

The background of the slide is a vibrant space-themed illustration. It features a bright, fiery orange and yellow nebula or star formation in the upper left. A satellite with blue solar panels orbits in the upper right. The foreground shows a grey, cratered lunar or planetary surface with several scientific instruments: a large blue parabolic radio telescope on the left, a spherical detector with multiple circular sensors in the center, a red and white telescope-like instrument on the right, and a blue-tiled detector structure on the far right. A network of thin, glowing purple and blue lines crisscrosses the dark blue space, representing gravitational waves or data paths. The letters 'ACME' are rendered in a large, white, outlined font, with the 'A' and 'C' filled with the fiery nebula image.

ACME

Astrophysics Center for Multimessenger studies in Europe

Gravitational waves, Cosmic rays, Neutrinos
VHE gamma-rays, X-rays, Optical, Radio

initiated by S. Katsanevas

ACME kick-off, September 16-17 2024,
Paris

Welcome to the APC laboratory



APC in a nutshell



Location: Univ. Paris Cité, campus Grands Moulins, Physics dept

Université Paris Cité & CNRS (IN2P3 with INSU & INP) with CEA, Observatoire de Paris and CNES

220 members: 80 faculty, 75 tech staff & 65 docs/postdocs

Main research topics: **astroparticle physics and cosmology**

From theory to experiments – Involved in 25 world-class projects

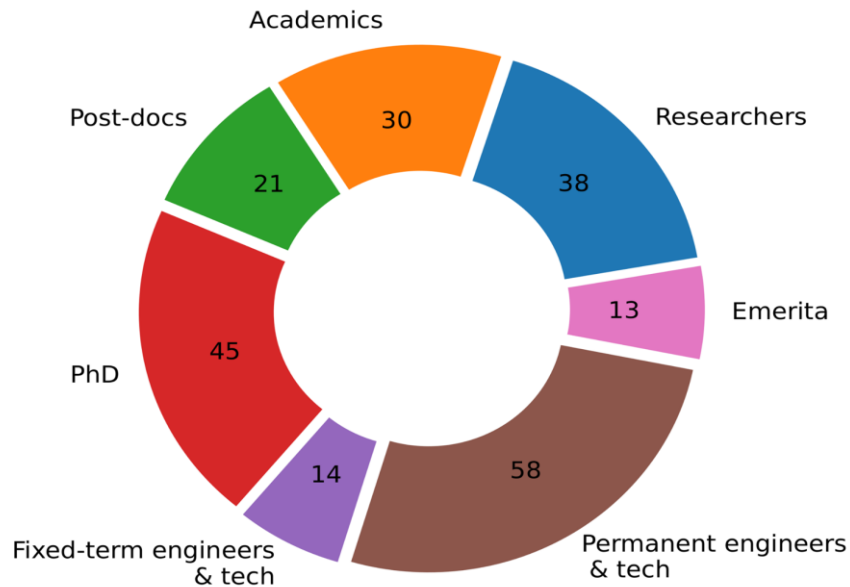
cosmology, gravitational-wave astronomy, high-energy astrophysics, particle physics (neutrino), theory

Welcome to the APC laboratory

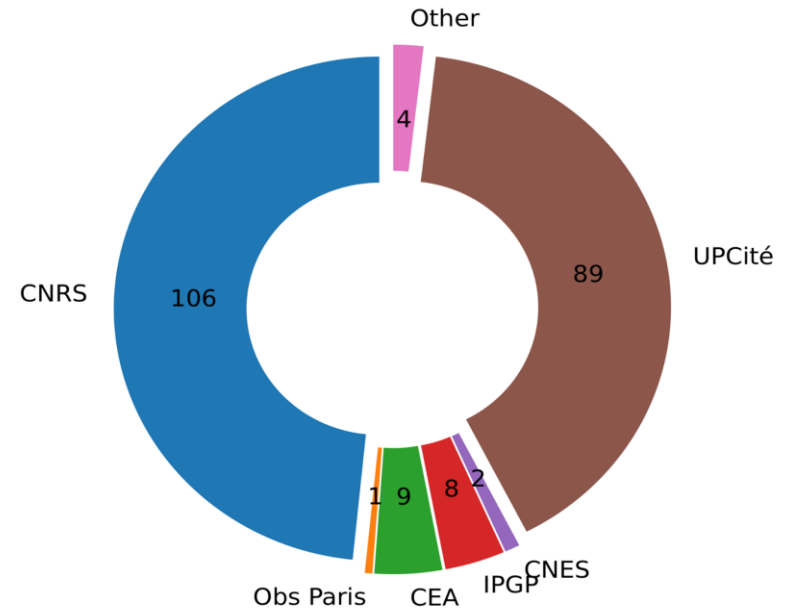


Human Resources

Composition of the laboratory by status



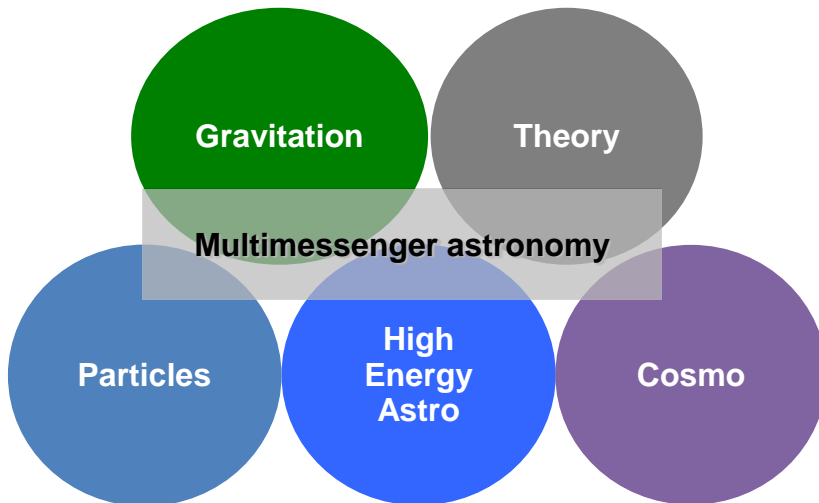
Composition of the laboratory by employer



Welcome to the APC laboratory



The APC Science Scope



- **Cosmology:** Origin and evolution of the universe. From theory to analysis and instrumentation Large optical and infrared surveys, and CMB
Euclid, Rubin/LSST, LiteBIRD, CMB S4, Simons Obs, Qubic
- **Gravitation:** Gravitational-wave astronomy using ground-based and spaced-based detectors
Virgo, ET, LISA, PTA
- **High-energy astrophysics:** violent cosmic phenomena with a multi-messenger approach ranging from X- and gamma-rays to very high-energy photons, neutrinos and cosmic rays
ANTARES, KM3NeT, H.E.S.S, CTA, LHAASO, ATHENA, JEM EUSO, SVOM
- **Particles:** initially, focus on neutrino physics (nature and mass hierarchy). Now, scope broadened to the direct searches for dark matter and Higgs boson
DUNE, Darkside, ATLAS, FCC
- **Theory:** theoretical studies on all the above themes as well as more fundamental research on gravity, quantum field theory and string theory

Welcome to the APC laboratory



A recent podcast (in French)

**REGARDER
LE CIEL
AUTREMENT,
JUSTE CIEL !**

Université Paris Cité

Regarder le ciel autrement

Juste Ciel !

Avec Irène Jacob
Musique Musique originale : Keren Ann

<https://u-paris.fr/juste-ciel/>



**Disponible dès à présent sur les principales plateformes
d'écoute.**

Rechercher « Regarder le ciel autrement »

ACIME kick-off, September 16-17 2024,
Paris

ACME

- **Supported by**



and



ASTRONET

A planning and advisory network for European astronomy

- **Selected for funding by the European Commission**



Funded by the
European Union

14.5 M€

- **Project start date: 01 September 2024**

Objectives: The Astronomy and Astroparticle physics research infrastructures involved in this proposal will lay the foundations for building a new ecosystem for a deepened, stronger and long-term vision collaboration with the aim to:

1. implement the **European roadmaps'** recommendations and act as a pathfinder to broaden, improve and align the accesses to the respective RI services and data
2. provide a harmonized **transnational and virtual access** to world-class RIs
3. develop **centers of expertise**
4. improve the **science data products** management
5. develop and improve interoperable **cyberinfrastructures** for alert sending and better manage **coordinated observations**
6. provide **training** for a new generation of scientists and engineers
7. open the astrophysics data sets to other disciplines and increase **citizen engagement** in scientific research

7 Work Packages (WP) corresponding to the objectives above

Consortium: 40 partners, 15 countries, over 30 research infrastructures (observatories and detectors, cyberinfrastructures and expertise centers) from Astronomy and Astroparticle domains, covering GW, Gamma & X-rays, neutrinos, CR, radio, optical.

Astrophysics Centre for Multi-messenger studies in Europe

The Astrophysics Centre for Multi-messenger studies in Europe (ACME) aims at providing **wider**, **simplified**, and **more efficient** access to the best research infrastructures (RI) available to researchers in the **astronomy and astroparticle physics communities**.

ACME is set up to realize an ambitious coordinated European-wide optimization of the accessibility and cohesion between multiple leading RI, offering access to instruments, data and expertise, focused on the new science of **multi-messenger astrophysics**.

Multi-messenger astrophysics is a transdisciplinary field with two main actors, the astronomy and astroparticle physics communities. So far, these two communities have worked separately – each community providing sources and discoveries to the other for separate analysis, but with insufficient capacity to gain the synergies of close working, complementary knowledge, and optimized coordination and collaboration.

The ACME project will **bridge** the two communities by implementing new ways of collaboration in order to provide easier and larger access to observing time, data and expertise that will benefit the users on both sides.

ACME - Objectives

1. implement the European roadmaps' recommendations and act as a pathfinder to broaden, improve and align access to the respective RI services and data, and assess and evaluate new models for better coordination and provision of at-scale services;
2. provide harmonized and inclusive transnational (TA) and virtual (VA) access to world-class RI;
3. develop centres of expertise providing expert support to enable easier access for more researchers;
4. improve science data products management to facilitate both focused research goals and serendipitous discoveries, implementing FAIR approaches to broaden access;
5. improve interoperable systems for rapid identification of astrophysical candidate events, and alert distribution to the network of RI and scientific consortia to optimize follow-up observations;
6. provide training for a new and broader generation of scientists and engineers;
7. open the astrophysics and astroparticle physics data sets to other disciplines, such as environmental studies or marine biology for the undersea neutrino facilities;
8. increase citizen engagement in scientific research.

ACME - Methodology

WP1: Coordination and Management. Ensure the achievement of the project' objectives, the coordination of all the activities carried out in the single WP and of the interactions among the project participants. OBJECTIVE 1.

WP2: TA2 for Multi-messenger and time-domain Astrophysics. Enable transnational access to a wide range of complementary astroparticle, high-energy and astronomical RIs. This will open new opportunities for the science community in the detection, analysis and subsequent follow up of multi-messenger and high- energy time-domain astrophysical events. OBJECTIVE 2.

WP3: TA3/VA3 Provision of scientific expertise for multi-messenger observations. Provide a new opportunity for European researchers to access scientific expertise on multi-messenger astrophysics to enlarge the user community and to maximize the science return of the observations. Creation of six joint centres of expertise (JCE). OBJECTIVE 3.

WP4: Provision of improved access to near-real time and archival multi- messenger data. Provide VA to online services enabling seamless combination of data products of different telescopes and detectors, together with the relevant modeling tools, within multi-messenger data analysis workflows. OBJECTIVE 4.

WP5: VA5 - Improved coordination for real-time detection of transient events and low-latency alert management. Create a realtime ecosystem, in which researchers obtain virtual access to different, essential and improved alert, provide tools to manage and analyse the streams, visualise the data and organise follow-up observations based on detections made in near real time. OBJECTIVE 5.

WP6: Training for scientists and engineers. Provide a dedicated support system to put into place and organise meetings and schools as well as the distribution of training material. OBJECTIVE 6.

WP7: ACME for environment and society. Extend ACME services for users that do not belong to the two main communities targeted by the project (astronomers and astroparticle physicists). OBJECTIVES 7 & 8.

ACME - Impact

Outcome 1: Wider, simplified, and more efficient access to the best research infrastructures available to researchers to conduct curiosity-driven research, irrespective of location.

Outcome 2: Breakthrough and leading-edge research enabled by advanced research infrastructure services made available to a wider user community.

Outcome 3: A new generation of researchers trained to optimally exploit all the essential tools for their research.

Outcome 4: Improved and harmonised RI services and broader use of RI resources across the EU and Associated Countries deriving from the exploitation of synergies and complementarities.

Outcome 5: Cross-disciplinary fertilisations and a wider sharing of information, knowledge and technologies across scientific fields fostered by closer interactions between researchers active in and around research infrastructures.

Outcome 6: Better management, including implementing FAIR data principles, of the continuous flow of data collected or produced by research infrastructures.

ACME – Uniqueness & Strength

The ACME consortium gathers 40 institutes together with their world-leading research infrastructures under one common objective: **to provide enhanced access to infrastructure and services for the European multi-messenger and time-domain research communities.**

The need for highly qualified experience in data collection, analysis and interpretation on a broad range of frequencies, big data structures, algorithms and software development, **requires a collection of expertise and skills that goes well beyond the single team/nation capabilities.**

This is the heart of the ACME project which will provide the user access to all developments and services in all domains connected to multi-messenger astronomy, regardless of the starting experience in any specific domain.

The synergy among the project institutions and groups will produce the rare and advantageous opportunity to combine cross-domain expertise and to offer the possibility to analyze and exploit data from different experiments and facilities.

All this will be achieved thanks to a synergic, collaborative, and complementary approach **where the whole is greater than the sum of parts.** To this end, the different professional skills, and the unique and complementary expertise of each of the proponents guarantee that the consortium will have all the necessary resources to assure the success of the project.