PRIN 2022 – Analogical Reasoning in Contemporary Physical Theories
Midterm Workshop on Research Progress and Dissemination
Monday 26 – Thursday 29 May 2025
URBINO

Monday, 26 May 2025

17:00-18:00 *Welcome Session*
Introduction to the PRIN 2022 project, its objectives, current developments, and the aims of this intermediate workshop.
Participants: members of the PRIN 2022 research group (the Urbino team and the Milan team), along with invited scholars—internationally recognized experts in the project's field—Eugenia Colafranceschi (University of Western Ontario), Karen Crowther (University of Oslo), and Erik Curiel (University of Bonn).
This session will be held at Palazzo Albani (Room D1), Via Timoteo Viti, 10, Urbino.

Tuesday, 27 May 2025

9:00-10:00 *Two Talks on Analogical Reasoning in Physics*
This session will feature two short presentations by members of the PRIN research group (the Urbino team and the Milan team), each exploring different perspectives on the use and role of analogy in contemporary physics, followed by an open discussion.
Discussants: Eugenia Colafranceschi (University of Western Ontario), Karen Crowther (University of Oslo), and Erik Curiel (University of Bonn).
This session will be held at Palazzo Albani (Room D1), Via Timoteo Viti, 10, Urbino.

Wednesday, 28 May 2025

9:00-10:00 *Two Talks on Analogical Models in Contemporary Physics*
A session dedicated to the role of analogy in theoretical modeling. The session will feature two brief presentations by members of the PRIN research group (the Urbino team and the Milan team), followed by a collective discussion aimed at exploring and critically assessing the methodological implications.
Discussants: Eugenia Colafranceschi (University of Western Ontario), Karen Crowther (University of Oslo), Erik Curiel (University of Bonn), and Richard Dawid (University of Stockholm).
This session will be held at Palazzo Albani (Room D1), Via Timoteo Viti, 10, Urbino.

Thursday, 29 May 2025

17:30-19:00 *Presentation and Dissemination of Project Results*
This closing session will take stock of the progress made thus far within the PRIN 2022 project, present a summary of the outcomes of the preceding working sessions, and open a reflection on potential future developments and directions.
Participants: members of the PRIN 2022 research group (the Urbino team and the Milan team), along with invited scholars—internationally recognized experts in the project's field—Eugenia Colafranceschi (University of Western Ontario), Karen Crowther (University of Oslo), Erik Curiel (University of Bonn), and Richard Dawid (University of Stockholm).
This session will be held at Palazzo Albani (Room D1), Via Timoteo Viti, 10, Urbino.

ABSTRACTS OF THE TALKS.

G. Macchia (University of Urbino):
“Some Analogies from the History of Astronomy/Cosmology”
Abstract: This presentation examines the role of analogical reasoning in astronomy and cosmology, focusing on how analogies have shaped scientific discovery, theory development, and communication. It explores key historical examples, including Galileo’s analogy between the Moon and the Earth, Newton’s gravitational analogy, and visual models like Eddington’s expanding balloon. Special attention is given to Gamow’s stellar analogy for explaining primordial helium and to Penrose and Hawking’s use of analogies between black hole singularities and the origin of the universe. These cases illustrate how analogies can function not just as explanatory tools, but as catalysts for conceptual breakthroughs.

F. Nappo (Polytechnic University of Milan):
“How Maxwell discovered the Maxwell equations”
Abstract: This talk argues that Maxwell’s development of the displacement current stemmed from an application of his method physical analogy, as outlined in his early work “On Faraday’s Lines of Force”. The reconstruction that I provide offers an alternative to the prevailing interpretation, which holds that Maxwell abandoned physical analogies relatively soon and that he arrived at the displacement current by positing a peculiar mechanical hypothesis.

M. Sanchioni (Sophia University Institute):
“Revisiting the Higgs–Superconductivity Analogy”
Abstract: This project critically examines the long-standing analogy between the Higgs mechanism and superconductivity through the lens of Mary Hesse’s theory of scientific analogy. The analysis is twofold: we first assess whether the analogy satisfies Hesse’s horizontal condition—concerning structural similarities at the level of observable features—and then turn to the vertical condition, regarding the causal architecture of the two mechanisms. To do so, we draw on recent developments in quantum field theory, particularly the framework of higher-form symmetries and the role of renormalization group flow in phase transitions. We argue that, once suitably reformulated, the analogy qualifies as material in Hesse’s strongest sense.

A. Brandelet (Polytechnic University of Milan):
“Physical Analogies as Possibility Explorers”
Abstract: The current debate on analogies in philosophy of physics is mainly structured around the physical/formal distinction. While most authors tend to accept the role of physical analogies, where a common causal mechanism establishes the resemblance, the success of formal analogies, on the other hand, raises deep philosophical questions: the transfer of a mathematical treatment from one physical domain to another need not carry a physical interpretation. Yet, these purely formal analogies are often successful.
In this talk, I wish to take a different route and question this very classification of analogies. I will take a closer look at the physical/formal distinction and show how a more precise analysis of the structure of the domains involved in the analogy may lead us beyond the strict opposition that is often taken as fundamental. More specifically, I will highlight the role of counterfactual reasoning in justifying analogies and show how this observation leads to a reformulation of the aforementioned distinction in terms of possibility. In turn, this view offers a more promising approach to the evaluation of analogies in physics, as it makes the case for a philosophical approach that incorporates modality, counterfactuality and physical possibility at its core.