EuCAPT

European Consortium for AstroParticle Theory



Where the Universe meets its constituents

About EuCAPT

The **European Consortium for AstroParticle Theory** (EuCAPT) was founded in 2019 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



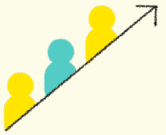
EXCHANGE
ideas and knowledge



COORDINATE
scientific activities



ATTRACT
resources for research



PROMOTE
a stimulating environment

More information

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



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COSMOLOGY

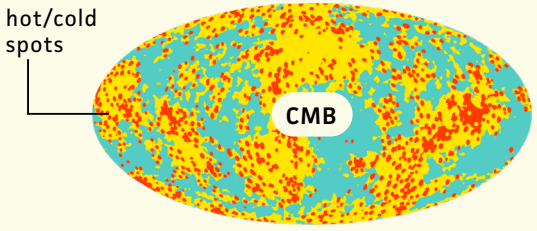
Unravelling the history of our Universe

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.



BIG BANG



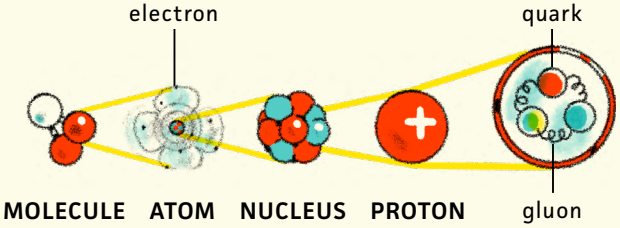
Beyond traditional telescopes, the emergence of multi-messenger astronomy offers fresh insights into the Universe. For instance, the detection of gravitational waves in 2015, helped identify space-time ripples produced by the collision of black holes.

ASTROPARTICLES

The cosmic particle laboratory

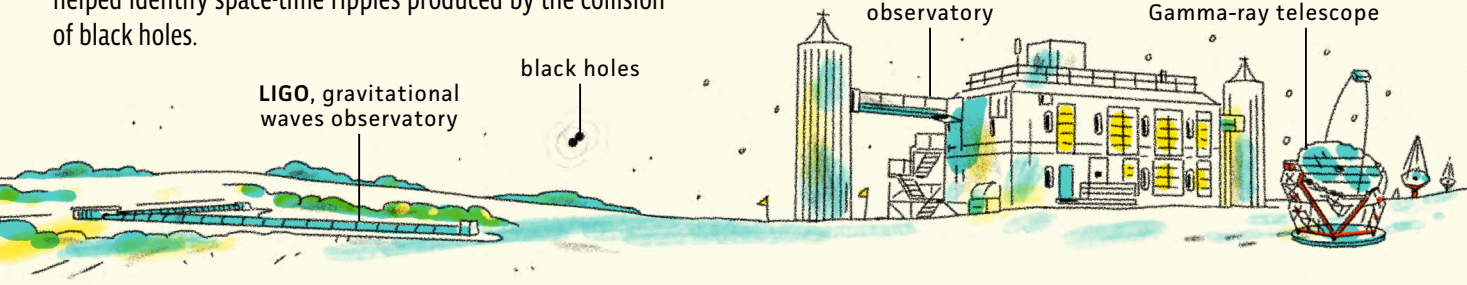
At the smallest scales, matter is composed of particles.

Particles 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 cataclysmic events that can accelerate particles to very **high energies**. Capturing these "astroparticles" with our telescopes allows us to gain insights on their properties. Understanding the **fundamental laws** that govern particles is also crucial to describe the Universe shortly after the Big Bang, when it consisted of a hot soup of particles and radiation.

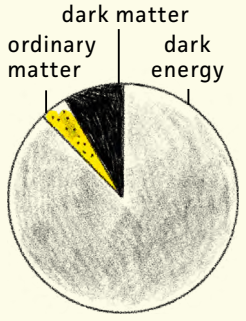




THE DARK UNIVERSE

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 merely make up 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 xxist century. Other mysteries of this modern cosmological conundrum are the physics that governed the Big Bang and the **origin of matter** itself.

