
IN PARTNERSHIP WITH:
**CNRS**

**Université de Lorraine**

Activity Report 2017

# Project-Team SEMAGRAMME

## Semantic Analysis of Natural Language

IN COLLABORATION WITH: Laboratoire lorrain de recherche en informatique et ses applications (LORIA)

RESEARCH CENTER
**Nancy - Grand Est**

THEME
**Language, Speech and Audio**

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# Project-Team SEMAGRAMME

*Creation of the Team: 2011 January 01, updated into Project-Team: 2013 July 01*

**Keywords:**

**Computer Science and Digital Science:**

A5.8. - Natural language processing
A7.2. - Logic in Computer Science
A9.4. - Natural language processing

**Other Research Topics and Application Domains:**

B9.5.8. - Linguistics

# 1. Personnel

**Research Scientists**

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# 2. Overall Objectives

## 2.1. Scientific Context

Computational linguistics is a discipline at the intersection of computer science and linguistics. On the theoretical side, it aims to provide computational models of the human language faculty. On the applied side, it is concerned with natural language processing and its practical applications.

From a structural point of view, linguistics is traditionally organized into the following sub-fields:

- Phonology, the study of language abstract sound systems.
- Morphology, the study of word structure.
- Syntax, the study of language structure, i.e., the way words combine into grammatical phrases and sentences.
- Semantics, the study of meaning at the levels of words, phrases, and sentences.
- Pragmatics, the study of the ways in which the meaning of an utterance is affected by its context.

Computational linguistics is concerned by all these fields. Consequently, various computational models, whose application domains range from phonology to pragmatics, have been developed. Among these, logic-based models play an important part, especially at the "highest" levels.

At the level of syntax, generative grammars [35] may be seen as basic inference systems, while categorial grammars [50] are based on substructural logics specified by Gentzen sequent calculi. Finally, model-theoretic grammars [62] amount to sets of logical constraints to be satisfied.

At the level of semantics, the most common approaches derive from Montague grammars [53], [54], [55], which are based on the simply typed $\lambda$-calculus and Church's simple theory of types [36]. In addition, various logics (modal, hybrid, intensional, higher-order...) are used to express logical semantic representations.

At the level of pragmatics, the situation is less clear. The word *pragmatics* has been introduced by Morris [57] to designate the branch of philosophy of language that studies, besides linguistic signs, their relation to their users and the possible contexts of use. The definition of pragmatics was not quite precise, and, for a long time, several authors have considered (and some authors are still considering) pragmatics as the wastebasket of syntax and semantics [31]. Nevertheless, as far as discourse processing is concerned (which includes pragmatic problems such as pronominal anaphora resolution), logic-based approaches have also been successful. In particular, Kamp's Discourse Representation Theory [48] gave rise to sophisticated 'dynamic' logics [42]. The situation, however, is less satisfactory than it is at the semantic level. On the one hand, we are facing a kind of logical "tower of Babel". The various pragmatic logic-based models that have been developed, while sharing underlying mathematical concepts, differ in several respects and are too often based on *ad hoc* features. As a consequence, they are difficult to compare and appear more as competitors than as collaborative theories that could be integrated. On the other hand, several phenomena related to discourse dynamics (e.g., context updating, presupposition projection and accommodation, contextual reference resolution...) are still lacking deep logical explanations. We strongly believe, however, that this situation can be improved by applying to pragmatics the same approach Montague applied to semantics, using the standard tools of mathematical logic.

Accordingly:

> *The overall objective of the Sémagramme project is to design and develop new unifying logic-based models, methods, and tools for the semantic analysis of natural language utterances and discourses. This includes the logical modeling of pragmatic phenomena related to discourse dynamics. Typically, these models and methods will be based on standard logical concepts (stemming from formal language theory, mathematical logic, and type theory), which should make them easy to integrate.*

The project is organized along three research directions (i.e., *syntax-semantics interface*, *discourse dynamics*, and *common basic resources*), which interact as explained below.

## 2.2. Syntax-Semantics Interface

The Sémagramme project intends to focus on the semantics of natural languages (in a wider sense than usual, including some pragmatics). Nevertheless, the semantic construction process is syntactically guided, that is, the constructions of logical representations of meaning are based on the analysis of the syntactic structures. We do not want, however, to commit ourselves to such or such specific theory of syntax. Consequently, our approach should be based on an abstract generic model of the syntax-semantic interface.

Here, an important idea of Montague comes into play, namely, the "homomorphism requirement": semantics must appear as a homomorphic image of syntax. While this idea is almost a truism in the context of mathematical logic, it remains challenged in the context of natural languages. Nevertheless, Montague's idea has been quite fruitful, especially in the field of categorial grammars, where van Benthem showed how syntax and semantics could be connected using the Curry-Howard isomorphism [67]. This correspondence is the keystone of the syntax-semantics interface of modern type-logical grammars [56]. It also motivated the definition of our own Abstract Categorial Grammars [4].

Technically, an Abstract Categorial Grammar simply consists of a (linear) homomorphism between two higher-order signatures. Extensive studies have shown that this simple model allows several grammatical formalisms to be expressed, providing them with a syntax-semantics interface for free [6], [65], [66], [60], [49], [61].

We intend to carry on with the development of the Abstract Categorial Grammar framework. At the foundational level, we will define and study possible type theoretic extensions of the formalism, in order to increase its expressive power and its flexibility. At the implementation level, we will continue the development of an Abstract Categorial Grammar support system.

As said above, to consider the syntax-semantics interface as the starting point of our investigations allows us not to be committed to some specific syntactic theory. The Montagovian syntax-semantics interface, however, cannot be considered to be universal. In particular, it does not seem to be that well adapted to dependency and model-theoretic grammars. Consequently, in order to be as generic as possible, we intend to explore alternative models of the syntax-semantics interface. In particular, we will explore relational models where several distinct semantic representations can correspond to the same syntactic structure.

## 2.3. Discourse Dynamics

It is well known that the interpretation of a discourse is a dynamic process. Take a sentence occurring in a discourse. On the one hand, it must be interpreted according to its context. On the other hand, its interpretation affects this context, and must therefore result in an updating of the current context. For this reason, discourse interpretation is traditionally considered to belong to pragmatics. The cut between pragmatics and semantics, however, is not that clear.

As we mentioned above, we intend to apply to some aspects of pragmatics (mainly, discourse dynamics) the same methodological tools Montague applied to semantics. The challenge here is to obtain a completely compositional theory of discourse interpretation, by respecting Montague's homomorphism requirement. We think that this is possible by using techniques coming from programming language theory, in particular, continuation semantics [64], [32], [33], [63], and the related theories of functional control operators [38], [39].

We have indeed successfully applied such techniques in order to model the way quantifiers in natural languages may dynamically extend their scope [5]. We intend to tackle, in a similar way, other dynamic phenomena (typically, anaphora and referential expressions, presupposition, modal subordination...).

What characterize these different dynamic phenomena is that their interpretations need information to be retrieved from a current context. This raises the question of the modeling of the context itself. At a foundational level, we have to answer questions such as the following. What is the nature of the information to be stored in the context? What are the processes that allow implicit information to be inferred from the context? What are the primitives that allow a context to be updated? How does the structure of the discourse and the discourse relations affect the structure of the context? These questions also raise implementation issues. What are the appropriate datatypes? How can we keep the complexity of the inference algorithms sufficiently low?

## 2.4. Common Basic Resources

Even if our research primarily focuses on semantics and pragmatics, we nevertheless need syntax. More precisely, we need syntactic trees to start with. We consequently need grammars, lexicons, and parsing

algorithms to produce such trees. During the last years, we have developed the notion of interaction grammar [45] and graph rewriting [2] as models of natural language syntax. This includes the development of grammars for French [59], [2], together with morpho-syntactic lexicons. We intend to continue this line of research and development. In particular, we want to increase the coverage of our grammars for French, and provide our parsers with more robust algorithms.

Further primary resources are needed in order to put at work a computational semantic analysis of utterances and discourses. As we want our approach to be as compositional as possible, we must develop lexicons annotated with semantic information. This opens the quite wide research area of lexical semantics.

Finally, when dealing with logical representations of utterance interpretations, the need for inference facilities is ubiquitous. Inference is needed in the course of the interpretation process, but also to exploit the result of the interpretation. Indeed, an advantage of using formal logic for semantic representations is the possibility of using logical inference to derive new information. From a computational point of view, however, logical inference may be highly complex. Consequently, we need to investigate which logical fragments can be used efficiently for natural language oriented inference.

# 3. Research Program

## 3.1. Overview

The research program of Sémagramme aims to develop models based on well-established mathematics. We seek two main advantages from this approach. On the one hand, by relying on mature theories, we have at our disposal sets of mathematical tools that we can use to study our models. On the other hand, developing various models on a common mathematical background will make them easier to integrate, and will ease the search for unifying principles.

The main mathematical domains on which we rely are formal language theory, symbolic logic, and type theory.

## 3.2. Formal Language Theory

Formal language theory studies the purely syntactic and combinatorial aspects of languages, seen as sets of strings (or possibly trees or graphs). Formal language theory has been especially fruitful for the development of parsing algorithms for context-free languages. We use it, in a similar way, to develop parsing algorithms for formalisms that go beyond context-freeness. Language theory also appears to be very useful in formally studying the expressive power and the complexity of the models we develop.

## 3.3. Symbolic Logic

Symbolic logic (and, more particularly, proof-theory) is concerned with the study of the expressive and deductive power of formal systems. In a rule-based approach to computational linguistics, the use of symbolic logic is ubiquitous. As we previously said, at the level of syntax, several kinds of grammars (generative, categorial...) may be seen as basic deductive systems. At the level of semantics, the meaning of an utterance is captured by computing (intermediate) semantic representations that are expressed as logical forms. Finally, using symbolic logics allows one to formalize notions of inference and entailment that are needed at the level of pragmatics.

## 3.4. Type Theory and Typed $\lambda$-Calculus

Among the various possible logics that may be used, Church's simply typed $\lambda$-calculus and simple theory of types (a.k.a. higher-order logic) play a central part. On the one hand, Montague semantics is based on the simply typed $\lambda$-calculus, and so is our syntax-semantics interface model. On the other hand, as shown by Gallin [41], the target logic used by Montague for expressing meanings (i.e., his intensional logic) is essentially a variant of higher-order logic featuring three atomic types (the third atomic type standing for the set of possible worlds).

# 4. Application Domains

## 4.1. Deep Semantic Analysis

Our applicative domains concern natural language processing applications that rely on a deep semantic analysis. For instance, one may cite the following ones:

- textual entailment and inference,
- dialogue systems,
- semantic-oriented query systems,
- content analysis of unstructured documents,
- text transformation and automatic summarization,
- (semi) automatic knowledge acquisition.

It seems clear, nowadays, that the need for semantics is ubiquitous. Nevertheless, according to the present state of the art, there are only a few applications for which a deep semantic analysis results in a real improvement over non semantic-based techniques. This is due to the fact that most current application chains are such that their weakest links are not located at the semantic level.

## 4.2. Text Transformation

Text transformation is an application domain featuring two important sub-fields of computational linguistics:

- parsing, from surface form to abstract representation,
- generation, from abstract representation to surface form.

Text simplification or automatic summarization belong to that domain.

We aim at using the framework of Abstract Categorial Grammars we develop to this end. It is indeed a reversible framework that allows both parsing and generation. Its underlying mathematical structure of $\lambda$-calculus makes it fit with our type-theoretic approach to discourse dynamics modeling.

# 5. New Software and Platforms

## 5.1. ACGtk

*Abstract Categorial Grammar Development Toolkit*
KEYWORDS: Natural language processing - NLP - Syntactic analysis - Semantics
FUNCTIONAL DESCRIPTION: ACGtk provides softwares for developing and using Abstract Categorial Grammars (ACG).

- Participants: Philippe De Groote, Jiri Marsik, Sylvain Pogodalla and Sylvain Salvati
- Contact: Sylvain Pogodalla
- Publications: A syntax-semantics interface for Tree-Adjoining Grammars through Abstract Categorial Grammar - ACGTK: un outil de développement et de test pour les grammaires catégorielles abstraites - Discourse Modeling with Abstract Categorial Grammars - On the expressive power of Abstract Categorial Grammars: Representing context-free formalisms - Towards abstract categorial grammars
- URL: http://calligramme.loria.fr/acg/

## 5.2. Dep2pict

KEYWORDS: Syntactic analysis - Semantics

FUNCTIONAL DESCRIPTION: Dep2pict is a program for drawing graphical representation of dependency structures of natural language sentences. Dep2pict takes into account the modified format mixing surface and deep syntactic information used in deep-sequoia.

- Contact: Bruno Guillaume
- URL: http://dep2pict.loria.fr/

## 5.3. Grew

*Graph Rewriting*
KEYWORDS: Semantics - Syntactic analysis - Natural language processing - Graph rewriting
FUNCTIONAL DESCRIPTION: Grew is a Graph Rewriting tool dedicated to applications in NLP. Grew takes into account confluent and non-confluent graph rewriting and it includes several mechanisms that help to use graph rewriting in the context of NLP applications (built-in notion of feature structures, parametrization of rules with lexical information).

- Contact: Bruno Guillaume
- URL: http://grew.loria.fr/

## 5.4. LEOPAR

KEYWORD: Parsing
FUNCTIONAL DESCRIPTION: Parser for natural language based on interacation grammars

- Participants: Bruno Guillaume, Guillaume Bonfante and Guy Perrier
- Contact: Bruno Guillaume

## 5.5. ZombiLingo

KEYWORDS: Syntactic analysis - Natural language processing - Lexical resource - Collaborative science
FUNCTIONAL DESCRIPTION: ZombiLingo is a prototype of a GWAP where gamers have to give linguistic information about the syntax of natural language sentence, currently in French, and later to other languages.

- Authors: Bruno Guillaume, Karën Fort, Nicolas Lefebvre and Valentin Stern
- Contact: Karën Fort
- URL: http://zombilingo.org/

## 5.6. Platforms

### *5.6.1. SLAMtk*

SLAMtk is a processing chain of transcriptions of interviews for the SLAM project (see Section 7.1.1). In particular, it products of a full anonymized and randomized version of the resources. Some extensions, based on Distagger (tagging of disfluencies) and MElt (tagging of part-of-speech and lemmas), have been implemented in order to run linguistic analyses. The tool was reimplemented in order to propose generic treatments for the different corpora.

- Contact: Maxime Amblard
- URL: http://slam.loria.fr

# 6. New Results

## 6.1. Syntax-Semantics Interface

**Participants:** Philippe de Groote, Sylvain Pogodalla.

### *6.1.1. Lexical Semantics*

The interpretation of natural language utterances relies on two complementary elements of natural language modeling. On the one hand, the description of the combinatorics of natural language expresses how elementary units, or *lexical units* (typically the word), combine in order to build more complex elements, such as sentences or discourses. On the other hand, the description of these elementary units specifies how they contribute to the meaning of the whole by their *lexical meaning*. This specification should also take into account how the different parts of the lexical meanings combine during the *composition* process and how they relate to their underlying meaning concepts. For instance, the verbs *buy* and *sell* should refer to a common conceptual representation. However, their syntactic arguments (e.g., the subject) play a different (semantic) role with respect to the *transaction* concept that they share.

The modeling of these concepts, and how they relate to each other, gave rise to Frames Semantics as a representation format of conceptual and lexical knowledge [40], [34], [28], [52]. Frames consist of directed graphs where nodes correspond to entities (individuals, events, ...) and edges correspond to (functional or non-functional) relations between these entities. Providing a fine-grained representation of the internal concept structure allows both for a *decomposition* of the lexical meaning and for a precise description of the sub-structural interactions in the semantic composition process [51].

Following up on our previous work [46], [47] based on Hybrid Logic (HL) [30], [27] on linking Frames and truth-logical semantics, we used the flexibility of the approach to model semantic coercion as induced by verbs such as *read* that can syntactically have an entity as argument (*John began a book*) while it semantically relates to an event (e.g., *reading*, *writing*, etc.) [7].

## 6.2. Discourse Dynamics

**Participants:** Maxime Amblard, Timothée Bernard, Clément Beysson, Maria Boritchev, Philippe de Groote, Bruno Guillaume.

### *6.2.1. Dynamic Generalized Quantifiers*

We have started a classification of the (French) determiners according to the dynamic properties of the generalized quantifiers they denote [12], [17].

Following Groenendijk and Stokhof [43], we say that a generalized quantifier is *internally dynamic* in case the dynamic binders occurring in its restriction have the capacity of binding material that occurs in their scopes. We also say that a generalized quantifier is *externally dynamic* in case the dynamic binders occurring in both its arguments have the capacity of binding material that occur in the continuation of the discourse. In addition to these notions of internal and external dynamicity, we consider a third notion that we call *intrinsic dynamicity*. We say that a generalized quantifier is intrinsically dynamic in case it introduces new referent markers and makes them available to the continuation of the discourse.

Using these three notions, we have defined three classes of dynamic generalized quantifiers, which fairly correspond to the notions of specific (e.g., *the*, *this*, *his*), general (e.g., *a*, *some*, *another*), and quantificational determiners (e.g., *every*, *no*). We then have shown how the dynamic generalized quantifiers belonging to these three classes may be formalized using the continuation-based approach introduced in [5].

### *6.2.2. Dialogue Modeling*

Studying dialogical interactions is a major subject in natural language processing, since dialogues represent the basis of human communication. Addressing this problem requires relating approaches from fields such as semantics, pragmatics, and, more generally, logic, and cognition. We have presented a compositional dynamic model of questions and answers mechanisms in a dialogical setting. We address dialogical and lexical issues starting from the formal definitions of frame semantics given in [7]. We achieve compositionality and dynamicity in our model by constructing it on top of concepts inherited from Type Theoretical Dynamic Logic [5]. We introduce control in the common (accessible to all participants of a dialogue) context of a conversation by formulating the concept of dialogical context and elaborating corresponding storage

operations. We apply our model to real non-controlled examples of dialogical interactions provided by the Schizophrenia and Language, Analysis and Modeling corpus [29]. The linguistic analysis of dialogues between patients with schizophrenia and psychologists has revealed specific language-driven manifestations of cognitive dysfunction. This approach to dialogue modeling in a dynamic framework allowed us to develop tools to handle specifics of dialogical interactions on top of already existing methods for general discourse.

### 6.2.3. Discourse Structure

A text as a whole must exhibit some coherence that makes it more than just a bag of sentences. This coherence hinges on the discourse relations (DRs). The latter express the articulations between the different pieces of information of the text. There is still debate about the number and the nature of these DRs. Yet, typical DRs include `Contrast`, `Consequence`, or `Explanation`. Using a discourse connective (*because*, *instead*, *although*) is usually the most direct and reliable way to express a DR. These lexical items have specific syntactic, semantic, and pragmatic properties. In particular, one can often observe a mismatch between the arguments of a DR and the (syntactic) ones of the connective lexicalizing it. It happens in configurations in which the argument of the DR does not directly correspond to syntactic argument of the discourse marker. In (1), for instance, the second argument of the `Explanation` relation is not the whole conditional, its antecedent, nor its consequent. But it is the possibility of the conditional, paraphrasable by *she might miss her train*. The discourse argument is here presupposed by the conditional (i.e., the syntactic argument).

1. Mary is worried because if there is too much delay, she will miss her train.
2. John did not come to the party although Mary said he was already back in town.

Another common case occurs when an attitude verb (*think*, *believe*) or a verb of report (*say*, *tell*) is used evidentially as in (2). In such cases, the contrast expressed by the writer holds between *John did not come to the party* and *he was already back in town*. The main function of the evidential (*Mary said ...*) is to introduce the argument of a DR without being itself part of the discourse structure.

Whereas DRs have two arguments, some discourse markers, such as adverbial connectives (*so*, *otherwise*), have only one syntactic argument. It then seems natural to use an anaphoric mechanisms to describe how the other argument of the DR they lexicalise is determined from the context. We extended this idea to all connectives and showed how this view can explain most usual cases of mismatch. Additionally, considering that discourse arguments are implicit semantic objects akin to the events introduced in the Davidsonian theory, it is possible to implement this proposal in Type Theoretic Dynamic Logic, without the need of a syntactic parse above the sentence level, and in a strictly compositional way, using continuations.

## 6.3. Common Basic Resources

**Participants:** Maxime Amblard, Clément Beysson, Philippe de Groote, Bruno Guillaume, Guy Perrier, Sylvain Pogodalla, Nicolas Lefebvre.

### 6.3.1. Crowdsourcing Complex Language Resources

Using a Wikipedia corpus, we showed that participants in a game with a purpose can produce quality dependency syntax annotations [44]. In [15], we have been considering a more complex corpus of scientific language. We ran an experiment aiming at evaluating the production of the participants of the game, and compared it to a gold corpus, annotated and adjudicated by experts of the domain.

We also ran two surveys on ZombiLingo's players, in order to better understand who they are and what their motivations in playing the game are, and improve the participation in the game [14].

### 6.3.2. Universal Dependencies

We participated to the development of new versions of the French part of the Universal Dependencies project (UD, http://universaldependencies.org/). Version 2.0 [58] was released in March 2017. In this version, a new French corpus *UD_French-Sequoia* was added. We built this corpus with an automatic conversion (using the Grew software) from the data built in the Sequoia project.

Version 2.1 [24] was released in November 2017. The conversion process, using Grew, was applied to the FrenchTreebank corpus, and led to a new corpus in Universal Dependencies: *UD_French-FTB*. In version 2.1, we worked on the harmonization of the subset of French treebanks. The Grew software was used to explore, to check consistency, and to systematically correct the data.

The "enhanced dependencies" sketched in the UD 2.0 guidelines is a promising attempt in the direction of deep syntax, an abstraction of the surface syntax towards semantics. In [13] (collaboration with Marie Candito and Djamé Seddah), we proposed to go further and enrich the enhanced dependency scheme along two axes: extending the cases of recovered arguments of non-finite verbs, and neutralizing syntactic alternations. Doing so leads to both richer and more uniform structures, while remaining at the syntactic level, and thus rather neutral with respect to the type of semantic representation that can be further obtained. We implemented this proposal in two UD treebanks of French, using deterministic graph rewriting rules. Evaluation on a 200-sentence gold standard showed that deep syntactic graphs can be obtained from surface syntax annotations with a high accuracy. Among all semantic arguments of verbs in the gold standard, 13.91% are impacted by syntactic alternation normalization, and 18.93% are additional edges corresponding to deep syntactic relations.

In [16], we present a reflection on the annotation of written French corpora in syntax and semantics. This reflection is the result of work carried out on the SEQUOIA and the UD-FRENCH corpora.

#### *6.3.3. FR-Fracas*

There are two major levels of processing that are significant in the use of a computational semantic frameworks: semantic composition, for the construction of meanings, and inference, either to exploit those meanings, or to assist the determination of contextually sensitive aspects of meanings. FraCas is an inference test suite for evaluating the inferential competence of different NLP systems and semantic theories. Providing an implementation of the inference level was beyond the scope of FraCaS, but the test suite nevertheless provides an overview of a useful and theory- and system-independent semantic tool [37].

There currently exists a multilingual version of the resource for Farsi, German, Greek, and Mandarin. We started the translation into French. 10% of the resource has been translated so far as a testbed, in order to setup guidelines for the translations. We plan to complete the translation following these guidelines and use it as an experimental tool.

# 7. Partnerships and Cooperations

## 7.1. Regional Initiatives

### *7.1.1. SLAM*

**Participants:** Maxime Amblard [coordinator], Philippe de Groote, Sylvain Pogodalla.

Schizophrenia is well known among mental illnesses for the strength of the thought disorders it involves, and for their widespread and spectacular manifestations: from deviant social behavior to delusion, not to speak about affective and sensitive distortions. The SLAM project aims at exploring the specific manifestation of disorders in conversational speech. This is an interdisciplinary research, both empirical and theoretical, from several domains, namely psychology, philosophy, linguistic, and computer science.

After having built building a corpus of pathological uses of language [9], the first transcriptions of pathological interviews have been analyzed [8]. A processing chain was implemented for disfluences and part-of-speech. We have focused on implementing the treatment of lexicographical issues, and proposed an interface for SDRT-annotations. We also started to collect new data with new patients at the Centre Médical d'Aix-en-Provence, and to re-implement the SLAMtk tool.

The SLAM project was supported by the MSH–Lorraine, USR 3261, the region Grand Est, and the Université de Lorraine. We have organized the fourth workshop (In)Coherence of Discourse which gathered linguists, psychologists, and computer scientists in March 2017.

## 7.2. National Initiatives

### 7.2.1. DGLFLF (Délégation générale à la langue française et aux langues de France)

#### 7.2.1.1. PLURAL

**Participants:** Bruno Guillaume [coordinator], Nicolas Lefebvre.

The objective of the PLURAL project is to build linguistic resources with GWAPs (Game With A Purpose) for poorly endowed languages. Unlike other languages, poorly endowed languages lack of freely available raw corpora. The goal of the PLURAL project is to provide a web inferface to gather corpora in poorly endowed languages of France. First target languages are Alsacian and Guadeloupean creole. The main difficulty is to take into account orthographic diversity and regional diversity for these languages.

Partners of the PLURAL projet are: Université Paris-Sorbonne (Karën Fort, Alice Millour, André Thibault) and Université de Strasbourg (Delphine Bernhard).

Nicolas Lefebvre is engineer in the PLURAL project from October 2017 to March 2018.

## 7.3. International Initiatives

### 7.3.1. Inria International Partners

#### 7.3.1.1. Informal International Partners

Maxime Amblard have started discussing with the Centre for Linguistic Theory and Studies in Probability (CLASP, University of Gothenburg, Sweden), about computational treatments of dialogues of patients with schizophrenia. We have common issues about the management such corpora and about the modeling of such interactions. As for now, ongoing discussions have not yet been turned into a formal project.

## 7.4. International Research Visitors

### 7.4.1. Visits to International Teams

#### 7.4.1.1. Research Stays Abroad

Timothée Bernard visited New York University, USA, from September 1st to December 15th, 2017.

# 8. Dissemination

## 8.1. Promoting Scientific Activities

### 8.1.1. Scientific Events Organisation

#### 8.1.1.1. General Chair, Scientific Chair

- Maxime Amblard: General chair of (In)Coherence of Discourse 4, March 2017, Université de Lorraine.
- Bruno Guillaume: General chair of "Acor4French: les corpus annotés du français", workshop of the TALN conference.

### 8.1.2. Scientific Events Selection

#### 8.1.2.1. Chair of Conference Program Committees

- Philippe de Groote: co-chair of MoL 2017 *15th Meeting on the Mathematics of Language* [20].
- Sylvain Pogodalla: co-chair of FG 2017 *22nd Conference on Formal Grammar* [19].

#### 8.1.2.2. Reviewer

- Maxime Amblard: (In)Coherence of Discourse 4, ACL2017, TALN 17, traitement automatique des langues, and RECITAL17 Rencontre des Étudiants Chercheurs en Informatique pour le Traitement Automatique des Langues, journée EGC-IA.
- Philippe de Groote: (In)Coherence of Discourse 4, MoL 2017, FG 2017, IWCS 2017.
- Bruno Guillaume: ACL2017, LREC2018.
- Sylvain Pogodalla: (In)Coherence of Discourse 4, TAG+13 *13th International Workshop on Tree Adjoining Grammars and Related Formalisms*.

### *8.1.3. Journal*

*8.1.3.1. Member of Editorial Boards*

- Maxime Amblard: Member of the editorial board of the journal *Traitement Automatique des Langues*, in charge of the final editing process.
- Philippe de Groote: area editor of the *FoLLI-LNCS series*; associate editor of *Higher-Order and Symbolic Computation*; member of the editorial board of *Cahiers du Centre de Logique*.
- Sylvain Pogodalla: Member of the editorial board of the journal *Traitement Automatique des Langues*, in charge of the *Résumés de thèses* section.

*8.1.3.2. Reviewer - Reviewing Activities*

- Maxime Amblard: Journal of Language, Logic and Information, *Traitement Automatique des Langues*.
- Philippe de Groote: Journal of Language, Logic and Information, Logical Methods in Computer Science.
- Sylvain Pogodalla: Journal of Language, Logic and Information, Mathematical Structures in Computer Science, *Traitement Automatique des Langues*;

### *8.1.4. Invited Talks*

- Maxime Amblard:
  - A Formal Account of Disorders in Dialogues, CLASP seminar, November 2017, University of Gothenburg, Sweden [8].
  - Table ronde "TAL et médical", TALN 2017, June 2017, Orléans.
  - Le discours des schizophrènes par la formalisation langagière, interpréter les troubles de la pensée par les troubles du langage, Séminaire C2S, June 2017, Université de Reims [9].
  - Modélisation sémantique de la langue, une mise en pratique, séminaire SIESTE, computer science department, ENS Lyon, March 2017, Lyon [22].
- Timothée Bernard:
  - A Montagovian semantics for discourse connectives, NYU Semantics Group, October 2017, New York, USA.
  - Negative events, joint work with Lucas Champollion, NYU Semantics Group, December 2017, New York, USA.
- Sylvain Pogodalla: Tutorial at FSMNLP 2017 & TAG+13 [26], Umeå, Sweden, September 2017.
- Guy Perrier: invited talk in the seminar of the TEXTE team (LIRMM, Montpellier), March 2017.

### *8.1.5. Leadership within the Scientific Community*

- Philippe de Groote: president of SIGMOL, *Association for Mathematics of Language, a Special Interest Group of the Association for Computational Linguistics*; member of the LACL steering committee.
- Bruno Guillaume: Management Committee Substitute of the COST Action CA16105 "European Network for Combining Language Learning with Crowdsourcing Techniques" (http://www.cost.eu/COST_Actions/ca/CA16105).

- Sylvain Pogodalla: member of the LACL steering committee; member of the Formal Grammar standing committee.

### 8.1.6. Scientific Expertise

- Philippe de Groote: member of the scientific council of the LIRMM, *Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier*; member of the scientific council of the AREN e-FRAN project, *ARgumentation Et Numérique*.
- Sylvain Pogodalla: external reviewer for CIMI LabEx, expert for the Research Executive Agency (REA) of the EU.
- Guy Perrier: external rapporteur on the scientific activity of Prof François Lareau (Université de Montréal, Canada) for his promotion as "professeur agrégé".

### 8.1.7. Research Administration

- Maxime Amblard:
  - Member of *conseil scientifique de l'Université de Lorraine*.
  - Standing invitee at the "pôle scientifique" AM2I of Université de Lorraine.
  - Member of the standing committee of the *conseil de laboratoire du Loria*.
  - Member of the board of the *Maison des sciences de l'homme, MSH-Lorraine*.
  - Head of the master (M2) in Natural Language Processing.
  - In charge of the proposal of a new master in NLP.
  - Member of the McF selection committee 4373 (section 7 and 27), Université Paris Sorbonne.
- Philippe de Groote:
  - Member of the *bureau du comité des projets d'Inria Nancy – Grand Est*.
- Bruno Guillaume:
  - Head of the Loria department NLPKD (Natural Language Processing and Kownledge Discovery).
  - Animator of the CPER 2015-2020 project *Langues, Connaissances et Humanités Numériques'* (Languages, Knowledge and Digital Humanities) in which ten laboratories of the *Université de Lorraine* are implied.
  - Member of the Comipers (Inria committee for PhD and Post-doctoral selection).

## 8.2. Teaching - Supervision - Juries

### 8.2.1. Teaching

Licence:

Maxime Amblard, Ingénierie de la langue, 25h, L3, Université de Lorraine, France.

Maxime Amblard, Panorama du TAL, 2h, L1, Université de Lorraine, France.

Timothée Bernard, Algorithmique (TD), 24h, L3, Université Paris Diderot – Paris 7, France.

Clement Beysson, C2I, 18h, L1, Université de Lorraine, France.

Clement Beysson, Linguistique, 14h, L2, Université de Lorraine, France.

Clement Beysson, Représentation Avancé de Donnée, 25h, L2, Université de Lorraine, France.

Clement Beysson, Ingénierie de la langue, 10h, L3, Université de Lorraine, France.

Pierre Ludmann, TD Tronc Commun d'Informatique I, 20h, 1st year Formation Ingénieur Civil, Mines Nancy, France.

Master:

Maxime Amblard, Formalisms: from Syntax to Discourse (english), 50h, M2, Université de Lorraine, France.
Maxime Amblard, Research methodology (english), 10h, M2, Université de Lorraine, France.
Maxime Amblard, Remise à niveau TAL (english), 4h, M2, Université de Lorraine, France.
Maxime Amblard, initiation au TAL, 30h, M1, Université de Lorraine, France.
Maxime Amblard, Programming for NLP (english), 44h, M1, Université de Lorraine, France.
Philippe de Groote, Formal logic, 35h, M2, Université de Lorraine, France.
Philippe de Groote, Computational structures and logics for natural language modeling, 18h, M2, Université Paris Diderot – Paris 7, France.
Bruno Guillaume, Remise à niveau TAL (english), 9h, M2, Université de Lorraine, France.
Bruno Guillaume, Linguistic Resources TAL (english), 15h, M2, Université de Lorraine, France.
Sylvain Pogodalla, Formal Languages, 24h, M2, Université de Lorraine, France.

### *8.2.2. Supervision*

PhD in progress:

Clement Beysson, *Quantificateurs généralisés dynamiques pour l'analyse discursive*, since September 2015, Philippe de Groote and Bruno Guillaume.
Maria Boritchev, *Dialogue Dynamics Modeling in the Simple Theory of Types*, since September 2017, Maxime Amblard and Philippe de Groote.
Pierre Ludmann, *Construction dynamique des structures discursives*, since September 2017, Philippe de Groote and Sylvain Pogodalla.

### *8.2.3. Juries*

Maxime Amblard was member of the jury of the master thesis of the master NLP (6 students).
Sylvain Pogodalla was member of the jury of the PhD thesis of Rapaël Salmon, *Natural Language Generation Using Abstract Categorial Grammars* July 10, 2017, Paris Diderot – Paris 7 University.
Sylvain Pogodalla was member of the jury of the *Prix de la thèse 2017* of the *Association pour le Traitement automatique des Langues (ATALA)*.

## 8.3. Popularization

- Maxime Amblard:
  - Vice head of the editorial board of interstices )i(, a French magazine popularizing computer sciences.
  - Several publication about algorithms, AI and NLP for interstices )i(.
  - Winner of a Blaise Pascal Foundation grant for a project to create a happy families game (*jeu des sept familles*) based on computer science sub-fields and scientists.
- Bruno Guillaume: interviewed by the large audience scientific newspaper *Sciences & Avenir* (January 2017) for the article *Pour aidez la recherche, jouez !*

# 9. Bibliography

## Major publications by the team in recent years

[1] G. BONFANTE, B. GUILLAUME, M. MOREY, G. PERRIER. *Modular Graph Rewriting to Compute Semantics*, in "9th International Conference on Computational Semantics - IWCS 2011", Oxford, Royaume-Uni, J. BOS, S. PULMAN (editors), January 2011, pp. 65–74, http://hal.inria.fr/inria-00579244/en/

[2] B. GUILLAUME, G. PERRIER. *Dependency Parsing with Graph Rewriting*, in "IWPT 2015, 14th International Conference on Parsing Technologies", Bilbao, Spain, 14th International Conference on Parsing Technologies - Proceedings of the Conference, 2015, pp. 30-39, https://hal.inria.fr/hal-01188694

[3] L. KALLMEYER, R. OSSWALD, S. POGODALLA. *Quantification in Frame Semantics with Binders and Nominals of Hybrid Logic*, in "Journal of Language Modelling", 2017, vol. 5, n° 2 [*DOI :* 10.15398/JLM.V5I2.147], https://hal.inria.fr/hal-01417853

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# Publications of the year

## Articles in International Peer-Reviewed Journals

[7] L. KALLMEYER, R. OSSWALD, S. POGODALLA. *Quantification in Frame Semantics with Binders and Nominals of Hybrid Logic*, in "Journal of Language Modelling", 2017, vol. 5, n° 2 [*DOI :* 10.15398/JLM.V5I2.147], https://hal.inria.fr/hal-01417853

## Invited Conferences

[8] M. AMBLARD. *A Formal Account of Disorders in Dialogues*, in "CLASP seminar", Gothenburg, Sweden, November 2017, pp. 1-158, https://hal.inria.fr/hal-01655817

[9] M. AMBLARD. *Le discours des schizophrènes par la formalisation langagière, interpréter les troubles de la pensée par les troubles du langages*, in "2017 - Séminaire C2S", Reims, France, June 2017, pp. 1-109, https://hal.inria.fr/hal-01655828

[10] M. BORITCHEV. *On Politics and Argumentation*, in "MALOTEC", Nancy, France, March 2017, https://hal.archives-ouvertes.fr/hal-01666416

## International Conferences with Proceedings

[11] T. BERNARD. *Factuality information as sets of probabilities*, in "24ème conférence sur le Traitement Automatique des Langues Naturelles", Orléans, France, articles courts, June 2017, vol. 2, https://hal.inria.fr/hal-01560547

[12] C. BEYSSON. *Determiners and dynamic generalised quantifiers*, in "TALN 2017 - Traitement Automatique des Langues Naturelles", Orléans, France, H. FLAMEIN, Y. PARMENTIER (editors), June 2017, pp. 81-93, https://hal.archives-ouvertes.fr/hal-01651749

[13] M. CANDITO, B. GUILLAUME, G. PERRIER, D. SEDDAH. *Enhanced UD Dependencies with Neutralized Diathesis Alternation*, in "Depling 2017 - Fourth International Conference on Dependency Linguistics", Pisa, Italy, September 2017, https://hal.inria.fr/hal-01625466

[14] K. FORT, B. GUILLAUME, N. LEFÈBVRE. *Who wants to play Zombie? A survey of the players on ZOMBILINGO*, in "Games4NLP 2017 - Using Games and Gamification for Natural Language Processing", Valencia, Spain, Symposium Games4NLP, April 2017, 2 p. , https://hal.inria.fr/hal-01494043

### National Conferences with Proceedings

[15] K. FORT, B. GUILLAUME, N. LEFÈBVRE, L. RAMÍREZ, M. REGNAULT, M. COLLINS, O. GAVRILOVA, T. KRISTANTI. *Towards (more) complex corpora annotation using a game with a purpose : the case of scientific language*, in "Traitement Automatique des Langues Naturelles (TALN)", Orléans, France, June 2017, https://hal.archives-ouvertes.fr/hal-01583863

[16] B. GUILLAUME, G. PERRIER. *Re´flexion sur l'annotation de corpus e´crits du français en syntaxe et en se´mantique*, in "ACor4French – Les corpus annotés du français", Orléans, France, June 2017, pp. 1-8, https://hal.inria.fr/hal-01651753

### Conferences without Proceedings

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[18] M. AMBLARD, M. MUSIOL, M. REBUSCHI, M.-H. PIERRE, S. JOKULSSON (editors). *(In)Coherence of discourse 4*, Published by the authors, March 2017, pp. 1-19, https://hal.inria.fr/hal-01655957

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[20] M. KANAZAWA, P. DE GROOTE, M. SADRZADEH (editors). *MOL 2017, the 15th Meeting on the Mathematics of Language: Proceedings of the conference*, Association for Computational Linguistics, London, United Kingdom, 2017, https://hal.inria.fr/hal-01654605

### Scientific Popularization

[21] M. AMBLARD. *Regard sur « Le temps des algorithmes »*, in "Interstices", January 2017, https://hal.inria.fr/hal-01466800

[22] M. AMBLARD. *Modélisation sémantique de la langue, une mise en pratique*, in "SIESTE 2017 - Séminaire d'Informatique pour les Etudiants, Scientifiques, et Tous ceux que l'informatique intéresse à l'ENS Lyon", Lyon, France, February 2017, pp. 1-77, https://hal.inria.fr/hal-01655840

[23] M. BORITCHEV. *Grande L3 deviendra mini-chercheuse*, in "Séminaire SIESTE", Lyon, France, February 2017, https://hal.archives-ouvertes.fr/hal-01666417

### Other Publications

[24] H. LEUNG, C. Y. LI, J. LI, K. LI, N. LJUBEŠIĆ, O. LOGINOVA, O. LYASHEVSKAYA, T. LYNN, V. MACKETANZ, A. MAKAZHANOV, M. MANDL, C. MANNING, C. MĂRĂNDUC, D. MAREČEK, K. MARHEINECKE, H. MARTÍNEZ ALONSO, A. MARTINS, J. MAŠEK, Y. MATSUMOTO, R. MCDONALD, G. MENDONÇA, N. MIEKKA, A. MISSILÄ, C. MITITELU, Y. MIYAO, S. MONTEMAGNI, A. MORE, L. MORENO ROMERO, S. MORI, B. MOSKALEVSKYI, K. MUISCHNEK, K. MÜÜRISEP, P. NAINWANI, A. NEDOLUZHKO, G. NEŠPORE-BĒRZKALNE, L. NGUYỄN THỊ, H. NGUYỄN THỊ MINH, V. NIKOLAEV, H. NURMI, S. OJALA, P. OSENOVA, R. ÖSTLING, L. ØVRELID, E. PASCUAL, M. PASSAROTTI, C. PEREZ, G. PERRIER, S. PETROV, J. PIITULAINEN, E. PITLER, B. PLANK, M. POPEL, L. PRETKALNIŅA, P. PROKOPIDIS, T. PUOLAKAINEN, S. PYYSALO, A. RADEMAKER, L. RAMASAMY, T. RAMA, V. RAVISHANKAR, L. REAL, S. REDDY, G. REHM, L. RINALDI, L. RITUMA, M. ROMANENKO, R. ROSA, D. ROVATI, B. SAGOT, S. SALEH, T. SAMARDŽIĆ, M. SANGUINETTI, B. SAULĪTE, S. SCHUSTER, D. SEDDAH, W. SEEKER, M. SERAJI, M. SHEN, A. SHIMADA, D. SICHINAVA, N. SILVEIRA, M. SIMI, R. SIMIONESCU, K. SIMKÓ, M. ŠIMKOVÁ, K. SIMOV, A. SMITH, A. STELLA, M. STRAKA, J. STRNADOVÁ, A. SUHR, U. SULUBACAK, Z. SZÁNTÓ, D. TAJI, T. TANAKA, T. TROSTERUD, A. TRUKHINA, R. TSARFATY, F. TYERS, S. UEMATSU, Z. UREŠOVÁ, L. URIA, H. USZKOREIT, S. VAJJALA, D. V. NIEKERK, G. V. NOORD, V. VARGA, E. VILLEMONTE DE LA CLERGERIE, V. VINCZE, L. WALLIN, J. N. WASHINGTON, M. WIRÉN, T. WONG, Z. YU, Z. ŽABOKRTSKÝ, A. ZELDES, D. ZEMAN, H. ZHU, J. NIVRE, Ž. AGIĆ, L. AHRENBERG, L. ANTONSEN, M. J. ARANZABE, M. ASAHARA, L. ATEYAH, M. ATTIA, A. ATUTXA, L. AUGUSTINUS, E. BADMAEVA, M. BALLESTEROS, E. BANERJEE, S. BANK, V. BARBU MITITELU, J. BAUER, K. BENGOETXEA, R. A. BHAT, E. BICK, V. BOBICEV, C. BÖRSTELL, C. BOSCO, G. BOUMA, S. BOWMAN, A. BURCHARDT, M. CANDITO, G. CARON, G. CEBIROĞLU ERYIĞIT, G. G. A. CELANO, S. CETIN, F. CHALUB, J. CHOI, S. CINKOVÁ, Ç. ÇÖLTEKIN, M. CONNOR, E. DAVIDSON, M. DE MARNEFFE, V. DE PAIVA, A. DIAZ DE ILARRAZA, P. DIRIX, K. DOBROVOLJC, T. DOZAT, K. DROGANOVA, P. DWIVEDI, M. ELI, A. ELKAHKY, T. ERJAVEC, R. FARKAS, H. FERNANDEZ ALCALDE, J. FOSTER, C. FREITAS, K. GAJDOŠOVÁ, D. GALBRAITH, M. GARCIA, M. GÄRDENFORS, K. GERDES, F. GINTER, I. GOENAGA, K. GOJENOLA, M. GÖKIRMAK, Y. GOLDBERG, X. GÓMEZ GUINOVART, B. GONZÁLES SAAVEDRA, M. GRIONI, N. GRŪZĪTIS, B. GUILLAUME, N. HABASH, J. HAJIČ, J. HAJIČ JR., L. HÀ MỸ, K. HARRIS, D. HAUG, B. HLADKÁ, J. HLAVÁČOVÁ, F. HOCIUNG, P. HOHLE, R. ION, E. IRIMIA, T. JELÍNEK, A. JOHANNSEN, F. JØRGENSEN, H. KAŞIKARA, H. KANAYAMA, J. KANERVA, T. KAYADELEN, V. KETTNEROVÁ, J. KIRCHNER, N. KOTSYBA, S. KREK, V. LAIPPALA, L. LAMBERTINO, T. LANDO, J. LEE, P. LÊ HỒNG, A. LENCI, S. LERTPRADIT. *Universal Dependencies 2.1*, 2017, LINDAT/CLARIN digital library at the Institute of Formal and Applied Linguistics (ÚFAL), Faculty of Mathematics and Physics, Charles University - Corpus - Project code: 15-10472S; Project name: Morphologically and Syntactically Annotated Corpora of Many Languages, https://hal.inria.fr/hal-01671887

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