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**Presentation of the Book of Olga Pombo: O CIRCULO DOS SABERES
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On Analytic-Content Based Truths

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1 Introduction: *The dialogical turn.*

Since the times of the ancient Greece, where the agora emerged as the first public space for discussion and decision-making on diverse and serious matters, and after the crucial influence of the Sophists, of Plato and of Aristotle, dialectical reasoning won a place in our understanding of science and constitution of a society which it ever lost any more.

The link between inference and dialectical reasoning is that dialectical reasoning provides the dynamics required to model agent-based knowledge constituted by inferential interaction.

In a recent paper Mathieu Marion and Helge Rückert (2012) who for the first time since the early publications by Kuno Lorenz and Jürgen Mittelstrass (1966a, 1966b)² take up the historic roots of the theory of meaning underlying dialogical logic, showed how the notion of quantified expressions of Aristotle's syllogistic was based on some specific rules for dialectical games of the *Topics* (Θ , 2, 157a 34 and 8,160b 3).³

¹ The present paper is based on a joint work in progress with Göran Sundholm (Leiden) and is part of an ongoing project in the context of the MESHs-Nord-pas-de Calais-programme *Argumentation, Decision; Action* (ADA).

² Reprinted in Lorenz (2010).

³ According to the paper; such rules of the *Topics* established how to challenge a universal quantifier by "building a counterexample" and how to defend it. Moreover, these rules for the quantified expressions were formulated into a frame that delivered what we call nowadays the *play level* while the syllogistic should link the

However, after Aristotle, the theory of inference and dialectical reasoning theory followed different paths and with it the dynamic aspects of logic were lost. Furthermore, during the years that followed immediately after the failure of the logical positivism project, the links between science as a body of knowledge and science as process by which knowledge is achieved were cut off. Indeed, a ban on the logical analysis of science as a dynamic process, which in traditional philosophy was overtaken by ‘gnoseology’, produced a gap between sciences and logic (including philosophy of science).⁴

As it happens quite often in philosophy, the echoes of the old traditions come back and point at the mistakes of the younger iconoclast movements. This is indeed the case in the relation between logic and knowledge where the inclusion or exclusion of the epistemic moment as linked with the concept of proposition provoked a heated debate since the 1960s.⁵ In 1955 Paul Lorenzen proposed an *operative* approach that delved into the conceptual and technical links between *procedure* and knowledge.⁶ The insights of Lorenzen’s *Operative Logik*, as pointed out by Schröder-Heister (2008), had lasting consequences in the literature on proof-theory and still deserve attention nowadays. Indeed, the notion of *harmony* formulated by the logicians that favoured the epistemic approaches such as Dag Prawitz⁷ has been influenced by Lorenzen’s notions of *admissibility*; *eliminability* and *inversion*.⁸ The epistemic approaches, which started to call themselves, following Michael Dummett, ‘antirealism’, found their formal argument in the mathematics of Brouwer and intuitionistic logic while the others persisted with the formal background of the Frege-Tarski tradition, where Cantorian set theory is linked *via* model theory to classical logic.

This picture is, however, incomplete: On one hand, already in the 1960s appeared *Dialogical logic* developed by Paul Lorenzen and Kuno Lorenz, as a solution to some of the problems that arouse in Lorenzen’s *Operative Logik* (1955). Since the appearance of Dialogical logic, the epistemic turn initiated by the proof theoretic approach was tackled with the notion of games that provided the dynamic features of the traditional dialectical reasoning. Inspired by Wittgenstein’s *meaning as use* the basic idea of the dialogical approach to logic is that the meaning of the logical constants is given by the norms or rules for their use; and it provides an alternative to both model-theoretic and proof-theoretic semantics.

On the other hand, by the sixties, Jaakko Hintikka combined the model-theoretical, the epistemic and the game-based traditions by means of the development of what is now known as *explicit epistemic logic*, where the epistemic content is introduced into the object language as an operator which yields propositions from propositions rather than as metalogical constraints on the notion of inference. These kinds of operators were rapidly generalized

play level with *the level of strategies*, by the means of which validity is defined. Moreover, it looks that the frame included two main rules that have a crucial role in contemporary dialogical logic, namely: the so-called *formal rule*, that makes the winning of a play independent of the meaning of its constitutive elementary sentences, and the non-delaying rule, that takes into consideration the real-life constraints, by imposing a fixed length on dialectical games.

⁴ In gnoseology the main notion was the one of judgement rather than that of proposition. This represented the basis of the Kantian approach to logic, which seemed to be in conflict with the post-Fregean approach where only relations between propositions are at stake and where the epistemic aspect is seen as outside logic. Cf. Sundholm (1998) and (1999).

⁵ Cf. Rahman/Primiero/Marion (2012), pp. vii-ix.

⁶ P. Lorenzen (1955).

⁷ Prawitz (1979).

⁸ Cf. Schröder-Heister (2008).

covering several propositional attitudes including notably knowledge and belief. Furthermore, Hintikka developed *game theoretical semantic* that is an approach to formal semantics that, like in the dialogical framework, grounds the concepts of truth or validity on game-theoretic concepts, such as the existence of a winning strategy for a player, though differently from the dialogical framework it is build up on the notion of model.⁹

Games, as stressed by Johan van Benthem, involve a tight interplay of what agents know and how they act, and the rise of this paradigm inside logic is unmistakable. But note again that this development also involves a major extension of a classical viewpoint. Games are typically an interactive process involving several agents, and indeed many issues in logic today are no longer about zero-agent notions like truth, or single-agent notions like proof, but rather about processes of verification, argumentation, communication, or general *interaction*. Actually, this new impulse where epistemic operators are combined with a game-theoretical approach experienced a parallel renewal in the fields of theoretical computer science, computational linguistics, artificial intelligence and the formal semantics of programming languages triggered by the work of Johan van Benthem¹⁰ and collaborators in Amsterdam who not only looked thoroughly at the interface between logic and games but also provided new and powerful tools to tackle the issue of the *expressivity* of a language – in particular the capability of propositional modal logic to express some undecidable fragments of first-order logic.¹¹ New results in linear logic by J-Y. Girard in the interfaces between mathematical game theory and proof theory on one hand and argumentation theory and logic on the other hand resulted in the work of many others, including S. Abramsky, J. van Benthem, A. Blass, H. van Ditmarsch, D. Gabbay, M. Hyland, W. Hodges, R. Jagadeesan, G. Japaridze, E. Krabbe, L. Ong, H. Prakken, G. Sandu D. Walton, and J. Woods who placed game semantics in the center of a new concept of logic in which logic is understood as a dynamic instrument of inference.¹²

A *dynamic turn*, as van Benthem puts it, is taking place and Kuno Lorenz's work is a landmark in this turn. In fact, Lorenz's work can be more accurately described as the *dialogical turn* that re-established the link between dialectical reasoning and inference interaction and provides the basis of a host of ongoing projects in the history and philosophy of logic, going from the Indian, the Chinese, the Greek, the Arabic, the Hebraic traditions, the Obligations of the Middle Ages to the most contemporary developments in the study of epistemic interaction.

Let me now come to a point that might be seen as a kind of a pending task. In its origins Dialogical logic constituted a part of an overall new movement called the *Erlangen School or Erlangen Constructivism* that should provide a new start to a general theory of language and of science.¹³ In relation to the theory of language, according to the Erlangen-School, language is not just a fact that we discover, but a human cultural accomplishment whose construction reason can and should control.¹⁴ The constructive development of a scientific language was called the *Orthosprache-project*.¹⁵ Unfortunately, the Orthosprache-project was not further developed and somehow seemed to fade away. Perhaps one could say that one of the reasons

⁹ J. Hintikka (1962), (1973), (1996), Hintikka/Sandu (1997).

¹⁰ van Benthem (1996), (2009), (2010), (2012).

¹¹ van Benthem (2001).

¹² See also, among others: Blass (1992), Abramsky/Melliès (1999), J.-Y. Girard (1993).

¹³ Cf. Kamlah/Lorenzen (1967) and (1973) and Lorenzen/Schwemmer (1975).

¹⁴ Cf. H. Robinson (1984) preface to his translation of *Logische Propädeutik*

¹⁵ Lorenzen (1973) and Lorenzen/Schwemmer (1975, p.24).

is that the link between dialogical logic and the Orthosprache was not sufficiently developed – in particular the systematic development of dialogues based on the norms built by an Orthosprache were not worked out – and then the new theory of meaning of dialogical logic seemed to be cut off from the project of setting the basis for scientific language and also from a general theory of meaning. However, in the last 30 years or more, Lorenz delved into the roots of the problem, initiated in his *Habilitationschrift*¹⁶ and developed a new theory of predication that should furnish the adequate means to complete the dialogical project.¹⁷

In the present paper, I would like to contribute to suggest the ways in which a general dialogical theory of meaning could be linked to dialogical logic. The general aim is to contribute to a general dialogical theory of meaning but in the present paper I will only set the preliminaries to such a work. In my view the recent work of Lorenz on predication can be integrated in the project at a precise place. The idea behind the proposal is to make use of constructive type theory where logical inferences are preceded by the description of a fully interpreted language, the latter, I think, provides the means for a new start not only for the project of an Orthosprache but for a general dialogical theory of meaning. Indeed, constructive type theoretical grammar (Ranta 1994) has been now successfully applied for the semantics of over 60 natural languages and the research is just starting. I am confident that the dialogical theory of meaning has the means for joining to and contributing to this project, and this is the work ahead we are aiming at.

Moreover, the dialogical approach should contribute to deepen the understanding of the development of the program of type theory by

delving into the notion of object and individual of type theory

delving into the understanding of the process by which non-paradigmatic examples of a kind (noncanonical elements of a type) relate to the paradigmatic examples (canonical elements of a type) in non-mathematical contexts

providing dynamic means to explicitly describe the *act of demonstration*, that is the actual construction of the proof object – a construction that is built bottom up at the level of plays.

However, as already mentioned, the present paper presents rather a research program and thus, herewith I will content myself with the task of developing the link between dialogical logic and the project of an Orthosprache making use of a type-theoretical setting.

In fact the paper falls short of constituting a development of CTT-dialogues since, though I will briefly mention it, I will not work out the process by means of which proof-objects are built. It is rather a development of dialogues of what in the context of CTT is called *explicit intuitionistic logic*.

¹⁶ Lorenz (1970).

¹⁷ Lorenz (2009).