Chapman - SNS Pisa

WORKSHOP IN LOGIC AND PHILOSOPHY OF MATHEMATICS

WEDNESDAY, APRIL 15 - THURSDAY, APRIL 16, 2026
CHAPMAN UNIVERSITY
KILLEFER SCHOOL CONFERENCE ROOM A AND ZOOM

Organizers

Guillaume Massas (Chapman University)
Marco Panza (Chapman University)
Mario Piazza (SNS Pisa)
Matteo Tesi (SNS Pisa)

Speakers

ANA BELÉN AVILEZ GARCÍA
Chapman University

JAMES FRANCESE
Chapman University

JOSÉ GIL-FEREZ
Chapman University

BRICE HALIMI
Université Paris Cité

BAS KORTENBACH
Scuola Normale Superiore di Pisa

FRANCESCA POGGIOLESI
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ANDREA SABATINI
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THOMAS SACHEN
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MATTEO TESI
Scuola Normale Superiore di Pisa

MIGUEL TREJO HUERTA
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PEDRO DEL VALLE INCLÁN
Institute Vienna Circle

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CHAPMAN UNIVERSITY | **Schmid College of Science and Technology**

Chapman–SNS Workshop in Logic and Philosophy of Mathematics

Wednesday, April 15 – Thursday, April 16
Chapman University

Organizers: Guillaume Massas, Marco Panza, Mario Piazza, Matteo Tesi

With special thanks to Lisa Beesley for her invaluable administrative support.

Practical Information

- **Venue:** Killefer Conference Room A, Daniele C. Struppa Research Park.
- **Zoom link:** https://chapman.zoom.us/j/95233162579, password: Logic!
- **Contact:** massas@chapman.edu

Schedule

Wednesday, April 15

Time	Event
8:45–9:00	**Coffee and welcome**
9:00–9:45	Pedro del Valle Inclán — *Structural Rules, Meaning, and Logical Connectives*
9:45–10:30	Bas Kortenbach — *A New Framework for Metainferential Logic*
10:30–11:00	**Coffee break**
11:00–11:45	Andrea Sabatini — *Profile-Sensitive Consequence*
11:45–12:30	Thomas Sachen — *Domain-Dependent Proof Identity*
12:30–1:45	**Lunch break**
1:45–2:00	**Coffee**
2:00–2:45	James Francese — *An Amorphous Continuum*
2:45–4:00	José Gil-Férez — *Formalizing Euclid's Deductive Arguments*
4:00–4:30	**Coffee break**
4:30–5:15	Ana Belén Avilez García — *Perfectly Regular Frames*
5:15–6:30	Matteo Tesi — *Intuitionistic Logic, Cycles, and Provability Interpretation*

Thursday, April 16

Time	Event
9:15–9:30	**Coffee**
9:30–10:15	Pietro Vigiani — *Dunn-Style Completeness of Modal RM and some Cousins*
10:15–11:00	Miguel Trejo Huerta — *Stone Duality, Stably Compact Spaces, and* **MLS**
11:00–4:00	**Break**
4:00–4:15	**Coffee**
4:15–5:30	Francesca Poggiolesi — *Explaining with Reasons*
5:30–6:45	Brice Halimi — *Abstracting away from Abstraction Principles*

Abstracts

Wednesday, April 15

Pedro del Valle Inclán

Institute Vienna Circle
Day/Time: Wednesday, 9:00–9:45
Title: Structural Rules, Meaning, and Logical Connectives

According to a well-known thesis of Quine's (1986), logics that validate different arguments use different logical vocabulary. In a certain sense, then, partisans of different logics merely talk past each other.

A popular response, going back to Putnam (1957) and Morton (1973), has it that sides who agree on "enough" logical principles use the same logical terms. Recently, some inferentialists have tried to spell out what "enough" agreement means in proof-theoretic terms (Restall 2002, 2014; Paoli 2003, 2014; Dicher 2016). They are often called minimalists, following Hjortland's (2014) terminology.

Minimalists draw a boundary between the operational and structural rules of sequent calculi: operational rules confer meaning, structural rules don't. Disagreements about validity that can be recast as disagreements about structural rules, therefore, need not involve a change of language. In this talk I will argue that current minimalist proposals lead to untenable views about which connectives are identical, and try to sketch an alternative picture of the role of structural rules and the meaning-variance debate.

Bas Kortenbach

Scuola Normale Superiore di Pisa
Day/Time: Wednesday, 9:45–10:30
Title: A New Framework for Metainferential Logic

This talk proposes to overhaul the standard definitional set-up of metainferential logic, by representing preservation of satisfaction and of validity explicitly as different kinds of metainferences, instead of treating them as different validity criteria for the same kind of metainference. This move is motivated by the workings of metainferences in natural language, and substantially increases expressive power. Moreover, it dissolves the dispute between local, global and pluralist views on metavalidity as a pseudo-problem. By extension, it clarifies several other contemporary debates in the philosophy of metainferential logic, such as those on antivalidity and theories of truth.

Andrea Sabatini

Scuola Normale Superiore di Pisa
Day/Time: Wednesday, 11:00–11:45
Title: Profile-Sensitive Consequence

In many real-world contexts, the information available to an agent, although insufficient to yield classically valid consequences, may nonetheless contain partial configurations - profiles - that already suffice to fix a conclusion across all admissible completions. We formalize this idea by introducing a novel notion of *profile-sensitive consequence*: a conclusion follows from a set of premises whenever there exists a profile satisfying the premises such that all its admissible extensions satisfy the conclusion. The resulting relation is non-monotonic, non-transitive, and

inherently branch-sensitive. We provide a geometric interpretation of profile-sensitive consequence over the Boolean cube, together with a structural characterization thereof. We also develop sequent calculi that are strongly complete with respect to the semantics. The proposal offers a simple and principled framework for capturing how agents draw rational conclusions from partial yet action-guiding information.

Thomas Sachen

Scuola Normale Superiore di Pisa

Day/Time: Wednesday, 11:45–12:30
Title: Domain-Dependent Proof Identity: the Infinitude of Primes in the Profinite Integers

We argue for a *domain-dependent* notion of informal proof-identity that uses change of domain as a diagnostic tool to distill the *central idea* of a mathematical proof. As a case study, we discuss generalizations of two proofs of the infinitude of primes – Euclid's classical proof and Furstenberg's topological proof – to the profinite integers $\widehat{\mathbb{Z}}$: we show that lifting to $\widehat{\mathbb{Z}}$ *separates* two proofs that look "the same" over $\mathbb{Z}$. Passing to $\widehat{\mathbb{Z}}$ makes prime factorization behavior more explicit, thanks to the fact that $\widehat{\mathbb{Z}} \cong \prod \mathbb{Z}_p$, where $\mathbb{Z}_p$ are the p-adic integers. This additional structure reveals genuine methodological differences between the proofs. We further motivate the choice of $\widehat{\mathbb{Z}}$ as the Stone space of the Boolean algebra generated by arithmetic progressions on $\mathbb{Z}$ and as the universal profinite compactification of $\mathbb{Z}$. Specifically, we show that Euclid's proof corresponds to a *local* property of $\widehat{\mathbb{Z}}$, whereas Furstenberg relies on *global* properties of the space (in particular, compactness): that is, Euclid's proof can be recovered from the behavior of finitely many p-adic projection maps on "Furstenberg sets" in $\widehat{\mathbb{Z}}$. Our central philosophical claim is that their coincidence over $\mathbb{Z}$ is due to the fact that arithmetic and topological properties are conflated in this space (in particular, finiteness and compactness are equivalent in the Furstenberg topology on $\mathbb{Z}$); when we move to a canonical completion, this correspondence dissolves. Therefore, a claim of identity of these proofs over $\mathbb{Z}$ is a claim about the proofs' extensional, rather than intensional, character.

James Francese

Chapman University

Day/Time: Wednesday, 2:00–2:45
Title: An Amorphous Continuum: Algorithmic Randomness and the Formal Ground of Motion

By reading Aristotle's "*apeiron* (*diareton*)" in his Physics as much closer to "arbitrarily (determinable)" than to "infinitely (divisible)", I will propose a constitutive principle for the continuum through the concept of an "random point" — mathematically, an algorithmically random real number — which I argue can provide a positive formal ground for motion. While the problem of understanding Aristotle's conception of potentiality for continuous magnitudes remains notorious, I will offer such an Aristotelian potentiality based on the "random point" interpretation. Because this involves points, I am led into confrontation with some of the most successful formalizations of the continuum intended to 'intrinsically encode motion' — such as smooth infinitesimal analysis/synthetic differential geometry (SIA/SDG) — with e.g. Bell explicitly inspired by Aristotle's response to Zeno. Contrary to the appeal of an axiomatically "viscous" continuum, I will discuss Demuth's Theorem as a key result illustrating the ability of a "random point" interpretation to formally ground motion in a manner more closely resembling Aristotle's own arguments against Zeno than SIA/SDG. I will then describe a technical harmonization of the "random point" view with point-free topology through cohesive topos theory.

José Gil-Férez

Chapman University
Day/Time: Wednesday, 2:45–4:00
Title: Formalizing Euclid's Deductive Arguments

Euclid's *Elements* is often regarded as a model of a logically sound approach to mathematics. In this setting, one only needs to take for granted a small number of assumptions (definitions, postulates, and common notions) from which a vast body of mathematical results is logically derived. There is abundant literature on both these initial assumptions and the mathematical results obtained from them. Nonetheless, the nature of the deductive arguments in the *Elements* is rarely questioned. In this talk, we present an ongoing approach to this issue. Our aim is to reconstruct Euclid's deductive framework as a unique and distinct formal setting.

Beyond the liminal assumptions, Euclid relies on diagrams as a fundamental instrument of his argumentation. Geometrical objects and their relevant properties are represented by diagrams, which serve, in principle, as a visual aid. More importantly, however, diagrams also justify many different inferences, ranging from the existence of intersections of lines to arithmetical deductions concerning the sum or difference of adjacent segments and angles. One of the most challenging aspects of our work is to formalize this form of diagrammatic reasoning with precision.

We call the main objects of our deductive system *Euclidean judgments*. These judgments represent the relevant content of diagrams. They consist of a set of letters (representing the geometrical objects in a diagram) together with a set of formulas (representing the relevant properties of those objects). The deductive rules of our system allow the derivation of new Euclidean judgments from given ones, thereby emulating the constructions and inferential steps employed by Euclid in his proofs.

Our ultimate goal is to reconstruct the entirety of Book I of the *Elements* within this framework, in a manner that is both fundamentally and crucially different from existing formal reconstructions, due to its unique structural features and adherence to a very minimal logical framework.

Ana Belén Avilez García

Chapman University
Day/Time: Wednesday, 4:30–5:15
Title: Perfectly Regular Frames

Cozero elements of a frame play an important role in point-free topology. The set of cozero elements, $\mathsf{Coz}\ L$, of a frame L is a sub σ-frame of L (that is, a sublattice closed under countable suprema and finite infima). Moreover, the lattice $\mathsf{Coz}\ L$ join-generates the frame L if and only if L is completely regular (a result analogous to the classical one for completely regular topological spaces).

In the completely regular setting, we study the structure of the generating lattice $\mathsf{Coz}\ L$. A natural question is whether this lattice can be enriched or extended to one with better structural properties, and how such an extension relates to the original frame. To address this, we consider the Dedekind–MacNeille completion of $\mathsf{Coz}\ L$, which in this context agrees with the Bruns–Lakser construction. The resulting frame can be identified as a sublocale of L, namely the smallest sublocale that contains $\mathsf{Coz}L$. A main goal of this work is to compare this sublocale with L, and to present results and examples that clarify when they coincide and when they differ.

Interpreting $\mathsf{Coz}\ L$ both as a generating lattice and via its completion naturally leads to two related but distinct classes of frames: cozero frames and perfectly regular frames. We discuss

these classes, with particular emphasis on perfectly regular frames, and conclude with a classical example.

This is an ongoing joint work with Guram Bezhanishvili and Joanne Walters-Wayland.

Matteo Tesi

Scuola Normale Superiore di Pisa
Day/Time: Wednesday, 5:15–6:30
Title: Intuitionistic Logic, Cycles, and Provability Interpretation

Cyclic proof theory is a branch of structural proof theory investigating non-wellfounded derivations. A familiar case study is the logic of arithmetic provability GL and its reflexive counterpart Grz. Intuitionistic logic can be soundly and faithfully embedded in both systems, but a syntactic proof — showing the transformation of derivations — was never found for GL. In the present paper we introduce a cyclic calculus for intuitionistic logic, where cycles are shown to be conservative over the base system by means of a syntactic argument. By bringing the sequential presentation of intuitionistic logic close to the one of GL, we give a simple proof of the faithfulness of the embedding which does not require any detour through semantics.

Thursday, April 16

Pietro Vigiani

Ghent University
Day/Time: Thursday, 9:30–10:15
Title: Dunn-Style Completeness of Modal RM and some Cousins

Relevant logics are weak non-classical logics, whose weakness comes at some price, e.g. the model theory builds on rich structures, Routley-Meyer models, and some logics in the family are undecidable. The logic RM, i.e. the extension of R with the Mingle axiom, is unlike other notable relevant logics in that it is decidable and it is complete with respect to simpler structures, developed by Dunn. Although complete modal extensions of RM with respect to Routley-Meyer models are well known, complete modal extensions of RM with respect to Dunn-style models seem to be lacking. In the first part of the talk, I aim to fill this gap. In the second part of the talk, I will discuss the significance of the completeness result in relation to the framework of generalized Nelson logics, which include RM alongside other logics with strong negation. I will show how to obtain modal extensions of generalized Nelson logics by generalizing the strategy for modal RM.

Miguel Trejo Huerta

Chapman University
Day/Time: Thursday, 10:15–11:00
Title: Stone Duality, Stably Compact Spaces, and **MLS**

This talk presents a conceptual path from classical Stone duality to its extension in the setting of stably compact spaces and the Multilingual Sequent Calculus (**MLS**).

We begin with the classical case of Stone duality for Boolean algebras, emphasizing the correspondence between algebraic and topological structures. We then move to the setting of stably compact spaces, where a similar duality persists but requires a refinement of the logical framework. In this context, **MLS** is introduced as a sequent calculus capable of

relating propositions across different logical systems, providing a proof-theoretic counterpart to domain-theoretic constructions.

Building on this perspective, we present **MLS** explicitly as a sequent calculus and explain how its structure reflects the duality between logic and topology. We then introduce William Lawvere's insight that quantifiers can be understood as adjoints to substitution, first in the classical setting of Boolean algebras. Finally, we explore how this adjoint perspective suggests a possible extension of **MLS** to the first-order level, highlighting both the conceptual challenges and the expected structural features of such an extension.

Francesca Poggiolesi

Université Paris 1 Panthéon-Sorbonne and CNRS
Day/Time: Thursday, 4:15–5:30
Title: Explaining with Reasons: from Aristotle to Machine Learning Classifiers

Explanations, and in particular explanations which provide the reasons why their conclusion is true, are a central object in a range of fields. On the one hand, there is a long and illustrious philosophical tradition, which starts from Aristotle, and passes through scholars such as Leibniz, Bolzano and Frege, that give pride of place to this type of explanation, and is rich with brilliant and profound intuitions. Recently, Poggiolesi (2025) has formalized ideas coming from this tradition using logical tools of proof theory. On the other hand, recent work has focused on Boolean circuits that compile some common machine learning classifiers and have the same input-output behavior. In this framework, Darwiche and Hirth (2023) have proposed a theory for unveiling the reasons behind the decisions made by Boolean classifiers, and they have studied their theoretical implications. In this paper, we uncover the deep links behind these two trends, demonstrating that the proof-theoretic tools introduced by Poggiolesi (2025) provide reasons for decisions, in the sense of Darwiche and Hirth (2023). We discuss the conceptual as well as the technical significance of this result.

The presentation is based on a joint paper with B. Hill (GREGHEC, CNRS)

Darwiche, A., & Hirth, A. (2023). On the (complete) reasons behind decisions. *Journal of Logic, Language and Information*, 32, 63–88.
Poggiolesi, F. (2025). (Conceptual) explanations in logic. *Journal of Logic and Computation*, 35(4), 1–34.

Brice Halimi

Université Paris-Cité
Day/Time: Thursday, 5:30–6:45
Title: Abstracting away from Abstraction Principles

The interpretation of mathematical objects as entities derived from "abstraction principles" has become a major program. Despite its virtues, this program tends to fuel abstractionism (i.e., the claim that all or most mathematical objects can be reconstructed through abstraction principles) and thus to give an inaccurate, because monolithic, picture of how abstract objects can be introduced in mathematics.

In particular, descent theory and homotopy type theory (two theories I will present briefly) call for the recognition of other important ways of referring to mathematical objects and of conceiving of their identity. In the first case, an object is reconstructed as the amalgamation of a system of local data whose overlaps are congruent. In the case of homotopy type theory, a

mathematical object is defined within a structure that pre-integrates the identifiability of two entities that are continuously deformable into one another.

My talk will endeavor to show that abstraction, collation, and deformation obey different principles and embody three very different ways of introducing a mathematical object which, beyond philosophy of mathematics, correspond to very different philosophical conceptions of the identity of an object.