

Preface

The PRELUDE program

The articles collected in this volume are based on contributions to workshops and meetings that were held within the context of the PRELUDE project. PRELUDE, an acronym for “Towards Theoretical Pragmatics based on Ludics and Continuation Theory”, ran from November, 2006 to November, 2009, with funding from the new French National Agency for Research (ANR). The objective of the project was to develop perspectives on Natural Language Semantics and Pragmatics based on recent developments in Logic and Theoretical Computer Science.

In the History of Logic, research on the conditions for a theoretical discourse to be coherent and rigorous, mainly initiated by G. Frege, was followed in the mid-twentieth century by a new approach, inspired by the Computing Revolution, focusing on the study of programs and their transformations. The view according to which programs could be seen as the proofs of the statements expressing their correctness made logical formalisms into valuable objects of study for Computer Science. Among such logical frameworks, intuitionistic logic was considered as an attractive system because of its constructiveness, which takes the form of a famous correspondence between programs and proofs, known as the Curry-Howard correspondence (Howard 80). After this discovery, the possibilities of extending such a correspondence were explored, and denotational semantics began to give more attention to the interpretation of proofs than to the interpretation of formulae.

Around the beginning of the 1990s, it became clear, mainly through the seminal work of A. Ranta (Ranta 94) based on Martin-Löf’s Type Theory (Martin-Löf 84), that the semantics of proofs could provide the foundations for a view on Natural Language semantics going beyond the simple truth-conditional approach usually taken within the Montagovian tradition. Constructive Type Theory for instance turned out to be a suitable basis for an account of anaphora in so-called *donkey sentences*, such as *every farmer who owns a donkey beats it*. Nevertheless, although the view of a sentence meaning as the set of its proofs allows for more fine-grained distinctions than a strict Fregean conception, it remains a *static* view. *Interaction*, which is the key point of *dialogue*, was still ignored. Pragmatics in the Type Theoretical frameworks remains concentrated on the agent’s judgements, which are viewed as mainly *static*.

The frameworks of Linear logic (Girard 87; Curien 2004), and then ludics (Girard 01; Girard 03), (Girard 06; Curien 2004), developed by Jean-Yves Girard, have provided new ways of thinking about dynamic processes and interaction. The objective of the PRELUDE project was to take these into account in order to analyze argumentation, dialogue, semantics and speech acts.

The first objective was to study Discourse in the light of the theory of continuations. This theory gives equal prominence to *text* and *context* (or *terms*,

or *programs* and *co-terms*, or *environments*), which is exactly what is required when one considers discourse as a process in which each sentence is interpreted in the context of the previous ones and where it contributes to create a new one, the view held in most versions of Discourse Theory (Kamp 81; Heim 88). In that perspective, actually, several works had already been done following seminal papers by P. de Groote, C. Barker and K. Shan (de Groote 01; de Groote 06; Barker 02; Barker 04; Shan 04). These approaches were based on different ways of extending the Curry-Howard correspondence to classical logic. Such extensions had been explored by several researchers since the beginning of the 1990s, such as M. Parigot (with the $\lambda\mu$ -calculus) (Parigot 92), P-H. Curien and H. Herbelin (with the $\bar{\lambda}\mu\tilde{\mu}$ -calculus) (Herbelin 05; Curien & Herbelin 2000), P. Wadler (Wadler 03) and V. Danos, J-B. Joinet and H. Schellinx (1). M. Moortgat and R. Bernardi (Bernardi & Moortgat 07), during the same period, developed a continuation semantics for Grishin’s “symmetric” extension of the Lambek calculus, useful for dealing with grammatical phenomena without using so-called “structural modalities”. In the context of the PRELUDE project, we were mostly interested in attempts to provide accounts of *dynamical processes* in discourse, like those studied within the framework of Discourse Representation Theory (see (de Groote 06)).

The second objective was to study the figures of dialogue and interaction through the concepts of Ludics. Here, incidentally, we were confronted with problems of client-server dialogues, where continuations are not sufficient since a whole tree of exchanges must be taken into account as a context (Fouqueré 09).

This objective rested on the idea that *interaction* is the key concept to study language, as it becomes clear as soon as we try, for instance, to understand questions like the origin of language (Pinker 07), or, in a more synchronic way, when we study language in context, even from a syntactic viewpoint, as R. Kempson and her collaborators have already shown (2).

In some respects, our approach converges with previous Game Theoretical views such as Hintikka’s Game Theoretical Semantics and Lorenzen’s Dialogical Logic, although it also differs from these in many respects¹ (Lorenzen 60; Hintikka-Sandu 97; 19; Rahman & Keiff 05). For this reason, we appealed to some contributors involved into these perspectives. It seemed important for us to help making distinctions between all these conceptions. Game Theoretical Semantics (GTS) has already helped to study linguistic phenomena from a game viewpoint, thus making a notion of *strategic meaning* to emerge, a notion which deserves much attention. Nevertheless, from our viewpoint, it lacks a *dynamical* dimension. As is claimed by Hintikka himself, game moves in GTS must never be seen as sequences of speech acts, but as mere games for “searching and finding” (see (Pietarinen 07)). For instance, this theory reflects quite well the

¹ Particularly because the aims of these different frameworks are not identical: Lorenzen’s Dialogical logic was an attempt to show that intuitionistic logic was the most natural logic; Hintikka’s GTS is also based on a priori rules but mainly aims at providing a basis for analyzing knowledge from this viewpoint; Ludics is prior to any set of logical rules since it aims at giving new foundations for logic itself.

mental behaviour of a reader trying to find the reference of some proper name in a text. We could also say that GTS has mainly an *epistemic* perspective, and does not try to reflect the dynamics of the interpretation process. Compared to GTS, Ludics is neither based on *a priori* rules, nor on some evaluation procedure which would lead to put various weights on issues. It aims at showing that rules themselves are determined by more general considerations like *symmetry* and *orthogonality*, that is *geometrical* considerations, so that it is possible to play with the rules of a game themselves, something important when confronted with dialogue situations.

The primitive objects of Ludics are kinds of trees (called *designs*) that represent dialogue (or proof) constructions, on which a relation of orthogonality is defined. This relation represents *interaction*. It implies duality between objects, like between *statements* and *tests* to validate them, provided that we always see statements as being themselves tests for tests.

As a mathematical theory, Ludics is based on theorems which make clear how it can be used for *typing* objects, that is to identify them as *stable* and *regular*. One of the fundamental tools is thus known as the “separation theorem”. The separation theorem states that two *designs* have a distinct behaviour if and only if we can find another one that is orthogonal to one of the two but not to the other. One can then isolate a notion of *observability* (Faggian 06) with which one can provide a basis for the notion of ambiguity in language: the case where a sentence gives rise to two observed types of interaction. Ludical objects are therefore simple but at an abstract level. Stable sets of designs (called *behaviours*) may be provided with operations which make it possible to recover the meaning of logical connectives, and may be then seen as the equivalent of *formulae*.

The project has resulted in several workshops and a final colloquium. The present volume collects the key contributions to these meetings. Actually only a few of them are devoted to Ludics properly speaking:

- M.-R. Fleury and S. Tronçon explore the way of representing speech acts in Ludics. Elaborating on recent conceptions linking speech acts and commitments (Gunlogson 03; Walton 2000), they show that speech acts may be represented as *designs* in that they include at the same time an utterance seen as a strategy, and a function which transforms the context.
- P. Livet also addresses the question of speech acts, but from a slightly different viewpoint. He sees in Ludics a particularly good frame to study the breakdowns which occur in communication and which are precisely repaired by speech acts.
- A. Lecomte and M. Quatrini explore what might be the contribution of Ludics to an inferential semantics, where meanings emerge from the interactions between utterances in real or virtual dialogues.
- C. Fouqueré shows how Ludics may be used for conceiving tools for programming web applications.
- M. Basaldella, A. Saurin and K. Terui bring innovative tools (*c*-designs) to extend Ludics into a real framework for rebuilding the concepts of computability.

Other papers are devoted to topics which surround Ludics, in that they provide:

- a perspective to situate Ludics with regards to Game Theoretical frameworks, via a philosophical reflection on the content of the Logic Games (T. Tulenheimo),
- concrete illustrations of the utility of tools to represent interactive situations as they occur in the dynamics of language (R. Kempson, Gregoromichelaki & Meyer-Viol), or the process of discourse (G. Winterstein and G. Schaden),
- alternative frames to represent commitments (F. Cardone),
- other alternative frames to represent interaction in the case of questions and answers (J. Groenendijk and F. Roelofsen).

Our first objective is actually reflected in this issue only by two papers, one of which is rather critical about the use of continuations even if it seems that the position it adopts with regards to questions like scope ambiguities is equivalent to a solution using them (C. Pollard). The other one (M. Petrolo) is more oriented towards theoretical computer science and gives a survey of various views of *duality*. Finally, another topic close to Ludics is discussed, concerning *coherence spaces* (used as a semantics for Linear Logic), and their possible applications to ontologies (M. Romano, C. Fouqueré and M. Abrusci).

The workshops were held in Carry-le-Rouet (June 2007), Pauillac (October 2007), Autrans (May 2008), Hamburg, as part of ESSLLI, (August 2008), and the final colloquium was held in September 2009 in Paris. During these meetings several major scientists have contributed, including (among researchers not directly included in the program): M. Abrusci, N. Asher, C. Beyssade, J-L. Dessalles, C. Faggian, J-Y. Girard, H. Herbelin, J-B. Joinet, L. Keiff, R. Kempson, M. Marion, P-A. Melies, D. Miller, M. Moortgat, A. Pietarinen, C. Pollard, A. Ranta, G. Sandu, L. Strassburger, T. Tulenheimo, G. White. The PRELUDE project was coordinated by Alain Lecomte. Institutions involved were the Mixed Research Units (UMR) “Formal Structure of Language” (University Paris 8), “Institute of Mathematics of Luminy (Aix-Marseille 2), LORIA (Nancy) and LABRI (Bordeaux) and, in the last period, the UMR LIPN (Paris-Nord). The project began in November 2006 and lasted 36 months. It benefited of an ANR funding of 147 397 euros and has hired two years of a postdoctoral researcher (Samuel Tronçon).

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