The Reasoner 19(4), 2005. https://doi.org/10.54103/1757-0522/30077

COSMOS: The History and Philosophy of Cosmology Network

:: **Silvia De Bianchi**

Abstract
Overview of the aims, scope and results obtained within the CARIPLO funded COSMOS research project (2021-2026)

Keywords
Philosophy of Cosmology; History of Cosmology; Astrophysics; Epistemology; Universe; Black Holes; Simulations.

Submitted 7/11/2025
Accepted 6/12/2025

How to Cite
Silvia De Bianchi. *COSMOS: The History and Philosophy of Cosmology Network*. The Reasoner 19(4) 2025. https://doi.org/10.54103/1757-0522/30077

THE REASONER 19(4), 2005. https://doi.org/10.54103/1757-0522/30077

COSMOS (2021-2026) is sponsored by Cariplo Foundation and hosted by the University of Milan. The project aims to create a network of experts from the fields of astrophysics, astronomy and cosmology that can systematically interact with philosophers on topics concerning the study of the universe, its phenomena and laws, in order to develop categories suitable for the understanding of cosmology as a unique practice of human beings. COSMOS relies on the consideration that our ability to do cosmology is deeply rooted in the foundations of mathematics, technological innovation and anthropology and on the awareness that only a multi-disciplinary collaboration can grasp all implications that theoretical and observational cosmology brings with it.

COSMOS main research questions are addressed by the network members who can interact through a platform (Slack) and can meet online in Virtual Labs to present and discuss their ideas, independently from the research pursued by the core research team. An annual meeting is held online and open to all members of the network who can also interact during our biennial conferences in History and Philosophy of Cosmology (1st H&PCC was held in 2022, the 2nd in 2024 in Milan and the next one will be held in Athens in 2026).

COSMOS research questions include:

1. The idea of universe: why does the need of modeling the universe arise? Is there a functionalist reading

THE REASONER 19(4), 2005. https://doi.org/10.54103/1757-0522/30077

of the dark sector and objects, such as black holes? (VIRTUAL LAB 1)

2. Paradigm/testing relationship of a theory and its models: How do we use high-energy physics to study matter and the early stages of the universe? How do we use nuclear physics and other branches of physics to understand the evolution of stars and map the observable universe? Which aspects of these practices show continuity/rupture with the past? (VIRTUAL LAB 2)

3. What is the role of analogical reasoning in astrophysics and cosmology? How could we attain confirmation from this? Which kind of inferences were used in the past when talking about the universe and its properties? (VIRTUAL LAB 3)

4. Which theoretical and observational challenges our physics encounters and which ones should be addressed in a new fundamental theory? (VIRTUAL LAB 4)

5. Which theories and ideas about the origin and development of the universe crossed the history of philosophical thought and cosmology? (VIRTUAL LAB 5)

Throughout the years, the core research team was constituted by the PI (Prof. Silvia De Bianchi) and postdocs (Dr

THE REASONER 19(4), 2005. https://doi.org/10.54103/1757-0522/30077

Laura Marongiu, Dr Laura Follesa, Dr Marco Forgione, Dr Federico Viglione) from different backgrounds, including the history of ancient and early-modern cosmology, the philosophy of physics and the philosophy of time. The team regularly publishes on peer-review journals of high impact and their research addresses hot topics in cosmology and theoretical physics, such as the nature of black holes (is it possible to avoid singularities in a GR setting?), cosmic time (what is the nature of cosmic time and its consistency with positions in the philosophy of time?), and the Hubble tension (i.e. there is a discrepancy in the measured values of the Hubble constant, which describes the universe's expansion rate, depending on methods at hand; is this due to epistemic biases or points to new physics?), by discussing the philosophical assumptions and implications they bring with them.

Among the publications of the team, it appears the volume Time and Timelessness in Fundamental Physics and Cosmology (2024) that brought together historians, philosophers and scientists to discuss major open questions in the philosophy of cosmology and quantum gravity. With regard to observational cosmology, both the PI and Dr Forgione are working on the epistemology underpinning the EUCLID mission and to elaborate a suitable notion of robustness in dealing with problems such as the Hubble tension, respectively.

Thus, COSMOS has four main objectives:

1. To **implement** research in the history and philosophy of cosmology, including topics from space sciences.

2. To **establish** a network of scientists (astrophysicists, cosmologists) and philosophers to pursue the development of categories suitable for the understanding the universe and its processes.

3. To **create** the possibility of inserting the history and philosophy of cosmology between training subjects in higher education.

4. To **share** knowledge with the public on the challenges of the 21st century concerning our understanding of the universe and the use of space.

With regard to objective 3, the BA in Philosophy at the University of Milan - STATALE counts on a course in Philosophy of Physics that includes a practical lecture on the use of telescopes and the integrated study of cosmology and philosophy that led to increase the number of students writing up their thesis on philosophical questions surrounding our current models in cosmology and astrophysics.

Further information and the library of videos and publications can be found on the website https://cosmosproject.unimi.it.

Selected list of COSMOS publications

The Reasoner 19(4), 2005. https://doi.org/10.54103/1757-0522/30077

- De Bianchi, S. (2025) "Null geodesics, causal structure, and matter accretion in Lorentzian-Euclidean black holes" (with S. Capozziello & E. Battista). Phys. Review D DOI: 10.1103/ybjp-8w2w
- De Bianchi, S. (2025) "Atemporality from Conservation Laws of Physics in Lorentzian-Euclidean Black Holes" (with S. Capozziello & E. Battista). Foundations of Physics 55, 36.
- De Bianchi, S (2025). Open Questions on Spacetime and Gravitation. Journal of Physics: Conference Series proceedings of DICE2024.
- De Bianchi, S. (2025). "Achronotopic Interpretation of Quantum Mechanics: Quantum Objects and Their Measurement in Emergent Space–Time Scenarios". (with I. Szapudi), Foundations of Physics, 55(1), 4.
- De Bianchi, S. (2025). "Time and Cosmology". In Emery, N. (ed) Routledge Companion to the Philosophy of Time. Routledge.

SILVIA DE BIANCHI
https://orcid.org/0000-0002-3296-6462
Dipartimento di Filosofia, Università degli Studi di Milano