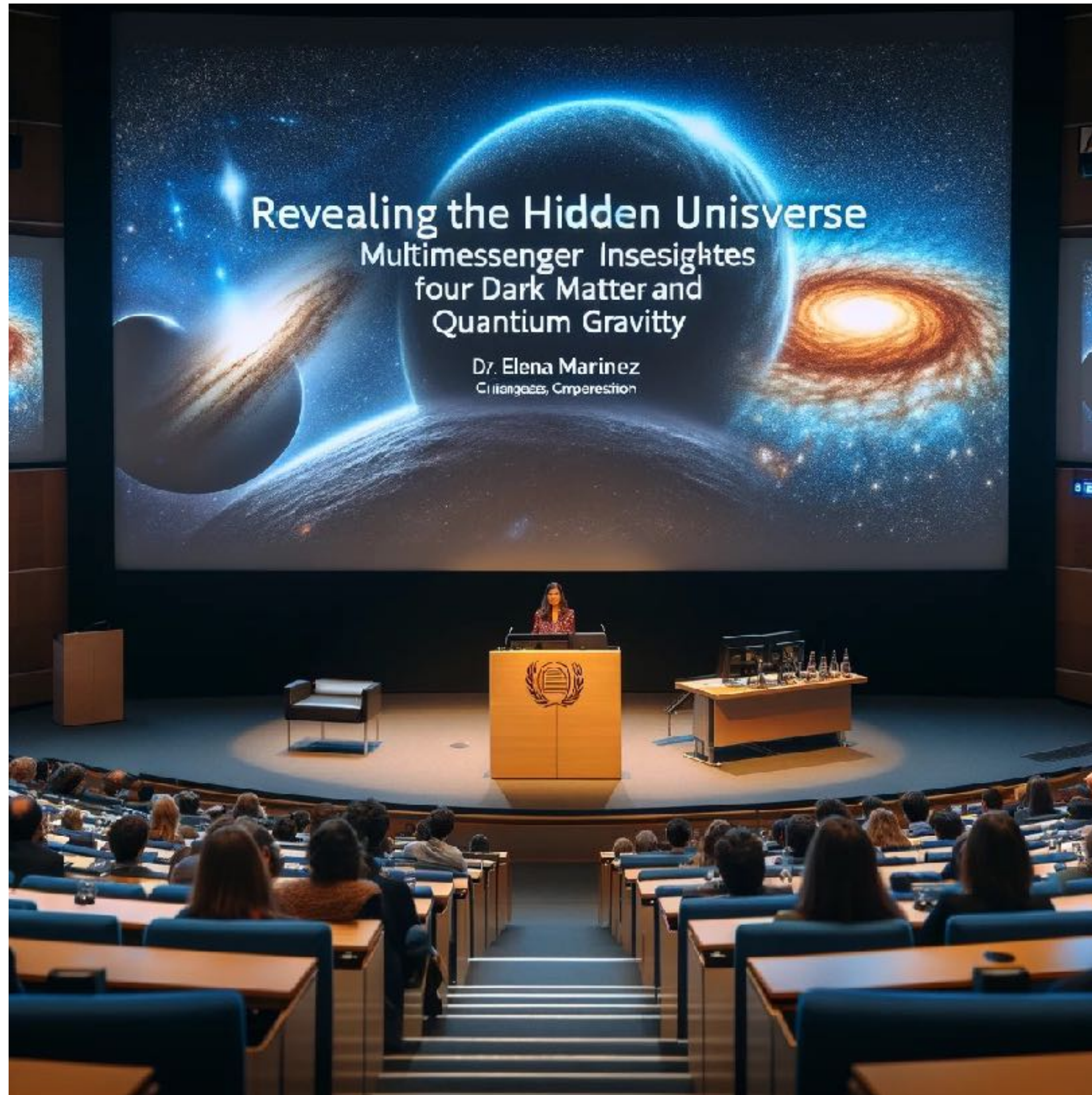
**Neutrino Physics:** The study of neutrinos has broadened, [...] indicating growing recognition of their importance in both particle physics and cosmology.

**Sustained Interest in High-Energy Phenomena:** Research on high-energy astrophysical phenomena remains robust, driven by improvements in detection technologies and theoretical models to explain extreme cosmic events.

Overall, the shift to more integrative and advanced topics reflects significant progress in observational capabilities, theoretical understanding, and a move towards a more holistic understanding of the universe through multimodal observations”.

**Show me an exciting talk at the next EuCAPT symposium?**  
(according to ChatGPT4o)

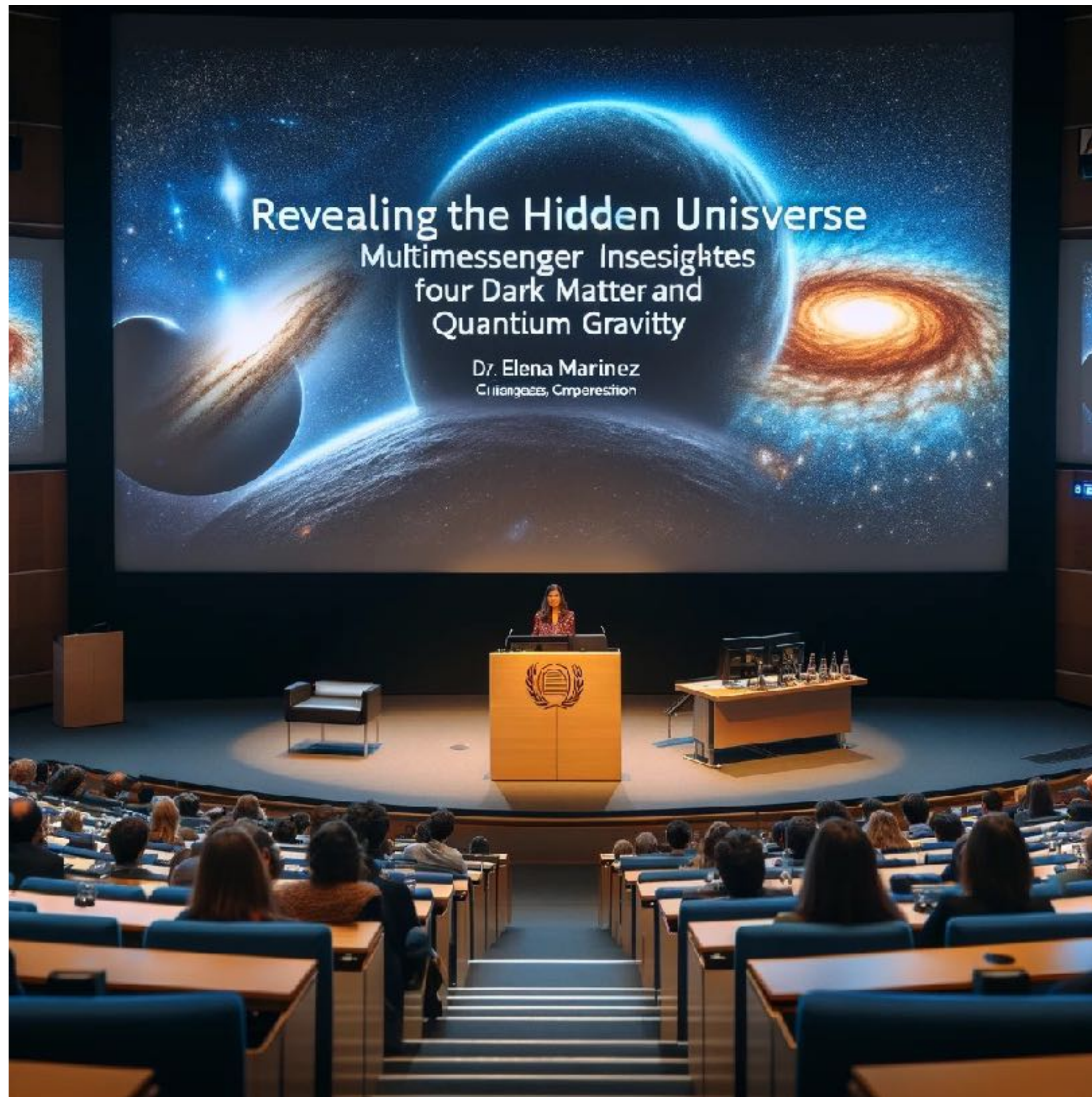
# Show me an exciting talk at the next EuCAPT symposium? (according to ChatGPT4o)



"Image showing Dr. Elena Martinez presenting her talk titled "*Revealing the Hidden Universe: Multimessenger Insights into Dark Matter and Quantum Gravity*" in the main auditorium at CERN".



# Show me an exciting talk at the next EuCAPT symposium? (according to ChatGPT4o)

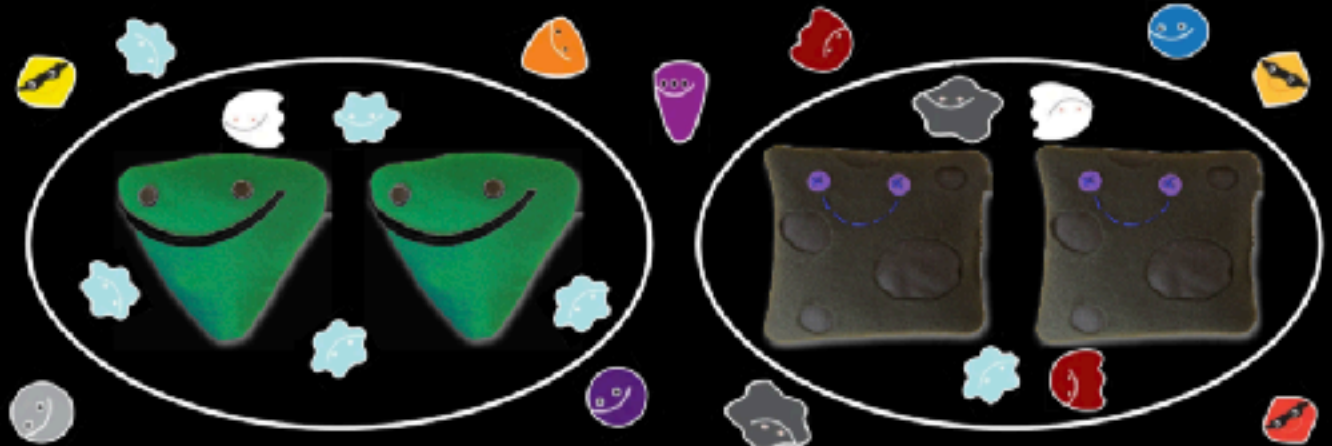


“Image showing Dr. Elena Martinez presenting her talk titled “*Revealing the Hidden Universe: Multimessenger Insights into Dark Matter and Quantum Gravity*” in the main auditorium at CERN”.

We may ***experiment with the symposium format*** over the coming years, but the symposium will always aim to ***bring together the community*** to share the most exciting developments and discoveries.

# What's going on in EuCAPT? (highlights)

## EuCAPT workshops in 2024:




2nd Edition of the Workshop 'Quarkonia meet Dark Matter' (QMDM)

18-22 Mar 2024  
Institute for Advanced Study, Technical University of Munich

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Overview	<b>Overview:</b> The second edition of the theory workshop "Quarkonia meet Dark Matter" continues to provide particle physicists a platform for exchanging knowledge and methodologies at the intersection both fields. In the spirit of the <a href="#">first edition</a> in 2021, this workshop aims to foster interdisciplinary collaborations, to expand field horizons, to generate new research directions, as well as to solve problems by applying novel concepts from one field to another. Key scientific topics on the intersection include effective quantum field theories for heavy quark-antiquark states inside the quark-gluon plasma and dark matter pairs in the early Universe, non-equilibrium quantum field theories for describing the system's dynamics such as the open quantum system and the Keldysh-Schwinger formalism, as well as effective field theories in the strongly coupled regime and other techniques for describing phase transitions of QCD at colliders and of new physics particles in the early Universe, such as dark sectors and their associated gravitational waves production.
Committees	
Scientific Programme	
Registration	
Call for Abstracts	
Timetable	
Contribution List	
Participant List	
Venue and Transportation	
Accommodation	



NEHOP 2024  
NEW HORIZONS IN PRIMORDIAL BLACK HOLE PHYSICS  
Edinburgh, Scotland  
June 17<sup>th</sup> to June 20<sup>st</sup> 2024

17-20 Jun 2024  
National Galleries of Scotland  
Europe/London timezone

Enter your search term

Overview	This workshop event aims to nurture discussions and bring together experts on the broad topic of <b>Primordial Black Holes (PBHs)</b> . From their phenomenological implications, their possible relationship to extant problems in the SM (dark matter, neutrino masses, baryon asymmetry, inflation), their theoretical underpinnings and origin, to the multi-messenger signals that are motivating state-of-the-art experimental developments.
Call for Abstracts	
Timetable	
Contribution List	
Book of Abstracts	
Registration	The registration fee, which we will open in the coming week, is £175. This fee covers venue hire, an AV Team, coffee breaks twice per day, and the workshop dinner.



EuCAPT  
Astroneutrino Theory Workshop 2024  
Prague, Czech Republic

Sep 16-27, 2024  
IEAP CTU in Prague  
Europe/Prague timezone

Enter your search term

Overview	<b>New Neutrino Interactions in Astrophysics and Cosmology (NnuIAC)</b>
Dates and Deadlines	The workshop is the 2nd edition of the EuCAPT Astroneutrino Theory Workshop. <a href="#">You can check the 1st edition here.</a>
Venue	The European Consortium for Astroparticle Theory (EuCAPT) seeks to bring together the European community of theoretical astroparticle physicists and cosmologists.
Pictures	
Accommodation	

+ 2 more (TBA)!

# Colloquia:

upcoming

**Axion production in pulsars**

$(\square + m_a^2) a = g_{a\gamma\gamma} \vec{E} \cdot \vec{B}$

Prabhu 2021, Noordhuis, Prabhu, SJW, Cruz, Chen, Weniger (2022), Noordhuis, Prabhu, Weniger, SJW (2023), Caputo, SJW, Philippov, Jacobson (2023), Khelashvili et al (2024)

Rotating  $\vec{B}$  induces  $\vec{E}$

↓

Plasma cannot screen  $\vec{E}$  everywhere

↓

“Vacuum gaps” support  $(\vec{E} \cdot \vec{B})(t) \neq 0$

Samuel J. Witte (University of Oxford) 24

June 2024	18 Jun	Antonio Riotto, "Primordial black holes"
May 2024	28 May	Shinji Mukohyama, "Effective Field Theory of black hole perturbations with timelike scalar profile"
April 2024	09 Apr	Sam Witte, "Axions in astrophysics"
June 2024	18 Jun	Antonio Riotto, "Primordial black holes"
March 2024	12 Mar	Paolo Creminelli, "Primordial non-Gaussianity: the $f_{NL} \sim 1$ threshold"
February 2024	13 Feb	Antonella Castellina, "Ultra-high energy astroparticle physics: latest results and future prospects"
December 2023	12 Dec	Elisa Resconi, "First Associations of High-Energy Neutrinos and Insights for the Future"
November 2023	14 Nov	Nicola TAMANINI, "Cosmology with gravitational-wave standard sirens"

All past colloquia are available online.

## Profile videos:



Prof. Clare Burrage  
University of Nottingham



Prof. Gabrijela Zaharijas  
University of Nova Gorica



Prof. Roberto Trotta  
SISSA, Trieste



Prof. Sera Markoff  
Anton Pannekoek Institute for Astronomy & GRAPPA,  
University of Amsterdam



Prof. Fotēini Oikonomou  
Norwegian University for Science and Technology



Prof. Pedro Ferreira  
University of Oxford

Available on YouTube,  
together with outreach videos  
from the 1st EuCAPT  
Cosmology School.

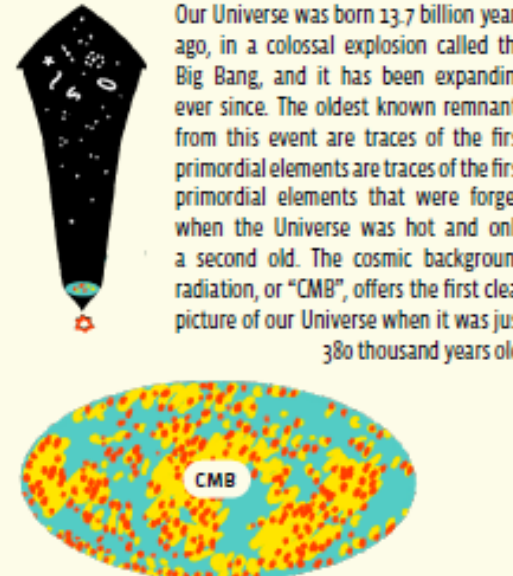
# New general-audience brochure:

### COSMOLOGY

Unravelling the history of our Universe

*We have reconstructed our cosmic history by observing the most distant and ancient objects in the sky.*

Our Universe was born 13.7 billion years ago, in a colossal explosion called the Big Bang, and it has been expanding ever since. The oldest known remnants from this event are traces of the first primordial elements that were forged when the Universe was hot and only a second old. The cosmic background radiation, or "CMB", offers the first clear picture of our Universe when it was just 380 thousand years old.




Beyond traditional telescopes, the emergence of multi-messenger astronomy offers us fresh insights into the Universe. For instance, gravitational waves, discovered in 2015, capture the space-time ripples produced by cataclysmic events such as the collision of black holes.

### ASTROPARTICLES

The Cosmic particle laboratory

*At the smallest scales, matter is composed of particles.*




They interact via fundamental forces, such as the strong nuclear force, which binds quarks and gluons within protons, and the electromagnetic force, which binds electrons to protons within atoms.

The Universe hosts astrophysical environments and accelerates particles at very high energies. Capturing these "astroparticles" with our telescopes allows us to gain new insights on their properties. Understanding the fundamental laws that govern the particles is also crucial to describe the Universe shortly after the Big Bang, when it consisted of a hot soup of particles and radiation.

### ASTROPARTICLE THEORY

From the smallest to the largest scales

*"Nothing exists per se except atoms and the void." Lucretius - 1st century BC*



Today, we know that our atoms make up merely a small fraction of the matter in the Universe. The rest is dark matter. We have also come to understand that vacuum is far from empty. It is imbued with a tiny dark energy that, at cosmological scales, is accelerating the expansion of the Universe.





Discovering the nature of dark matter and dark energy stands as one of the paramount scientific challenges of the 21st century. Other mysteries of this modern cosmological conundrum are the physics that governed the Big Bang and the origin of matter itself.

Feedback welcome! (*Contact* Gabriela Barenboim and Jorge Martin Camalich).

## About EuCAPT

The European Consortium for Astroparticle Theory (EuCAPT) was founded in 2020 with the task of meeting the modern challenges of Cosmology and Astroparticle physics. This is a large, diverse and highly talented community striving to unravel our cosmological history and make discoveries that shape our future.

## Our mission






-  **EXCHANGE**  
ideas and knowledge
-  **COORDINATE**  
scientific activities
-  **ATTRACT**  
resources for research
-  **PROMOTE**  
a stimulating environment


## EuCAPT in Europe



EuCAPT currently counts more than 2,000 scientists from over 120 research centers in Europe. Its central node is located at CERN, Switzerland.

## To learn more

 [eucaaptsecretariat@cern.ch](mailto:eucaaptsecretariat@cern.ch)  [eucaapt.org](http://eucaapt.org)  
 Director: Silvia Pascoli  @EuCAPT  
 Vice Director: David Marsh

 **EuCAPT**  
Acknowledgments: Bus as accusci llestia ndaest, ut harum dolo quidemature cum alias molorro euqpat pproressi unitiae omfclandi omnis et minvelstam nullictistem volut ex et aut omnis autem et

**EuCAPT**  
 EUROPEAN CONSORTIUM  
 FOR ASTROPARTICLE THEORY



*Where the Universe  
 meets its constituents*

# Building EuCAPT

## ***Who's missing?***

Want all interested, eligible European institutions to join.

In addition to open calls, we will be more proactive (*suggestions to* Alvise Raccanelli & Jessica Turner).

## ***Dedicated administrative support***

Based in Bologna.

## ***Rapid-response online workshops:***

Bring together the community when exciting experiments, observational, or theoretical developments happen. Provides a forum for prompt scientific exchange, may raise the level of the community, facilitate new connections, and accelerate discoveries.

An organisation group will be formed soon; *get in touch* with David if interested.

# Enhancing EuCAPT

## ***Reach out to other communities:***

Provide opportunities for new collaborations and dedicated joint efforts (e.g. with astroparticle experiments, particle physics, cosmology, to the non-European astroparticle theory to facilitate exchanges and common programmes).

## ***Forum for scientific policy and work conditions***

How well does the current funding and job landscape work for our field?

For a start, will survey the community, targeting in particular the younger generations and gathering information on needs, aspirations and issues.

Use EuCAPT to act for the benefit of the community.

## **Longer-term goals**

### **Attracting significant funding**

Exchange programs are funding limited; many new initiatives require funding.

Long-term: establish a prestigious EuCAPT fellowship program.

We are exploring and considering different options.



## The strength of EuCAPT

—by the community; for the community—

We are open for new ideas and initiatives

From this meeting, e.g.:

Share experience on private funding opportunities; road maps for funding.

Provide a database of industry contacts consisting of former members of the community.

Including transferable skills elements at meetings.

There are many of us, and we are strong together.

Member institutions: 141

Individual members: 1922

*There are opportunities to get involved, so please **get in touch** if interested.*