



BOOK OF ABSTRACTS

Language and the Cognitive Niche

11-13 December 2024 (in person)

Department of Civilizations and Forms of Knowledge, University of Pisa

In recent decades, evolutionary theories have portrayed embodied agents as actively modifying their environments through bodily actions, making them more conducive to survival. This has sparked inquiries into the role of language in this process. It has been suggested that language functions as a structure humans have constructed to enhance their cognitive niche. In the sciences, formalization inevitably involves choices about how concepts are represented, alongside the abstract nature of the notions involved, leading to a plurality of perspectives and raising significant ontological and epistemological questions. This workshop aims to investigate the possibility of reinterpreting the expressive, representational, and inferential dimensions of language. We are particularly interested in whether these dimensions should be examined from an internal, mental perspective or whether they instead require an external, social perspective, and in considering the role of science in this relationship between internal and external worlds.

Organizers: Danilo Manca, Giacomo Turbanti, Giorgio Venturi.

Accommodation



Residence Le Benedettine
Lungarno Sidney Sonnino, 19, 56125 Pisa PI

Invited speakers will be hosted at the **Residence Le Benedettine**, located in the city center along the southern bank of the Arno River. The Residence is easily accessible by bus from Pisa Centrale station. It is about a 15-minute walk away.

Two social dinners are planned for the evenings of Wednesday 11, and Thursday 12, respectively, at the restaurants **La Mescita** (Via Domenico Cavalca, 2) and **La Grotta** (Via San Francesco, 103). Lunch on Thursday 12 and Friday 13 will be served buffet-style directly near the workshop venue.

Venues



Palazzo Boilleau

Via Santa Maria 85, Pisa.

Wednesday 11



Polo Guidotti

Via Trieste 40, Pisa

Thursday 12 and Friday 13



Schedule

Wednesday, December 11	Palazzo Boilleau, lecture hall
14:00 - 14:30	<i>Registration</i>
14:30 - 14:45	<i>Inauguration</i>
14:45 - 15:30	Guido Baggio Gesture, Language and Mathematics from a Pragmatist Enactive Perspective
15:30 - 16:15	Marco Fenici How Language Acquisition Shapes Mindreading Capacities
16:15 - 16:30	<i>Break</i>
16:30 - 17:15	Francesca Poggiolesi (joint work with & Brian Hill) Explaining with reasons: from Aristotle to Machine Learning Classifiers
17:15 - 18:00	Luca Bellotti Gödel, Husserl and the intuition of ideal objects

Thursday, December 12	Polo Guidotti, room G1
10:00 - 10:45	Anke Breunig Justifying Rules of Language
10:45 - 11:00	<i>Break</i>
11:00 - 11:45	James O'Shea Norm, Nature, & Representation: Sellars' Cognitive Fusion of the Early & Later Wittgenstein
11:45 - 12:00	<i>Break</i>
12:00 - 12:45	Ulf Hlobil How We Can Learn Inferential Roles
12:45 - 15:00	<i>Lunch</i>
15:00 - 15:45	Leon Horsten What is there?
15:45 - 16:00	<i>Break</i>

16:00 - 16:45

Matteo De Benedetto & Lorenzo Rossi

The Cognitive Content of Mathematical Structures: The Case of Number Concepts

Friday, December 13

Polo Guidotti, room G2

10:00 - 10:45

Preston Stovall

Primus Inter Pares: Philosophy of Language as First Philosophy

10:45 - 11:00

Break

11:00 - 11:45

Teresa Marques

The Expression of Anger

11:45 - 12:00

Break

12:00 - 12:45

Augusto Basilio

Evolutionary Game Theory and the Origins of Human Language

Gesture, Language and Mathematics from a Pragmatist Enactive Perspective

Guido Baggio

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Abstract: My contribution focuses on the theoretical elements that can support a pragmatist-enactive approach to language and mathematical reasoning through the concept of “gesture.” This conceptual tool is seen as the sensorimotor element that contributes to the making-sense processes in the interactions between organisms and between organisms and their environment, which are at the basis of the emergence of language and abstract reasoning. It is, therefore, both a key element of the biosemiotic process and a maker of that sensorimotor coordination of the visual, manual and reflexive elements that enables the traceability of the graphic sign as a co-constructor of abstract concepts. This investigation is part of a broader project that aims to promote a Pragmatist Enactivism, which seeks to consolidate the “pragmatic turn” in 4EA cognition.

How Language Acquisition Shapes Mindreading Capacities

Marco Fenici

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Abstract: How do we predict others' behavior? The traditional view suggests that we do so by reasoning about others' mental states—what I call “folk psychological reasoning” (FPR). The relevance of FPR for action prediction originates from influential works in philosophy (Lewis, 1972; Dennett, 1987), though it is not without theoretical challenges. Indeed, philosophers such as Wittgenstein and Sellars have argued extensively and effectively that FPR more accurately reflects the discursive practice of rationalizing behavior after it has occurred, rather than a psychological capacity to silently process others' mental states.

In the talk, I will defend such a discursive view. Specifically, I propose that discursive FPR evolved because (i) by reporting mental states, we publicly take responsibility to align future behavior with specific patterns of action, and (ii) tracking such pragmatic commitments is fundamental for coordinating actions (Fenici & Zawidzki, 2020). Accordingly, FPR is fundamentally a linguistic capacity (Bruner, 1990; Hutto, 2008) that children master by familiarizing with the pragmatic conditions for ascribing mental states to themselves and others in conversation (Fenici, 2016, 2022).

The proposal supports the compelling idea that folk psychology serves a regulatory function (Mameli, 2001; McGeer, 2007; Zawidzki, 2013), while also accommodating a more radical socio-cultural framework (Fenici & Zawidzki, 2020; Kusch, 1997). Mental states are cultural artifacts, maintained only through socially rehearsed, intersubjectively defensible, and justifiable linguistic practices.

References:

- Bruner, J. S. (1990). *Acts of Meaning*. Cambridge (MA): Harvard University Press.
- Dennett, D. C. (1987). *The Intentional Stance*. Cambridge (MA): The MIT Press.
- Fenici, M. (2016). “What is the role of experience in children's success in the false belief test: Maturation, facilitation, attunement or induction?” *Mind & Language*, 32(3): 308-337.
- Fenici, M. (2022). “How children approach the false belief test: Social development, pragmatics, and the assembly of Theory of Mind”. *Phenomenology and the Cognitive Sciences*, 21(1): 181-201.
- Fenici, M., & Zawidzki, T. W. (2020). “The origins of mindreading: How interpretive socio-cognitive practices get off the ground”. *Synthese*, 198: 8365-8387.
- Hutto, D. D. (2008). *Folk Psychological Narratives*. Cambridge (MA): The MIT Press.
- Kusch, M. K. (1997). “The sociophilosophy of folk psychology”. *Studies in History and Philosophy of Science*, 28(1): 1-25.
- Lewis, D. (1972). “Psychophysical and theoretical identifications”. *Australasian Journal of Philosophy*, 50(3): 249-258.

- Mameli, M. (2001). "Mindreading, mindshaping, and evolution". *Biology and Philosophy*, 16(5): 595-626.
- McGeer, V. (2007). "The regulative dimension of folk-psychology". In D. D. Hutto & M. Ratcliffe (Eds.), *Folk-psychology Reassessed*. Dordrecht:Springer.
- Zawidzki, T. W. (2013). .: Cambridge (MA): The MIT Press.

Explaining with reasons: from Aristotle to Machine Learning Classifiers

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Brian Hill

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Abstract: 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 other hand, there is a long and illustrious philosophical tradition, which starts from Aristotle, and passes through scholars as Leibniz, Bolzano and Frege, that give pride to this type of explanations, and is rich with brilliant and profound intuitions. Recently, Poggiolesi (2024) has formalized ideas coming from this tradition using the logical tools proper to proof theory. On the one 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 talk we will show the deep links behind these two trends: in particular, we will demonstrate that the proof-theoretic tools introduced by Poggiolesi can be used to compute the complete reasons behind the decisions made by Boolean classifiers and we will illustrate them using examples.

References:

- Darwiche, A. and Hirth, A. (2023). “On the (complete) reasons behind decisions”. *Journal of Logic Language and Information*, 32:63-88.
- Poggiolesi, F. (2024). “(Conceptual) explanations in logic”, *Journal of Logic and Computation*.
<https://doi.org/10.1093/logcom/exae064>

Justifying Rules of Language

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Abstract The notion of material inference plays a central role in inferentialist theories of meaning. Inferentialists hold that certain material rules of inference correspond to laws of nature. This account leads to a well-known dilemma: while the inferentialist is committed to the view that statements about laws of nature are not straightforwardly empirical, it also does not seem right to say that we learn about laws of nature by meaning analysis. Sellars and Brandom propose different solutions to this dilemma. Sellars thinks that statements about laws of nature are indeed conceptually true, if they express material rules of inference we have endorsed. However, he thinks the real question is whether to accept a particular material rule of inference as part of our language. This is a practical question that calls for a decision, though a wise decision is one that takes into account the available evidence. Sellars thinks it is by deciding on the rules of language that we give meaning to our words. It is our responsibility to shape our language and make it a useful tool for explaining and predicting past, present and future events. The rules of language, and the meanings they constitute, are our own making. Conceptual change is thus of first importance. Brandom also admits that statements about laws of nature, if true, are conceptually true. But he thinks, paradoxically, that we must discover empirically whether they are conceptually true. He rejects the view that we determine the meaning of our words. Linguistic norms are objective, they are not up to us. Our task is discovery instead of invention. In spite of Brandom's many borrowings from Sellars, this difference between his and Sellars's version of inferentialism runs deep. In my talk I will explicate Sellars' account of justifying rules of material inference, examine some of its consequences, and contrast it with Brandom's rather different approach.

Norm, Nature, & Representation: Sellars' Cognitive Fusion of the Early & Later Wittgenstein

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Abstract Sellars attempted to harmonize several discordant themes in mid-20th century philosophy: on one hand, the scientific realism and physicalist naturalism of his father Roy Wood Sellars; but on the other hand, the crystalline analytic ideal of Wittgenstein's *Tractatus*, Russell's logical atomism, and Carnap's *Aufbau* and *Logical Syntax*. Yet increasingly in the 1950s we find Sellars developing the normativist, holist, and anti-reductionist insights for which he is most famous, among them his critique of the myth of the given and his conception of the logical space of reasons. Here I focus on Sellars' attempted integration of ostensibly conflicting themes from both the early and later Wittgenstein within one unified account of human and animal cognition.

How We Can Learn Inferential Roles

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Abstract: We humans have an innate and natural ability to learn to make inferences. Learning to make inferences requires that one grasps (at least partially) the inferential role some sentences. This raises the question in virtue of what we grasp one inferential role and not another. An answer to this question should allow us to respond to Kripke's meaning skepticism. In this talk, I will suggest that the biological notion of defect and well-functioning are useful in answering the question. Roughly, we grasp one inferential role, A, rather than another, B, just in case a well-functioning capacity to learn inferential roles yields a grasp of A, given one's training experience.

Gödel, Husserl and the intuition of ideal objects

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Abstract: In order to discuss some aspects of the problem concerning the conditions of possibility of some sort of intuition of ideal (abstract) objects, we comment on a few relevant remarks on Husserl's 'Logical Investigations' (in particular the last one) which can be found in Gödel's unpublished notes (first reported by K. Hauser) and on others reported earlier by H. Wang. These remarks are not only significant examples of Gödel's attitude towards Phenomenology, but show his original (not fully developed) phenomenologically inspired idealistic point of view, aiming at a viable philosophical clarification of intuition of ideal objects in view of its role in mathematical knowledge.

What is there?

Leon Horsten

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Abstract:

The cognitive content of mathematical structures: the case of number concepts

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Lorenzo Rossi

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Abstract: Structures are ubiquitous in mathematics. But how should they be understood? Modelists (Button and Walsh, 2018) argue that they should be understood as specified by model theory, i.e., as structured sets. In this talk, we articulate and defend a version of modelism, which we call cognitive modelism, by building upon recent core-cognition theories of conceptual development (Carey 2009, Spelke 2022) According to these theories, conceptual development is strongly directed from innate and domain-specific learning mechanisms that guide our construction of many fundamental concepts such as color concepts, physical concepts, agency concepts, and, crucially for us, mathematical concepts. Building upon these psychological theories, cognitive modelism will give the modelist's thesis a cognitive justification, by showing that model-theoretic structures faithfully explicate the cognitive content of central mathematical concepts.

We will give a cognitive modelist reconstruction of four different number systems: the natural numbers, the rational numbers, the real and the complex numbers, and quaternions. We will show how, in constructing more complex mathematical concepts, agents seem to gradually move away from the cognitive basis of core cognition, towards concepts with a distinctively cultural character. The more a concept acquires a distinctively cultural character, the less it seems dependent on our core cognitive mathematical capacities and, therefore, the less cognitive modelism delivers a univocal picture of its conceptual content.

Finally, we will briefly show how our cognitive modelist picture of these different number concepts bears on classical debates in the philosophy of mathematics, such as the adoption of specific formal foundational theories.

References:

- Button, T. and Walsh, S. (2018). *Philosophy and Model Theory*. Oxford University Press, Oxford.
- Carey, S. (2009). *The Origin of Concepts*. Oxford University Press, Oxford.
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Primus Inter Pares: Philosophy of Language as First Philosophy

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Abstract: It is an open question whether and in what sense non-linguistic animals are capable of cognitive acts that have logical content, and of how explicitly codified deduction systems like those of classical logic might relate to whatever sort of cognition non-human animals are capable of. In this essay, I show that a practical capacity for rejecting speech acts and collections of speech acts – of the sort found in bilateral deduction systems – can account for cognitive acts having a distinctively logical structure but not content. On this basis, I hypothesize that the ability to engage in acts of self-directed cognitive rejection is an evolutionary bridge linking simpler non-human and linguistic human cognition. I also show that a unilateral account of deductive inference, where logical operations are accounted for in terms of content rather than structure, would be more parsimonious in communicating over and propagating the rules of such systems. This provides a plausible explanation for why logical instruction would occur in a unilateral rather than bilateral framework today even if, in the etiology of these capacities, bilateral and rejection-based modes of thinking antedate unilateral assertion-based accounts.

The Expression of Anger

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Abstract: This paper addresses the following question: in what contexts is the expression of anger permissible? The plan for this paper is as follows: I first present arguments in favour of the place of the expression of anger in the public domain and explain why they rely crucially on the idea that anger has fittingness or aptness conditions that include moral wrongs or moral injustice and aims that are not retributive. If anger is apt when it is a response to moral wrongs, then its expression would likewise be appropriate and admissible under conditions of injustice, or so the argument goes (Srinivasan 2018, Lepoutre 2018, Shoemaker 2017, Silva 2021a, 2021b). I show that it's far from obvious that anger constitutively appraises injustice. Moreover, we cannot ignore the counterproductive effects of anger, nor is it established that its aim is not corrective. I conclude with some considerations about the political contexts in which anger's expression is permissible.

References:

- Lepoutre, M. (2018). "Rage inside the machine: Defending the place of anger in democratic speech", *Politics, Philosophy & Economics*, 17(4): 398-426.
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- Srinivasan, A. (2018). "The Aptness of Anger", *Journal of Political Philosophy*, 26: 123-144.

Evolutionary Game Theory and the Origins of Human Language

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Abstract: The evolution of human language marks a pivotal transformation in the history of *Homo sapiens*, driving significant cognitive, social, and cultural advancements. This presentation examines language evolution through the lens of Evolutionary Game Theory, with a particular focus on models developed by Martin Nowak and collaborators. These models conceptualize languages as communication strategies within Darwinian populations, whose evolution is shaped by frequency-dependent selective pressures. Using these models, we can propose a plausible multi-stage transition from primitive signaling systems to today's syntactic, generative languages.

In the initial stage of language evolution, coherent signal-object mappings emerged within populations. However, the fitness of these strategies is constrained by information-theoretic error limits. Without structural changes, the effectiveness of these communication strategies remains bounded. Word formation provided a mechanism to overcome these constraints. As Nowak and colleagues show, the *noisy coding theorem* can be used to prove that combining phonemes into words allows for exponential fitness gains while requiring only a linear increase in word length.

The emergence of syntax and subsequently generative grammars marked a significant leap, enabling words to be structured into sentences for more complex and efficient communication. Syntactic systems can achieve evolutionary stability in populations where communication demands are sufficiently complex and the environment is suitably structured to necessitate such advancements. Numerical simulations and theoretical analyses demonstrate that this stage of language evolution is dependent on a *coherence threshold*, which establishes the conditions required for a dominant grammar to emerge. These results challenge traditional views, such as Chomsky's hypothesis of language as an arbitrary, non-adaptive trait, by revealing language's design as an optimized evolutionary outcome.