

# **XIV International Conference on New Frontiers in Physics 2025**



XIV International Conference  
on New Frontiers in Physics  
17-31 July 2025, OAC, Kolymbari, Crete, Greece

**Thursday 17 July 2025 - Thursday 31 July 2025**

**Orthodox Academy of Crete, Kolymbari, Crete, Greece**

## **Scientific Program**

The conference series "New Frontiers in Physics" aims to promote interdisciplinarity and cross-fertilization of ideas between different disciplines addressing fundamental physics. While different fields each face a distinct set of field-specific challenges in the coming decade, a significant set of commonalities has emerged in the technical nature of some of these challenges, or are underlying the fundamental concepts involved. A Grand Unified Theory should in principle reveal this underlying relationship.

For instance, techniques from string theory have become relevant in recent years for improving perturbative techniques in high-energy physics or identifying material properties of non-abelian plasmas that share essential features with the systems studied in heavy-ion collisions. Fluctuation analyses of the cosmic microwave background involve techniques and concepts that are becoming increasingly relevant for the study of the quickly expanding little bangs in heavy-ion collisions. Cosmological models are developed in close interplay with searches for new physics at the LHC. There is a multitude of examples illustrating that crosstalk between neighbouring fields is relevant or even crucial for progress in either field.

The conference series "New Frontiers in Physics" aims at identifying interdisciplinary topics on which crosstalk between different disciplines of fundamental physics can contribute to further progress. The conference series aims at bringing together key scientists of different fields to discuss the state of the art and the nature of open questions in a language suitable for a physics-educated interdisciplinary audience and to discuss avenues for further progress.

## **Main topics**

While the main body of the conference builds mainly on the below-mentioned topics, presentations on yet different disciplines are invited and vary every year. Such topics can be for example nuclear structure, atomic physics, plasma physics, physics applications (biophysics, medical science), biology, mathematics, computing science, etc.

### **High Energy Particle Physics**

Searches for new particles and new phenomena (Higgs boson, SUSY, top quarks, extra dimensions, flavour physics, precision electroweak measurements and others), hadron physics, and neutrino physics.

### **Heavy Ion Collisions and Critical Phenomena**

The properties of QCD matter under extreme conditions and the QCD phase diagram. Branching out to neighbouring disciplines: Superconductivity, Neutron Stars, Quark Stars, Exotics.

### **Quantum Physics, Quantum Optics and Quantum Information**

Quantum Optics, Quantum Information, Foundations of Quantum Mechanics, Quantum information; Entanglement and the Universe: Black Holes and Cosmology, Quantum Non-Locality, Cold Atoms.

### **Cosmology, Astrophysics, Gravity, Mathematical Physics**

Cosmic Microwave Background, Dark Energy, Gravitational waves, Dark Matter, Astroparticle Physics, Quantum Gravity, String Theory, Non-Commutative Geometry, Holography.

## **Workshops & Special Sessions**

Workshops, mini-workshops and special sessions will be also organized during the conference. The full list of scientific topics will be published soon.

## **Workshop on Laser Fusion, a spin-off from heavy-ion collisions**

**Convener:** Prof. Laszlo Pal Csernai, University of Bergen, Norway (laszlo@csernai.no)

**Dates:** July 28-31, 2025

If you are interested in participating in the workshop, please choose this topic in the abstract submission form. In case of questions please contact the convener.

## **Workshop on Dark matter from micro to macro**

**Convener:** Prof. Alexander Dolgov, Prof. Elena Arbuzova

Dates TBA

## **Special Session on Quantum Information and Quantum Optics**

(TBC)

## **Workshop on Instruments and Methods**

## **Workshop on QCD**

Date TBA

Convener: Prof. Willibald Plessas, University of Graz, Austria.

## **Workshop on Astro-Cosmo-Gravity**

Conveners: John Antoniadis, David Blaschke, Armen Sedrakian.

Dates TBA.

## **School on Machine Learning**

Convener: Pietro Vischia

Dates TBA.

## **Special session on Machine Learning**

Convener: Pietro Vischia

Dates TBA.

## **Special session on neutrino physics**

## **Session on other topics and interdisciplinary topics**

## **Outreach**

# **Extended session**

December 2025