# PPS Activity Report 2007-2012

Laboratoire Preuves, Programmes, Systèmes, UMR 7126
Université Paris Diderot and CNRS

March 1, 2013

## Contents

# 1 General presentation, objectives and results

The laboratory *Preuves, Programmes et Systèmes (PPS)* was created as a joint CNRS and Université Paris Diderot research group in 1999. Its ambition was to gather people from two different cultures: computer scientists coming mainly from the *Laboratoire d'Informatique de l'École Normale Supérieure* (ENS Ulm) and logicians coming mainly from the *Équipe de Logique* (Université Paris 7, now Université Paris Diderot). This scientific enterprise, initiated by Pierre-Louis Curien, was driven by a common interest and passion for a better understanding of the mathematical foundations of program and proof construction. Indeed, one of the main unifying paradigms underlying this project is the *Curry-Howard correspondence* which reveals an isomorphism between computer programs and mathematical proofs.

Since those early days, the PPS lab has grown, exponentially at the beginning and more quietly later, naturally enlarging its scientific interests and applicative ambitions. Despite this extended span of interest, the PPS lab has preserved a unified point of view and a common interest in understanding the structure of *programming* in the large. For this purpose, we use concepts and tools coming from theoretical computer science and mathematical logic of course, but also from other mathematical theories such as category theory, algebraic topology, probability theory and functional analysis. Our goal is not only to *use* these theories in our research; we also want to *develop* a new object of study for mathematicians. In that respect, we believe that Computer Science should play, wrt. Mathematics, the same role as Physics has since the 19th century. This is why we insist on maintaining strong institutional relations with mathematicians, and Université Paris Diderot is a perfect institution for hosting such interdisciplinary efforts. At the same time, the PPS lab promotes a unified view of Computer Science, where theory is nurtured by practice and conversely. This is why we are keen to encourage within the lab an experimental approach oriented towards the modelization of complex phenomena like those occurring in implementations of concurrency, computer networking, large software distributions and biological systems.

This integrated approach to Computer Science also justifies the choice of an informal and open organisation of the PPS lab which facilitates internal communication and thematic mobility (see Section 1.3). After internal discussions, we decided to organise this activity report and the associated research project along three federating themes:

- *proofs and types*
- *mathematical foundations of programming*
- *system modeling, analysis and design*

which reflect the current scientific structure of the PPS lab.

## 1.1 Themes

**Proofs and types.** The Curry-Howard (CH) correspondence is one of the main methodological guidelines of the PPS lab[1]. It works at the three levels of programming languages, since it relates (1) types to logical formulae (2) programs to proofs and (3) program execution to cut-elimination. Initially limited to functional programming languages and intuitionistic logic, this correspondence has been considerably extended since its discovery in the 1970s. Most notably, it was extended to Classical Logic by T. Griffin in the early 90's. This extension of the CH correspondence was a huge surprise because general cut-elimination in the Gentzen classical sequent calculus is non-deterministic and induces a trivial equivalence relation on proofs: all proofs of the same formula are identified. Strikingly this extension of CH is based on a previously existing construct of the scheme programming language: the *call with current continuation* effect. A careful analysis led to the discovery that the computational meaning of classical logic relies in fact on a fundamental *duality* between programs and environments. This discovery is important, because it provides a properly logical account of evaluation strategies in the $\lambda$-calculus and in its classical extensions – *call by name* versus *call by value* in particular – as well as a logical understanding of advanced programming effects like *delimited control*. This unexpected success also motivates the study, from

[1] An important proportion of the research presented in the *Proofs and Types* and *Mathematical foundations of programming* themes is supported by the ANR *blanc* project RECRE http://recre.ens-lyon.fr/.

a logical point of view, of other extensions of the lambda-calculus *e.g.* with *patterns* or with *explicit substitutions* — motivated by programming practice — which are now very well understood from the operational point of view, and admit clean syntactical presentations.

This duality between programs and environments was observed for the first time in Linear Logic (LL) where it is expressed through the notion of *polarity* on formulae, and polarity-based restrictions on the use of the structural rules. This dual point of view enables a reduction of the proof-search space by *focalizing* proofs, that is, by gathering the rules of a derivation tree into clusters of the same polarity. This combinatorial idea is the starting point of *ludics*, an interactive presentation of logic deeply related to game semantics. In that way, LL provides a nice unifying framework, which combines an elegant categorical semantics with an asynchronous representation of proofs (*proof-nets* and *interaction nets*) supported by a purely algebraic description of resources investigated by *differential linear logic*.

Our foundational advances would not have been possible without a strong involvement of the PPS lab in the current practice of typed programming languages. Types are particularly important in programming because they guarantee a correct execution and a sound control of resources. The development of more expressive type systems including polymorphism, subtyping and intersection types is thus a requisite in order to manipulate more safely the complex tree-like structures of XML, as done in the CDuce programming language. Great care has been also devoted to the development of region calculi for multi-threaded programs with effects, and to complexity-bounded programming languages, both using ideas coming from LL.

The PPS lab has also benefited from the creation of the INRIA team pi.r2, this integrating the development and the maintenance of the Coq proof assistant as a major activity of the lab. Coq provides a sophisticated environment (including tactics) for writing mathematical proofs and certifying software properties. As a language, Coq is a higher order extension of Martin-Löf Type Theory extended with inductive and co-inductive types. It comes equipped with a rich collection of libraries implementing various mathematical theories. It has many applications in mathematical proof formalization of course (*e.g.* the *Four Colors Theorem* formalized in Coq by Gonthier and Werner) but also in program certification (Leroy's C-minor compiler certified in Coq). The PPS lab is also involved in the construction of certified compilers, providing certified bounds on the complexity of the generated low-level code.

Recently, proof formalisms generalizing the sequent calculus by allowing rules to be applied anywhere in formulae — and not only at the outermost level — have been introduced under the generic name of *deep inference*. These systems have a strong categorical flavour and allow the representation of logical rules which are out of the scope of the more standard sequent calculus, natural deduction and proof net formalisms. There, the main issue is to understand cut-elimination and to relate these formalisms with more usual proof representations.

**Mathematical foundations of programming.** The starting point of denotational semantics is the discovery that $\lambda$-terms can be seen as proofs (through the CH correspondence) and at the same time as (continuous, stable...) functions between the relevant spaces. The observation that they may be also represented as linear or analytic maps between topological vector spaces opened the study of their differential calculus, leading to differential linear logic (DiLL) and a generalized Taylor expansion formula. These topological models are based on a new understanding of the relationship between topology and computation, distinct from the traditional domain-theoretic view discovered by Scott. In particular, they rely on the fundamental duality between bounded and open subsets of functional analysis. These ideas provide firmer foundations for *resource* sensitive extensions

of the $\lambda$-calculus introduced in the 1990's after Milner's $\pi$-calculus. They enable to improve the syntax of these calculi, to clarify their operational semantics and to develop an analytic approach to termination. In this way, they offer a major bridge between syntax and semantics, suggesting moreover new developments towards probabilistic models.

This cross-fertilization between semantics and syntax is a distinctive feature of the scientific methodology of the PPS lab. It is also illustrated by the introduction of *tensorial logic*, a refinement of LL where linear negation is not involutive, motivated by a careful analysis of game semantics, where proofs and programs are interpreted as interactive strategies playing on dialogue games. Tensorial logic provides a type-theoretic foundation to game semantics, and enables to see strategies as tensorial proof-nets formulated in the algebraic language of string diagrams.

These investigations at the interface of syntax and semantics are also justified by our desire to understand the algebraic structure hidden in Jean-Louis Krivine's *classical realizability*. This classical version of Kleene realizability offers a fundamental bridge between programming languages and Cohen forcing. In particular, it enables to construct a model of Zermelo-Fraenkel set theory from any functional language extended with imperative features. In this framework, every formula becomes the specification of untyped imperative programs formulated in a completely independent fashion. In particular, and quite surprisingly, it appears that well-known axioms of set theory (like the axiom of dependent choice or the continuum hypothesis) specify existing imperative effects like memory access or the `quote` command of `scheme`. A central purpose and achievement of classical realizability is to characterize the various realizers of a given formula (typically an axiom) by exhibiting their common operational behaviour.

Rewriting theory is another key component of our toolbox in the mathematical investigation of computations. Whereas denotational and game semantics describe the potential interactions of a program with its environment, rewriting treats programs as intrinsically dynamic objects. From this point of view, the main issues are termination (or, more generally, responsivity) and confluence. Logical tools such as reducibility (a variant of realizability) are essential for dealing with termination. One main conceptual step concerning confluence has been the discovery of a deep relationship with the so-called coherence theorems established in higher dimensional algebra. This new geometric understanding of confluence as the first step (dimension 1) of a higher-dimensional ladder also including standardization (dimension 2) leads to the general question of adapting well-known techniques of rewriting theory (like the Knuth-Bendix completion or termination orders) to handle these higher-dimensional rewriting systems. This question also opens promising connections with mainstream mathematics, this including homotopy (around Quillen categories), homology (around the Squier Theorem) and computational algebra (around Gröbner bases).

We believe that these geometric tools related to homotopy theory will play an increasing and unifying role in the future of programming languages and more generally, computational systems. They already appear as a fundamental tool in the study of concurrent and distributed processes. The idea is to consider critical sections (typically coming from locks on shared resources) as geometric obstructions, leading to non-trivial homotopy invariants of the associated computational space. Quite surprisingly, homotopy theory also appears in Martin-Löf Type Theory, as noticed in the 1990s by Hoffman and Streicher. This pioneering observation followed by Voedvodsky's impulse has been the starting point of a very active line of research on the homotopic structure of equality types in the proof assistant Coq, and of a debate on the status of the *univalence axiom* when confronted to proof-irrelevance. Finally, homotopy theory gave rise to *operads* like $A_\infty$-spaces which describe algebraic structures up to topological deformation. It appears that the operadic framework

is tightly connected to the notion of *monad* used in programming languages like Haskell for dealing with effects and non-functional system calls. In particular, they provide purely combinatorial description of well-known effects like memory calls or exceptions. These algebraic and topological investigations developed in the PPS lab reinforce our interactions with the mathematicians of Université Paris Diderot (IMJ).

**Modeling, analyzing and conceiving systems.** Although programming languages were originally designed in order to implement algorithms, they also provide a powerful tool to model computationally complex situations. This is a key feature of Milner's $\pi$-calculus, which is designed as a foundational concurrent programming language, and at the same time as a process algebra reflecting the temporal and resource conflicts between distributed agents. The study of these process calculi is a fundamental activity of the PPS lab, and comes with various purposes, like the design of synchronous versions of the $\pi$-calculus, or the type-theoretic accounts of interactions based on session types.

However, these process calculi should be refined in order to describe properly and efficiently biochemical systems like cellular signaling pathways. The $\kappa$-calculus was introduced in that purpose: its local and reversible representation of interactions enables to model these chemical systems and to simulate them, typically using formal methods like *abstract interpretation* in order to improve modularity and efficiency. The concrete case studies have led to interesting and new theoretical questions related to Winskel's description of causality cascades using *event structures*. In particular, causality is related to reversibility, a concept which plays a central role in biochemistry, and should become a basic ingredient of concurrent and distributed programming languages, integrated as a semantically valid undo primitive.

Many modeling situations like biochemical systems are of an intrisically stochastic nature. The PPS lab is thus involved in a long-term mathematical investigation of new probabilistic and concurrent models of computation, offering an appealing unification of event structures and Markov chains. An important outcome of the approach is the emergence of rigorous limit theorems in concurrency theory.

The development of formal tools in the PPS lab is also propelled by the project of analyzing complex situations encountered in the context of large software distributions. The main difficulty is that these distributions consist of a huge number of small components developed by a crowd of independent programmers — this is mostly true of the *open source* systems in which the PPS lab is involved — with complex dependency and incompatibility relations between them. When a whole system, or even a simple package, is installed on an actual computer, it is of course essential to take into account these dependencies and incompatibilities. This crucial analysis is computationally complex and requires clever data structures and efficient algorithms.

As a research lab devoted to programming languages, the PPS lab integrates the design and use of domain-specific programming languages (typically extending C or Ocaml) as one of its main activities. Concurrent programming is a particularly important field since most operating systems are concurrent and difficult to program and to debug. The programming concept of *thread* offers a very pleasant and comfortable framework but notoriously difficult to compile. The CPC translator was designed to turn thread-based programs into programs which use event-loops — much more difficult to write directly without mistakes, but much easier to compile. This technological achievement is based on a continuation passing style translation, derived from Gödel's translation of classical logic in intuitionistic logic. The PPS lab is also involved in the design and implementa-

tion of the Ocsigen web server, together with the Eliom web programming environment[2]. Together, they allow to combine the best of traditional and persistent applications, allowing to write them in a classical declarative way and offering the power of the Ocaml type system to enforce many properties at compile time. A striking benefit of the language is to ensure that Javascript APIs are correctly used, that database accesses are safe, that links go to existing services with the right parameters. These achievements rely on an efficient implementation of light threads also performed in the PPS lab, and integrated in the Ocaml Lwt library.

### 1.2 Milestones

The period under examination has been marked by several important events for the PPS lab. Some of them have deeply modified the structure of the laboratory.

**Creation of the pi.r2 team.** pi.r2 is an INRIA - Université Paris Diderot - CNRS EPC (*équipe-projet commune*) created in 2008. It originates from a long term scientific collaboration between Pierre-Louis Curien (CNRS, creator, former director and member of PPS) and Hugo Herbelin (INRIA). Their common interest in classical extensions of the $\lambda$-calculus and in sequent-based calculi is at the origin of one of the scientific themes of pi.r2. Hugo Herbelin is also one of the main architects of the Coq proof assistant, and Pierre Letouzey, a member of the PPS lab since 2005, was already very active in the development of Coq and so it was natural to include this activity in the scientific themes of the new pi.r2 team. pi.r2 is now the leading group for the development and maintenance of Coq, reinforced by the recruitment of Matthieu Sozeau (INRIA) in 2010. Of course, all the scientific activities of pi.r2 are deeply related with those of the rest of PPS.

The pi.r2 team is hosted by INRIA, in its building located *avenue d'Italie*. Scientific interactions between these two geographically separated parts of the PPS lab have been reinforced by the creation of a common working group on type theory and realizability. When the PPS lab will move to the *Sophie Germain* building at the beginning of 2013, the pi.r2 group will also move there, thus joining the rest of the lab.

**Creation of IRILL.** *Open source* is an increasingly significant model of software development which has many specificities and advantages. It opens markets which were closed and captured by a few companies. It allows software users and producers to have complete control of, and to trust, the tools they use, because they have free access to the source code. Moreover, open source has a social and political significance and impact since this software becomes a common heritage of all of society instead of private goods. Open source software is also a source of new fascinating scientific questions and educational challenges. In order to address these issues, and after an already rich experience in research on open source acquired in the EDOS and MANCOOSI European projects, Roberto Di Cosmo (PPS) decided to promote the creation of a new research structure devoted to this topic. His efforts have been crowned with success in 2010, with the official inauguration of the *Initiative de Recherche et d'Innovation sur le Logiciel Libre* (IRILL), a joint INRIA, Université Paris Diderot and Université Pierre et Marie Curie structure. IRILL is not an autonomous research group; its purpose is to host visitors, organize meetings and seminars and to stimulate the cooperation between private companies and academic research groups; accordingly,

[2] Ocsigen is now used by several companies, like BeSport or MetaWeb (both in San Francisco), Li-Cor (Lincoln, Nebraska), Hypios (Paris), etc. Several startups are currently being created using the framework. Of course, the web site of the PPS lab is hosted by an Ocsigen server.

IRILL has permanent contacts with the SYSTEMATIC Paris Région competitivity pole, through its *groupe thématique sur le logiciel libre* (GTLL).

**Creation of the INFINIS international laboratory.** The long-term scientific cooperation[3] between France and Argentina in Computer Science led to the creation of the International Laboratory (LIA) INFINIS, at the end of 2011. This creation is the result of the constant efforts of Delia Kesner (PPS) for pursuing this project over the last five years. She shares with Sergio Yovine (CONICET) the directorship of this LIA in which Université Paris Diderot and CNRS in particular are involved and which will be an efficient tool for enforcing our already rich scientific interactions with South America.

**Creation of the Labex Sciences Mathématiques de Paris.** Since its creation, the PPS lab has been an active member of the FSMP (*Fondations Sciences Mathématiques de Paris*), an RTRA (*Réseau Thématique de Recherche Avancée*) which gathers all mathematics labs of Paris *intra muros* as well as the PPS lab and the LIAFA. The PPS lab was actually one of the founding members of this RTRA in 2005, and Pierre-Louis Curien has been one of its co-directors until the creation of the Labex. In 2008, the FSMP decided to apply to the competition launched by the Ministery of Research for the *Laboratoires d'Excellences* (Labex), whose pupose was to gather high level research teams around well defined scientific goals and projects. During the preparation of this application, we insisted on the importance of Computer Science among Mathematical Sciences and on its specificities. This led to the inclusion of the *Laboratoire d'Informatique de l'École Normale Supérieure* (LIENS) in the Labex *Sciences Mathématiques de Paris* which won the competition in 2010, and to a number of programmes devoted to Computer Science in this Labex.

The FSMP has developed many innovative programmes which have reinforced the international visibility of the Mathematics and Fundamental Computer Science departements of Paris. Among them, we can outline a post-doc program from which the PPS lab has regularly benefited, and the Paris Graduate School program whose purpose is to attract top students to our Masters and PhDs.

**Creation of two startup companies.** Balat is currently creating a startup OCSIGEN Lab for developing Web applications with Ocsigen and helping Ocsigen based projects to emerge. This project is candidate for the *concours national de création d'entreprise - Oséo (catégorie "émergence")*. It is supported by INRIA and IT Translation and is candidate for being supported by the SATT[4] Île de France Innov. Balat is also part with Vouillon (PPS) and Pierre-Laurent Jouannet (Teikhos) of a project for creating a company for file synchronization, based on the Unison file synchronizer and the Ocsigen framework. This project is candidate for the *concours national de création d'entreprise - Oséo" (catégorie "création développement")*.

**Preparing our move to the new building Sophie Germain.** Since its creation, a major concern for the PPS lab has been its constant lack of physical space. Located in a building *Rue du Chevaleret* which is not managed by Université Paris Diderot, the laboratory has had to reconfigure various times since its arrival in 2000. In particular a major internal reorganization of the offices of the PPS lab has been performed in 2010 after the departure of the mathematicians affiliated to Université Pierre et Marie Curie. New buildings have been constructed by Université Paris Diderot located on its campus in the *Paris Rive Gauche* area, close to *Bibliothèque François Mitterrand*. At

[3]Concerning PPS, this cooperation took place in particular within the STIC-AMSUD program (*Types for Robust Program Development* project) and within the CNRS-CONICET projects *Langages avec Motifs: Syntaxe et Sémantique* and *Réécriture axiomatique*.

[4]SATT: *Société d'Accélération de Transfert de Technologie*.

the beginning of 2013, the *Sophie Germain* building will host the entire Mathematics and Computer Science departments of the University. Organizing this move has been a delicate task and we arrived at a configuration where the PPS lab will share the 3rd floor of the building with the Computer Science UFR administration, close to the LIAFA (4th floor). With respect to the actual situation, this move will thus provide a welcome improvement to our working environment. However, the main benefit from our point of view is that the PPS lab and the pi.r2 team will be located at the same physical place.

**A new computer infrastructure.** The planning of this move has been combined with a comprehensive reorganization and rationalization of the computer services of PPS. Since the building *Sophie Germain* has a single computer room, it was natural to gather the computer services of the various departments located in the *Sophie Germain* building into a single technical team, with a common computer infrastructure. This has been carried out over the past 5 years by Yves Legrandgérard (PPS) together with his colleagues from the Mathematics Department, leading to a common platform based on modular hardware, benefiting from the newest virtual machines technologies and offering an increasing number of services[5]. This common infrastructure is operational and ready for transfer to the new building, and is supervised by the *Fédération de Recherche en Mathématiques de Paris Centre* (FR 2830) of which PPS is a member.

**The project of a joint LIAFA-PPS lab.** In July 2010, the Computer Science Institute of CNRS (INS2I) asked the two directors of LIAFA and PPS to consider the idea of unifying their laboratories, ideally on the horizon of 2014. The main objective was to create one large Computer Science Laboratory in Université Paris Diderot which would span almost all the spectrum of Fundamental Computer Science. In order to examine the various benefits of such a merge, but also the difficulties and issues that we would have to overcome in order to achieve this goal, a LIAFA-PPS committee headed by Pierre Fraigniaud was created and met regularly during the year 2011. A detailed report summarizing its conclusions was released at the beginning of 2012 and submitted to the members of the two laboratories. A general meeting of each lab was organized the same week in order to stimulate free discussions about the benefits and dangers of this potential fusion. One main concern during these discussions was the difference between the architectures of the two labs. The idea of building a joint lab was openly supported by the directors of LIAFA and PPS, who explained their position in a joint letter emailed to the members of the two labs. A referendum was organised at the beginning of the following week among the permanent members of each of the laboratories. After the ballot, it appeared that a moderate but clear majority of the PPS members rejected the idea of an immediate merge, whereas a majority of the LIAFA members voted for it. This immediately stopped the administrative process, or at least postponed it, since the idea of a joint LIAFA-PPS lab remains a natural and appealing perspective. As a matter of fact, this long process of discussions revealed that, whatever the way the two labs are articulated administratively, their respective members are convinced, to a vast majority, that they would gain a lot in strengthening their scientific links. This convergence should be supported by a firm scientific policy and encouraged by the organization of common scientific events like seminars, lectures, meetings, or projects. A joint LIAFA-PPS scientific committee integrating members of the IMJ logic team, headed by Paul-André Melliès (PPS) and Olivier Serre (LIAFA), has been created in May 2012 in order to launch and promote such actions.

[5] See https://www.math.univ-paris-diderot.fr/sysadmin/.

## 1.3 Structure and scientific organization of the PPS lab

The *Règlement Intérieur* of the PPS lab is attached to this dossier.

One remarkable and important feature of the PPS lab is that it is not divided into formal teams. This choice of structure comes from history, and is justified today by the general philosophy and the scientific objectives of the lab, described above. It is also made possible by the following facts.

- The PPS lab is still relatively small (about 40 permanent members) and is structured around a series of regular thematic and well-attended working groups where local and external speakers are invited to give technical talks about their research, see Section 1.4. Concretely, the attendees of these working groups constitute flexible research teams within the PPS lab, attracting and naturally integrating external researchers.

- This informal organization is complemented by the fact that several PPS members take part to the joint research team pi.r2 with INRIA, or to the IRILL initiative with INRIA and Université Pierre et Marie Curie (see Section 1.2). These structures provide in particular a favorable framework for supporting several of the major software developments to which PPS contributes, like Coq and Ocsigen.

- In addition, the PPS lab is structured by the many national and international projects (see Section 6) in which it is involved. Each project is organized around clear scientific objectives, with strong scientific animation activities, such as organization of seminars, workshops, conferences. These projects are essential today for funding post-doc researchers and PhD students. They are also particularly important for supporting software developments, see *e.g.* Section 4.7, 4.8 and 4.9.

**Conseil de laboratoire.** The major decisions concerning the PPS lab are discussed by its *Conseil de laboratoire*. Among these decisions, we can mention:

- The hiring policy: request for Professor and Assistant Professor positions opening to the Université Paris Diderot, determination of the scientific profile of these positions, suggestions for the composition of the *Comités de Sélection*.

- PPS post-doc candidates ranking (typically for the FSMP post-doc program).

- Université Paris Diderot, CNRS and FSMP foreign professors invitations: ranking of candidates.

- Preparation for the *Demande de moyens CNRS* in September.

Meetings of the PPS *Conseil de laboratoire* are organized when necessary, roughly every two months. Some of the members of the PPS *Conseil de laboratoire* were elected by the lab in spring 2009 for a period of 4 years. The other members were nominated by the director.

- *Collège enseignants-chercheurs:* Samy Abbes (elected), Delia Kesner (elected), Yann Régis-Gianas (nominated), Daniele Varacca (nominated).

- *Collège chercheurs:* Giuseppe Castagna (elected), Paul-André Melliès (nominated).

- *Collège ITA:* Odile Ainardi.

- *Collège IATOSS:* Yves Legrandgérard.

- *Collège doctorants:* Fabien Renaud.
- *Permanent invited member:* Pierre-Louis Curien.

Since many important issues concerning the PPS lab are also discussed in the *Conseils scientifiques* of the Computer Science Department and of the Mathematics Department (UFR), the members of PPS who participate to them are systematically invited to the meetings of the *Conseil de laboratoire*: Roberto Amadio, Vincent Balat, Roberto Di Cosmo, Gabriel Kerneis, Pierre Letouzey, Jean-Marie Rifflet, Ralf Treinen, Daniele Varacca.

**Specific tasks.** A few committees, internal to PPS, are in charge of specific questions, currently:

- *Commission des moyens*, responsible for the purchase of new computer devices (Ainardi, Legrandgérard, Letouzey, Rozière).
- *Commission des locaux*, responsible of the internal moves of PPS and of its move to the *Sophie Germain* building (Ainardi, Castagna, Ehrhard, Kesner, Legrandgérard).
- *Commission du séminaire*, responsible of the organization of the PPS seminar (Faggian, Jean Krivine, Saurin).

and a few members of the lab have specific responsabilities, currently:

- Legrandgérard is responsible for the computer infrastructure,
- Harmer is CNRS delegate for communication,
- Ainardi is CNRS delegate for training,
- Balat is responsible for the Web site,
- Bucciarelli is responsible for international relations and supervising invitations,
- Vouillon is our HAL correspondent[6],
- Tasson is PhD adviser, meaning that she is in charge of keeping a regular and friendly contact with all the PhD students of the PPS lab, and of helping them in case of difficulties.
- Melliès is responsible for the documentation (internal PPS library) and for the relations with universitary libraries.

## 1.4 Scientific animation

The scientific animation of the PPS lab is implemented by means of a number of specific actions supported by the laboratory and by the associated institutions pi.r2 and IRILL.

- The PPS Seminar[7]. It takes place each week, traditionally on Thursday morning in the *Rue du Chevaleret* building and is currently organized by Claudia Faggian, Jean Krivine and Alexis Saurin. The topics chosen are of general interest for the members of the PPS lab and the invited speakers are asked to make as widely accessible presentations as possible.

[6] He is in charge of giving the official PPS agreement stamp to publications uploaded on the HAL server by members of the lab.

[7] See http://www.pps.univ-paris-diderot.fr/seminaire/.

- PPS regular Working Groups[8]. These are more specialized and less formal seminars, where talks can typically be interrupted by questions of the attendees and longer technical discussions can take place. Members of the PPS lab are frequently invited to present their ongoing work in these working groups. The currently active working groups are:

  – *Sémantique*, organized by Paul-André Melliès and taking place each week in the *Rue du Chevaleret* building.

  – *Réalisabilité et théorie des types*, organized by Hugo Herbelin and Paul-André Melliès since the creation of the pi.r2 team, and taking place each week in the INRIA *Avenue d'Italie* building where the pi.r2 team is currently hosted. In addition to its purely scientific interest, one goal of the working group is to provide a scientific forum between the two parts of the PPS lab (*Rue du Chevaleret* and *Avenue d'Italie*).

  – *Programmation*, organized by IRILL (Emmanuel Chailloux) and taking place most often in the INRIA *Avenue d'Italie* building (where IRILL is located), every two weeks.

  – *Catégories supérieures, polygraphes et homotopie*, organized by François Métayer and taking place each week in the *Rue du Chevaleret* building. This working group is devoted to an emerging topic at the frontier of programming language semantics and homotopy theory, and is attended by PPS members as well as mathematicians members of the IMJ.

  The working group *Concurrence et programmation aléatoire* was active until 2010 and is currently stopped, mainly because its topics are partly covered by the other PPS working groups. We plan to relaunch it in the near future.

- PPS exceptional Working Groups. These working groups are organized from time to time on the initiative of the members of the PPS lab. Typical examples are the working group on *classical realizability* organized by Paul Rozière in Spring 2011 or the working group on *algèbre and lambda-théories* organized in Spring 2012 by Thomas Ehrhard, on the occasion of the visit of Antonino Salibra at PPS.

- PPS Annual Meeting. In order to take into account the widening of the scientific span of PPS, it seemed useful to organize a regular internal PPS meeting (two days) with scientific talks given by the members of the lab so as to increase the knowledge of all members of PPS of the activities of the lab. After the success of the first venue in September 2011 organized by Delia Kesner in a hotel of Trouville (more than the half of the lab attended), a second instance has been organized in the same place, again by Kesner, in September 2012.

- Invitation of external researchers (1 month or more). The PPS lab has benefited regularly from CNRS associate researchers positions: one per year, lasting from 3 to 6 months. It has also widely benefited from the Université Paris Diderot invitation program, and from other invitation programs as well (*e.g.* FSMP and *Ville de Paris*).

An important event in the national scientific landscape in Computer Science has been the creation by the CNRS of the GDR-IM in 2006. The PPS lab has immediately taken an important animation activity in this GDR, and more specifically in the birth of the LAC (*Logique, Algèbre, Calcul*) and of the GEOCAL (*Géométrie du Calcul*) working groups (see 6.2).

[8] See http://www.pps.univ-paris-diderot.fr/gdt.

## 1.5 Funding

The general expenses of the PPS lab are funded by yearly subventions received from CNRS and Université Paris Diderot[9]. The typical amount of these subventions is 35 000€ for CNRS and 70 000€ for Université Paris Diderot, but the global tendency is a regular decrease of these amounts, in spite of the efforts of these institutions to maintain them as high as possible. These resources are extremely useful to fund travels and invitations which cannot be funded by projects or are of global interest for the laboratory. Typical examples of such operations are the PPS Annual Meeting, initiated in September 2011, and the invitation of speakers to the PPS Seminar, who often stay a week or more in the lab. These subventions also enabled us to buy computers for the new PPS members, and to buy servers and other devices as contributions to the new computer infrastructure, see Section 1.2.

These global financial resources are complemented by fundings coming from a significant number of projects of varous kinds, listed in Section 6. In this section, the reader will find a detailed description of these projects as well as the funding received by the PPS lab from these projects when this applies (when the funding is not given, this means usually that the project has directly funded travels of PPS members, without transferring money to our accounts).

An essential part of this resource has been used to fund post-doctoral researchers in the PPS lab.

## 1.6 Evolution of the composition and recruitment policy

The current composition and *organigramme* of the PPS lab is provided as a document attached to this dossier.

**Administrative staff.** Odile Ainardi is the person in charge of the administrative management of the PPS lab since 2001. She has taken up alone all the administrative management of the PPS lab until 2009, in spite of the constant growth of the lab. Pierre-Louis Curien, the former director of PPS, asked the CNRS for another administrative staff position to be attributed to PPS and obtained it in 2008.

In November 2008, Audrey Mansuet was recruited as a CNRS ITN[10] at PPS[11]. She started to work in the laboratory under the supervision of Odile Ainardi who helped her to improve her knowledge of all aspects of managing a joint CNRS-university laboratory like PPS, from financial aspects to the management of employees. Audrey Mansuet also attended several training sessions organized by the CNRS on various aspects of these managing activities, and on mastering the associated softwares. In October 2010, she succeeded in the CNRS AI[12] competition, got recruited as an AI in a biology research laboratory and left PPS in February 2011.

In June 2012, INS2I CNRS Institute attributed to PPS a one year administrative staff position. We recruited Melina Sainte-Rose on this position: she currrently provides essential help and assistance to Odile Ainardi.

**Scientific permanent members.** Since January 2007, the following members of PPS have left the laboratory.

[9] As an INRIA team, pi.r2 has its own INRIA funding which is not managed by PPS. Similarly, as an autonomous structure, IRILL has its own funding from INRIA, Université Pierre et Marie Curie and Université Paris Diderot.

[10] Administrative Technician.

[11] Odile Ainardi was a member of the selection committee.

[12] Administrative Engineer.

- Chantal Berline (CNRS Chargée de Recherche, CoNRS 1) retired in October 2008.
- Emmanuel Chailloux (Université Paris Diderot Assistant Professor, CNU 27) left PPS in July 2007 and became Professor at Université Pierre et Marie Curie, and a member of the LIP6 lab.
- Guy Cousineau (Université Paris Diderot Professor, CNU 27) left PPS in June 2012. He is a member of AERES since 2008 (in *délégation*). Before 2008, he was President of Université Paris Diderot.
- Vincent Danos (CNRS Directeur de Recherche, CoNRS 7) left PPS in September 2008 to become Professor at University of Edinburgh (LFCS). He is now in *détachement*[13] until September 2014 and plans to come back to PPS after that date.
- Jean-Baptiste Joinet (Université Panthéon Sorbonne Assistant Professor, CNU 17) left PPS in January 2012, to become a member of the CIRPHLES lab of ENS Ulm.
- Olivier Laurent (CNRS Chargé de Recherche, CoNRS 1) left PPS in August 2008, to become a member of the LIP lab (ENS Lyon), team Plume. This is a *mutation*, that is, a permanent departure.
- Alexandre Miquel (Université Paris Diderot Assistant Professor, CNU 27) left PPS in September 2009 to become a member of the LIP (team Plume) lab at ENS Lyon where he is *détaché*.
- Jean-Marie Rifflet (Université Paris Diderot Professor, CNU 27) left PPS in June 2012.

The following members of PPS arrived during the period 2007-2012:

- Samy Abbes arrived at PPS in October 2007 as an Université Paris Diderot Assistant Professor (CNU 25).
- Yves Guiraud arrived at PPS–pi.r2 in June 2012 as an INRIA Chargé de Recherche.
- Hugo Herbelin arrived at PPS–pi.r2 in January 2009 as an INRIA Directeur de Recherche.
- Jean Krivine arrived at PPS in September 2009 as a CNRS Chargé de Recherche (CoNRS 7).
- Yann Régis-Gianas arrived at PPS in September 2008, as an Université Paris Diderot Assistant Professor (CNU 27).
- Paul Ruet arrived at PPS in September 2011 as a CNRS Chargé de Recherche (CoNRS 1).
- Alexis Saurin arrived at PPS–pi.r2 in September 2010 as a CNRS Chargé de Recherche (CoNRS 7).
- Matthieu Sozeau arrived at PPS–pi.r2 in September 2010 as an INRIA Chargé de Recherche.
- Christine Tasson arrived at PPS in September 2009 as an Université Paris Diderot Assistant Professor (CNU 27).
- Ralf Treinen arrived at PPS in September 2007, as an Université Paris Diderot Professor (CNU 27). He was before Assistant Professor at ENS Cachan, member of the LSV lab.

[13] Meaning that he is still a member of the CNRS, but does not receive a salary from it.

- Stefano Zacchiroli arrived at PPS in September 2011, as an Université Paris Diderot Assistant Professor.

The global balance (+3) is clearly positive for the PPS lab, and a significant part (4) of these arrivals are directly related to the creation of the pi.r2 common team with INRIA. The effect of these arrivals is a reinforcement of the PPS research potential on all of its three research themes described above. This is the result of a long-thought recruitment policy developed jointly by the laboratory and Université Paris Diderot, CNRS and INRIA over the years, and whose purpose is to promote our scientific programme explained above.

**PhD students.** The PPS lab has hosted 48 PhD students during the 2007-2012 period, with a reasonable number of new PhD students each year[14], mainly coming from the MPRI and LMFI Research Masters. The strong involvement of the PPS members in these masters has been essential for attracting these students. All of these students have been funded by PhD grants of various kinds. Among them, 28 have defended their PhD thesis and 16 are currently working on it. Five PhD students trained in the PPS lab received prestigious national or international awards for their PhD thesis: Carraro (Prize for the best scientific PhD of Ca'Foscari University), Ilik (Gödel Prize), Lengrand (Ackerman Prize), Manzonetto (EADS Foundation) and Tabareau (Prix de la Chancellerie, 2nd Gilles Kahn Prize). Two PhD students also resigned during that period, in order to become software engineers in private companies, and one PhD student decided to change his research topic.

It should be noted that the average number of PhD students hosted by the PPS lab during the period is 18. We believe that this number can be improved considering the scientific dynamic of the PPS lab. One should keep in mind however that after twelve years of creation, the lab remains a group of relatively young researchers with only 12 members having their HDR. One of our main purposes currently is thus to encourage our researchers to pass their HDR and to start supervising PhD students: 2 of them (Melliès and Varacca) will pass their HDR within a few months and 3 others at least (Balat, Chroboczek, Padovani) are clearly on the HDR track. This general policy is supported by the Computer Science UFR with (partial) *délégations* for the Assistant Professors. These forthcoming HDRs will greatly increase the PhD supervision capabilities of the PPS lab.

An additional issue is that finding PhD grants is more and more difficult outside dedicated research projects. Factually, the PPS lab can expect only 2 or at most 3 PhD grants each year from its Doctoral School (Doctoral School 386), meaning that the other PhD thesis are funded by other means: mainly grants from *Écoles Normales Supérieures*, from École Polytechnique or from national and european research projects[15]. As a recent illustration of this issue, the PPS lab obtained in 2012 two grants for four candidates from Doctoral School 386, and thus two very good students wishing to prepare their PhD thesis at PPS and having found their supervisors here had to give up due to a lack of local funding: as a result, PPS should have hosted 8 instead of 6 new PhD students in September 2012. To improve the situation, we will suggest more systematically PPS ANR project promoters to present four-year proposals including PhD grants[16] and we will encourage submission of ERC Research projects.

[14] Apart for the exceptional year 2007 where 10 students started a PhD at PPS, the typical number of new PhD students is 5 per year.

[15] The end of the *domaine d'intérêt majeur (DIM) Région Île de France* *Logiciels et Systèmes Complexes (LSC)* means also that one of the possible sources of PhD grants has vanished.

[16] A PhD grant is for 3 years and an additional preleminary year is useful to find a good candidate.

**Post-doctoral researchers.** During the same period, the PPS lab has hosted 26 post-doctoral researchers for periods from 6 months to 3 years (most of them were 12 months positions), 21 among them coming from foreign universities. Most of these positions were funded by projects of various kinds (ANR, European, *Région Île de France* projects). A few of them were directly funded by Université Paris Diderot, CNRS or INRIA. In addition, a series of post-doc positions were funded by the FSMP. These positions are particularly prestigious and lead each year to a severe competition, the candidates being selected by a high-level FSMP committee. The PPS lab obtained 5 such positions during the period 2007-2012 (including a position starting in September 2012).

**Invited researchers.** During the period under consideration, the PPS lab hosted nearly 70 invited researchers. In most cases, the invitations lasted one month and were funded by Université Paris Diderot. In some cases, funding was by the CNRS, by INRIA, by the FSMP or by research projects PPS was/is involved in.

**Training of the members of the PPS lab.** Several members of the lab have taken part to training sessions organized on various topics by the Université Paris Diderot, CNRS or other institutions. Our policy is also to encourage PhD students and young researchers to to take part to Summer Schools and similar events, and to (co)organize such events as we did for ***Logic and Interaction 2012*** weeks in Marseille.

### 1.7 Summary of results

Sections 2, 3 and 4 provide a reasonably accurate description of the scientific activities of the PPS lab in each of its three themes. In the following sections, we try to provide an exhaustive description of our production and activities from various points of view. We provide here a short summary of this material.

**Publications.** The PPS lab has published 112 international journal papers and 164 peer-reviewed international conference papers during the period 2007-2012, see Section 5. This production is of high quality with a good balance between journal and conference papers[17].

**Software.** The PPS lab develops and maintains various large software systems, the most important ones being Coq (within the pi.r2 team; Coq is distributed by INRIA) and Ocsigen (developed within the IRILL structure and for which a start-up is currently being created, see Section 1.2). PPS develops also smaller systems, often of a more experimental nature or with more specific applications, or which are parts of larger open source distributions. As explained in Sections 2 and 4, these software developments are an essential part of our research activities. See Section 5 for a complete list.

**Involvement in projects and cooperations.** The PPS lab is involved — or has been involved during the considered period — in many research projects, listed in Section 6: 26 national projects (of which 18 are ANR projects), 11 European projects (of which 4 are EU research projects) and 10 extra-european projects. This certainly demonstrates the good integration of the PPS lab in the international research community and the relevance of our research themes. But this means also that our research activities are extremely dependent on this short-term and goal-oriented funding scheme. We see this as a serious threat for the future.

[17] Remember that conferences are often more selective than journals in Computer Science.

**Connection with society.** The PPS lab made efforts for explaining its research activities to a larger audience: we have been regularly participating to the *Fête de la Science* and Di Cosmo has been invited twice to France Culture radio programs. Di Cosmo and Treinen have written various popularization articles, see Section 5. The PPS lab is very active in the Open Source software community and several of its members are regular contributors to various program developments. In particular, Stefano Zacchiroli is currently the Debian[18] Project Leader.

Curien took part to the redaction of the *Rapport Petit* which preceded the creation of the CNRS institute INS2I. Di Cosmo has coordinated an academic and industrial working group to produce a Report on the French Software Industry, which has been made available to the public in June 2011.

### 1.8 Conclusion

The evolution of our funding structure has continued, projects of various kinds providing an ever-growing part of our budget. A large part of the travel and invitations made by members of the PPS lab are therefore funded by projects, the regular PPS funding being used in priority for operations of general interest and for members of the lab who have no current access to project grants. This high number of projects of various kinds has made the management of the lab much more complicated, and has turned the production of the reports and of the numerous indicators required by our administrations into a quite intricate task. New management tools, and in particular a global information system, should be designed to help the lab in these administrative duties.

The production of the PPS lab during the period 2007-2012 consists of a significant number of high level international publications of course, but also of the design, production and maintenance of several software products, most notably Coq and Ocsigen. This effort has been done mainly by Université Paris Diderot Assistant Professors, CNRS and INRIA Researchers, who devoted an important part of their research time to these development activities. This software production, supported and encouraged by the new associate institutions pi.r2 and IRILL, represents an essential part of our scientific activities by now. The PPS lab is currently trying to recruit a Research Engineer able to contribute to the development and maintenance of these software products as a support to this evergrowing aspect of our production.

The scientific themes of the PPS lab have significantly evolved during the period. An important evolution is the increase of the research devoted to type theory, both from a practical viewpoint and from a theoretical one. This research effort is complemented by the maturing of our interface with mainstream mathematics, and the integration of new ideas coming from homotopy theory and higher dimensional algebra. Another important evolution of the PPS lab is the growing interest in formal methods applied to Open Source software systems, to concurrent and network programming, and to modeling biological systems.

## 2 Theme: Proofs and Types

► *Participants (permanents).* Amadio, Bucciarelli, Castagna, Curien, Ehrhard, Faggian, Herbelin, Joinet, Joly, Kesner, Krivine (Jean-Louis), Letouzey, Melliès, Miquel, Padovani, Régis-Gianas, Rozière, Saurin, Sozeau, Tasson, Vouillon.

[18] See http://www.debian.org, one the most important Linux distributions.

## 2.1 Lambda-calculus and extensions

An important activity of the PPS lab is to study the formal properties of the symbolic structures appearing in actual programming languages. These structures, like pattern matching or closures (explicit substitutions), are naturally understood as canonical extensions of the lambda-calculus whose metaproperties may be then carefully investigated.

► *Lambda-calculi with patterns.* B. Jay and Kesner introduced the Pure Pattern Calculus (PPC) [JK09] which extends previous calculi with pattern matching, including the $\rho$-calculus by H. Cirstea and C. Kirchner [vO90, CK01, Jay04, FK07]. One difficult question is to find normalizing strategies for these calculi where patterns are also evaluated. E. Bonelli, Kesner, Lombardi and A. Ríos [BKLR12] introduced a specific call-by-need strategy for PPC and showed that it normalizes[19]. Balabonski studied the efficient implementation of calculi with dynamic patterns, combining an explicit matching mechanism [Bal10a] with an explicit characterization of optimal sharing in a calculus of weak reduction [Bal10b]. This led him to study more generally the sharing of subterms in the implementation of functional programming languages, using ideas from rewriting, and more specifically a *fully lazy sharing* of programs based on abstract labelled terms [Bal12b, Bal12a].

► *Calculi with explicit substitutions (ES).* ES calculi decompose the usual substitution of higher-order calculi into more atomic steps in order to analyze the compilation schemes of functional languages, typically based on closures. While the $\lambda$-calculus does not have critical pairs, ES calculi [ACCL91] suffer from diverging reductions on metaterms (terms with metavariables). However, it is possible to reconcile confluence on metaterms and preservation of $\beta$-SN[20], as in $\lambda\mathtt{lxr}$ [KL07a], but at the price of complex reduction systems. Kesner [Kes07, Kes08] introduced an alternative ES formalism with full and safe composition, inducing a concise calculus with all the good properties: confluence, simulation of $\beta$-reduction, full composition, preservation of $\beta$-SN and SN of typed terms [Kes09].

► *Explicit substitution and distance calculi.* The various ES systems treat the content of a substitution as a non-linear resource, *i.e.* a box that can be composed with another one by means of commutative rules. A box-free net formalism for $\lambda$-terms inspired by Intuitionistic MELL[21] has recently been proposed [AG09]. Accattoli and Kesner [AK10] studied a term formalism based on the read-back of these nets [Acc11]. This calculus has many good properties: confluence, full composition and preservation of $\beta$-SN. Its reduction admits a modular extension implementing a natural operation on nets [AK12a].

► *Permutative theories for the $\lambda$-calculus.* The standard operational semantics of $\lambda$-calculus is given by $\beta$-reduction and is often extended with other rewriting rules allowing the permutation of constructors. The *permutative $\lambda$-calculus* of Accattoli and Kesner [AK12b] generalizes all previous extended $\lambda$-calculi by taking the permutations as *equivalences*, and not as *reductions*. It preserves $\beta$-SN and is Church-Rosser modulo the equivalences.

[19] This research is part of a long-term cooperation involving the PPS lab and the CS Departments of University of Buenos Aires and National University of Quilmes, which contributed recently to the creation of the LIA INFINIS http://www.infinis.org/ directed by Kesner, see Section 1.2. It is also supported by the MoDy project of the *région Ile-de-France* and by several STIC-Amsud partnerships.

[20] Strong normalization.

[21] Multiplicative Exponential Linear Logic.

## 2.2 Subtypes and intersection type for XML data processing

CDuce is a programming language designed to query and process XML data, developed and maintained by Castagna and his group at PPS [BCD+11, BCF07]. The CDuce language is motivated by clear practical interests but also has a significant impact on fundamental research[22].

► *Polymorphic iterators and subtyping.* Even the simplest XML transformations by iteration of basic functions require very expressive type systems and advanced polymorphism in order for the code to be modular and reusable. In XDuce, Xtatic or CDuce these iterators are hard-coded into the language and specific typing rules are added for them. However, this approach soon shows its limits. Castagna and K. Nguyen (LRI) [CN08] proposed a restricted polymorphic language, expressive enough to write complex iterators and simple enough to type them precisely. This restricted language is designed in order to be embedded in any statically typed host language.

In [FCB08], V. Benzaken, Castagna and A. Frisch defined a natural set-theoretic interpretation of types in order to define a decidable subtyping relation. Extending this to polymorphism was deemed impossible because the natural generalization leads to a subtyping incompatible with parametric polymorphism. [HFC09] proposed a partial solution, and then, Castagna and Xu characterized uniformity using a notion of *convex* model and obtained a subtyping relation for very rich polymorphic types that has all the desired properties and is EXPTIME-decidable[23].

► *Development of CDuce.* Besides these theoretical investigations towards a polymorphic version of CDuce, the language has been extended in more data-oriented ways. The pattern matching has been extended by a query language [BCCM08, BCCM07] and the interoperability of CDuce has been improved as follows: integration into Ocsigen, web-services in CDuce integrated to Ocaml, and finally, an interface with XProc — an XML pipeline language recently specified by W3C.

## 2.3 Rewriting and security

Treinen continued at PPS his work initiated at LSV on using techniques from logic, rewriting, and tree automata for the analysis of the security properties of cryptographic protocols in the presence of algebraic properties which allow the modeling of important properties of cryptographic primitives. Together with S. Kremer and A. Mercier (both LSV) he investigated the automated verification of a particular type of security protocols, called group protocols, in the presence of an eavesdropper, *i.e.*, a passive attacker [KMT08a]. They also investigated the combination of algorithms for deciding static equivalence modulo equational theories [KMT09, KMT12]. Static equivalence is a well-established notion of indistinguishability of sequences of terms which is useful in the symbolic analysis of cryptographic protocols. Together with F. Jacquemard, E. Lozes and J. Villard (all LSV), Treinen investigated the model-checking problem of A$\pi$L, a spatial equational logic for the applied $\pi$-calculus [JLTV11]. The decision algorithm given in that paper relies on a reduction to the first-order theory of finite trees with several distinguished congruence relations, each given by some equational axioms.

[22] This research has been supported by the ACI TraLaLA and by the ANR *domaines émergents* project Codex, and has motivated the creation of the ANR *Blanc* project Typex, starting in 2012.

[23] This research is supported by the National Natural Science Foundation of China project Unranked tree-structured data and semantically defined polymorphic type systems.

## 2.4 Development of the Coq system

The first public release of CoC (an implementation of Coquand and Huet's *Calculus of Constructions*) dates back to 1989. The same year, Coquand and Paulin [CPM90] designed an extension of the Calculus of Constructions with a generalization of algebraic types, called *inductive types*. The resulting *Calculus of Inductive Constructions* (CIC) became the foundation for the Coq system. It is a logic powerful enough to formalize all everyday mathematics and, at the same time, an expressive dependently-typed functional programming language, with no effects and no non-terminating functions. The development and maintenance of Coq is performed today by pi.r2 together with the team CPR at CNAM.

▶ *The main components of Coq.* The *verification kernel* is based on an interpreter of CIC programs and a module system. It is essentially stable with all modifications tied to the evolution of the underlying CIC formalism. The *user language* is called Gallina, and includes type inference as well as a complex pattern-matching algorithm, implicit arguments and mathematical notations. The system offers a large set of *libraries* for arithmetics, lists, etc. The *tactics* enable to conduct proofs, from the basic inference rules of CIC to advanced automation techniques. Finally, *extraction* transforms programs (or even computational proofs) of CIC to functional programs in OCaml, Scheme or Haskell.

**Development of Coq at pi.r2.** Since the creation of pi.r2, three versions of Coq have been released: 8.2, 8.3 and 8.4. We describe their contribution briefly.

▶ *Internal architecture.* The integrated graphical interface of Coq (CoqIDE) has been revised: Gross implemented a new communication model based on process interaction rather than on threading (multiple Coq sessions, robustness on non Unix-compliant OS, etc.). Letouzey finalized this work: CoqIDE and Coq are now separate processes. Letouzey also improved the internal architecture of Coq, isolating "plugins" parts that can now be dynamically loaded and introduced an alternative build infrastructure based on ocamlbuild. This allowed him to propose a fully-automated script for building the Windows versions of Coq. This major reorganization of the internal components of Coq aims at better isolating components and making explicit the interfaces between them. In parallel, Régis-Gianas optimized the hash-consing algorithm used in the kernel.

▶ *Modules.* Soubiran [ES09] unified module implementations and module types into the single concept of *theory* equipped with a notion of equivalence providing Coq with a transparent name-space. This primitive notion of theory may be then separated into *name-space* and *structure*, thus leading to a new merging-of-structure combinator.

▶ *Extraction.* Letouzey has improved and maintained the current implementation of the Coq extraction, in particular towards Haskell. Many practical aspects of extraction have been reworked to provide a better user experience, in particular the code transformations done to optimize the extracted programs. Letouzey has also worked on better ways to allow replacing Coq code or axioms by external code during extraction, or ways to fine-tune the parts of Coq code that are kept or not during extraction.

▶ *Type inference, tactics, unification and type classes.* Sozeau corrected issues with the unification algorithm and enhanced it to support universes. He improved the type-class [SN08] implementation and introduced a new system based on type classes to allow for generalized rewriting by custom relations [Soz09]. To improve the power of induction tactics, Herbelin added new heuristics for second-order pattern-matching and Letouzey extended the pattern-matching feature of the tactic language.

**Towards the next generation of proof assistants.** Apart from this essential mission of improving and maintaining the Coq proof assistant, one crucial objective of the pi.r2 team and the justification of its integration in the PPS lab is to design and experiment the new concepts which will be at the heart of future generations of proof assistants[24].

► *Libraries.* Letouzey started a deep reform of some parts of the Standard Library of Coq (mainly FSets and Numbers): all number representations come with the same set of basic functions and the same set of lemmas about them[25]. These modernized and certified libraries are also one of the first large-scale experimentations of the new features of modules and type-classes. Sozeau [Soz12] worked with members of the Foundations team at Nijmegen on enhancing the implementation of type-classes to suit the needs of the development of the MathClasses formalization of abstract algebra[26]. This gave rise to an experimental implementation of forward reasoning for instance resolution.

► *Certified extraction.* Glondu [SG09, Glo12] proposed an extraction algorithm for Coq that produces correctness proofs of the generated programs and proved manually the correctness of the extraction of some basic functions involving recursion, logical preconditions, and re-use of previously defined functions. He proved that reductions in the source language can be simulated in the target language (the converse was already known).

► *Proof languages.* Puech worked on an inference mechanism in Coq for the recognition of mathematical structures, and on its integration into the automated theorem proving tactics of Coq, this enhancing their efficiency and expressiveness. Proof assistants like Coq provide a read-eval print loop interface with a global undo system, implemented in an ad-hoc way. Puech and Régis-Gianas [MRG10] developed a principled and general approach to incrementality in typed formal language, by means of a fine-grained analysis of dependencies.

► *Forcing in Coq.* Sozeau, N. Tabareau and G. Jaber studied an extension of Coq with Cohen forcing, formulated in presheaf categories, and adapted to dependent types [JTS12]. Sozeau is developing a plugin for Coq in order to define forcing layers and automatically translate statements in these layers to core Coq, with expected applications to verification of imperative programs and low level code.

## 2.5 Formalization in Coq and in other proof assistants

Besides its participation in Coq development, the PPS lab is also interested in experimenting and formalizing within various proof assistants.

► *Proofs of programs.* Régis-Gianas and F. Pottier worked on proofs of higher-order programs using Hoare Logic [RGP08]. In a similar spirit, Vouillon has formalized in Coq the semantic argument based on step-indexing establishing the correctness of low level programs in [VM04]. In collaboration with P. Audebaud and C. Paulin-Mohring, Régis-Gianas worked on proofs of probabilistic programsIn another direction, Sarnat and Zeilberger investigated CPS translation and defunctionalization [Rey72] from the viewpoint of their effect on termination proofs — with the practical aim of building a compiler from higher-order proof assistants like Coq to first-order ones like Twelf.

[24] Part of this research is performed within the ANR *Ingénierie Numérique et Sécurité* Paral-ITP project.
[25] This work has been supported by the ANR *Sécurité, Systèmes Embarqués et Intelligence Ambiante* project CompCert.
[26] Part of this research was performed within the European ForMath EU project.

► *Proofs in logic and type theory.* On the meta-theoretic side, Siles has formalized in Coq properties of untyped Pure Type Systems (PTS) possibly formulated as sequent calculus[27]. He has extended this work to PTSs with judgemental equality, and proved that both presentations are equivalent. Ilik formalized in Coq his completeness proof for full intuitionistic logic with respect to a newly introduced notion of model based on a dependently-typed continuation monad. In this way, he avoided the need of the Fan Theorem and of delimited control operators [Ili10b]. A. Bove, A. Krauss and Sozeau [BKS12] have compared various formalization methods for recursive functions available in constructive type theories like Agda or Coq and classical systems like HOL.

### 2.6 Certification of cost annotating compilers

The formal description and certification of software components is reaching a certain level of maturity with impressive case studies ranging from compilers to kernels of operating systems. A nice illustration is provided by the proof of functional correctness of an optimizing compiler of the Cminor language [Ler09]. A natural refinement would be to integrate the *execution cost* of the compiled code — and to construct a certified C compiler that would produce the expected low level code together with a cost annotation of the high level code[28]. The state of the art in *e.g.* Scade (Esterel Tech.) is that the *reaction time* of the program is estimated by abstract interpretation on the binaries, using specific knowledge of the processor and requiring explicit (and uncertified) annotations of the binaries. In contrast, Amadio, Ayache and Régis-Gianas [AARGS10, ARG12] have designed a general *labelling method* which enables the transformation of a compiler into a "cost annotating compiler". In addition, they have provided evidence for the usability of the generated cost annotations by implementing a Frama-C plugin which relies on their cost annotating compiler.

### 2.7 Dependent types

The design and theory of a new generation of proof assistants relies ultimately on a deeper understanding of their type-theoretic foundations, and possible extensions, typically with pattern-matching and coinductive reasoning. Just as in Section 2.1, these investigations should be performed in an appropriate framework, provided in this case by Pure Type Systems (PTS), which generalizes HOL as well as the original Calculus of Construction.

► *Unification and pattern-matching in PTSs.* The CIC system underlying Coq has a decidable *syntax-directed* presentation. However, only its *typed equality* presentation can be shown consistent by semantic means. Herbelin and Siles [SH10, SH12, Sil10] bridged this gap by showing that every PTS is equivalent to its typed counterpart; this opens the way to a study of unification algorithms in Coq. In collaboration with B. Ziliani and A. Nanevski, Sozeau started a project to formalize (on paper) the improved unification algorithm, taking into account its advanced features. This will enable the Coq system to handle the delicate *usage patterns* developed by G. Gonthier in the INRIA-MSR Mathematical Components team, and to scale the system to large formalizations. In a similar spirit, Herbelin and Boutillier have worked on a new simulation of Agda's style dependent pattern-matching [Coq93] in Coq which relies on earlier work by Boutillier [Bou12]. Sozeau developed the Equations [Soz10b, Soz10a] plugin to build and reason on dependently-typed programs and applied it to prove the metatheory of LF.

[27] See https://www.lix.polytechnique.fr/~vsiles/coq/formalisation.html

[28] This project is the starting point and purpose of the EU *Certified Complexity* (CerCo) project. This research is also supported by the INRIA ARC Eternal project.

► *(Co)Inductive Types and PTSs in Sequent Calculus.* Herbelin, Sarnat and Siles initiated a sequent-calculus presentation of CIC, starting from a simple type theory with inductive and coinductive types, pattern matching, and guarded least and greatest fixed-points. Accordingly, Herbelin and Siles investigated formulations of PTSs in sequent calculus, building on previous work by Herbelin [Her94] and Lengrand [Len06].

► *Normalization of CoC and CIC.* During his stay in the PPS lab, Abel designed and partially formalized a normalization proof of CoC (Calculus of Constructions) in Coq based on normalization by evaluation [Abe10]. With M. Pagano he studied normalization by evaluation for Martin-Löf type theory with singletons [ACP09]. Using a connection to abstract machines, Boutillier extended to all possible reduction strategies the structural guard condition for fixpoints, whose role is to ensure the termination of Coq programs.

► *Implicit calculus of constructions.* Together with B. Barras, Bernardo developed an Implicit Calculus of Constructions [Miq01] with dependent sums and decidable type inference, introducing its syntax, proving subject reduction and studying its denotational semantics. In discussions with Bernardo and B. Barras, Abel investigated the relationship of proof irrelevance and implicit quantification in CoC [Abe11].

► *Linear dependent types.* One main ambition of the PPS lab in future years is to connect proof-assistants with linear logic and other advanced tools in programming language semantics. Developing ideas in his PhD thesis [Spi11], Spiwack started investigating linear dependent types in order to understand what kind of set theory based on *setoid* arises in this setting. In particular, Spiwack observed that setoids give rise to a quasitopos inside Coq.

## 2.8 Classical logic, operational duality and effects

The discovery of polarities and the operational duality between programs and environments led to a finer logical and syntactic account of programming languages, including their evaluation strategies. This general picture is enhanced by the key observation that side effects may be incorporated into intuitionistic proofs by extending the logic with axioms like the Markov principle or the double negation shift.

► *Polarization and focalization.* The Curry-Howard interpretation of the sequent calculus (rather than natural deduction) initiated by Herbelin at the beginning of the 1990s led to the design with Curien of a symmetric calculus [CH00] exhibiting the dualities between programs and environments, and between call-by-name (CBN) and call-by-value (CBV) strategies. Starting from this work, Munch-Maccagnoni [MM09] designed *focalizing system L* as a term syntax for polarized classical logic and LL based on J.-Y. Girard's ideas [Gir91]. Curien and Munch [CMM10] investigated in this framework the shift from a focalized syntax of cut-free classical proofs to a confluent calculus of focalized and polarized classical proofs.

► *Axiomatization of CBV and call-by-need.* Herbelin and Zimmermann designed an original reduction semantics of CBV $\lambda$-calculus that is both complete and confluent [HZ09]. Z. Ariola, Herbelin and Saurin formulated the *call-by-need* strategy in the spirit of duality, leading to a call-by-need $\lambda\mu$-calculus and unveiling at the same time a new and intriguing evaluation strategy [AHS11] dual to the usual call-by-need. In parallel, Munch-Maccagnoni investigated a notion dual to the *thunks* of CBV $\lambda$-calculus which allow to simulate CBV in CBN.

► *Effects and proofs.* Herbelin discovered that, in an intuitionistic logic extended with a very restricted classical principle and a control delimiter, Markov's principle becomes provable [Her10]

and this incidentally provides with a syntactic proof that adding Markov's principle to intuitionistic logic retains the existence property. Similarly, Ilik designed an intuitionistic proof system integrating the double negation shift [Ili10a]. Herbelin investigated extensions of these two systems to other kinds of effects, and in particular, designed a logical formalism with memory management that allows to *prove* in direct-style any statement provable using the forcing method, starting from ideas by Krivine [Kri08]. Despite the use of effects, the whole framework satisfies the disjunction and existence property. Two typical applications are global-memory proofs of the axiom of countable choice and an enumeration-free proof of Gödel's completeness theorem.

► *Kripke semantics for classical logic.* Herbelin and G. Lee gave a simple proof of Kripke completeness for the negative fragment of intuitionistic logic [HL09]. Herbelin, Ilik, and G. Lee also defined a Kripke semantics of classical logic and proved completeness constructively [ILH10]. These two works were formalized in Coq [HL12] and provided an interesting case study on the formal representation and manipulation of binders. Herbelin and Ilik used their systems with side effects in order to prove constructively the completeness of intuitionistic logic wrt. Kripke semantics in the presence of positive connectives (disjunction, existential quantification).

## 2.9 Delimited control

Delimited control (DC) is an advanced control mechanism which enables the programmer to insert prompts inside programs, and to consider them as the new root of the environment during evaluation. This mechanism enables in particular to reify and reflect any effect (references, exceptions, states, dynamic bindings. . . ) which can be defined as a monad in the system, as first observed by Filinski [Fil94][29].

► *Delimited control and $\Lambda\mu$.* The $\Lambda\mu$-calculus was originally introduced by Saurin [Sau05] as a variant of Parigot's $\lambda\mu$-calculus [Par92] enjoying the Böhm separation theorem. Herbelin showed with S. Ghilezan [HG08] that the $\Lambda\mu$-calculus provides a CBN version of Danvy-Filinski's CBV calculus of DC. Much work has been devoted to the precise description of the connection between the various calculi and the operational properties of the $\Lambda\mu$-calculus [HS09, Sau08, Sau10b, HG08, Sau10a].

► *Logical interpretation of delimited control.* Herbelin and Ilik discovered a connection between DC and the double-negation shift schema which is the main ingredient in providing an interpretation of the double-negation translation of the Axiom of Choice, and hence of consistency of Analysis [Ili10b]. Zeilberger studied in [Zei10] a generalization of the classical interpretation of polarities, with the aim of better understanding DC, and of building a stronger connection between classical polarities and intuitionistic effect systems such as Levy's call-by-push-value [Lev99]. Munch-Maccagnoni [MM11] investigated DC operators and delimited CPS translations from the point of view of LL, and provided a polarized DC calculus with two dual modes of evaluation for expressions (strict and lazy).

## 2.10 Tensorial proof-nets and combinatorics of proofs

The operational duality between programs and environments may be alternatively studied in syntactic frameworks inspired from LL proof-nets and nicely connected to interactive models of computation like game semantics. This idea leads to a new generation of proof-nets with different

[29] This research takes place in particular within the Semacode INRIA associate team.

degrees of sequentiality, with L-nets going from the purely sequential tensorial proof-nets to the familiar concurrent LL proof-nets. These combinatorial representations open the general problem of enumerating the proofs of a given type, or at least of deciding when it is inhabited in an effective fashion.

► *Tensorial logic.* Despite their shared origins, LL and game semantics have slowly diverged and become schismatic in the late 1990s[30], driven by earlier influencial works by Lorenzen [], Berry and Curien [] and Gandy [], and by the need of developping new models of non functional features (references in particular). The situation is confusing and problematic if one wishes to formulate a clean algebraic theory of programming languages. In order to resolve the gap, Melliès introduced *tensorial logic* [MT10], a primitive logic of tensor and negation, which refines LL by relaxing the hypothesis that negation is involutive. Somewhat unexpectedly, this slight change in the logic leads to a notion of tensorial proof-net which unifies game semantics and LL proof-nets. This work also reveals that game semantics is a *diagramatic syntax* of linear continuations, formulated in the 2-categorical language of string diagrams, and nicely connected to functorial knot theory. It provides a satisfactory equational theory of proofs, since two proofs are equal precisely when their proof-nets are equal modulo topological deformation, resolving the traditional problem of equality with multiplicative units in proof-nets in LL.

► *Sequentialization.* Faggian and P. Di Giamberardino applied ideas coming from parallel and sequential strategies as expressed in L-nets [CF12] to the syntax of proof-nets, producing a new, elegant and compact proof of sequentialization [DGF08][31].

► *Ticket entailment.* Padovani [Pad10] worked for several years on, and eventually solved, the difficult question of the decidability of the Logic of Ticket Entailment (problem #2 in the TLCA list of open problems), raised by Anderson and Belnap in 1960. The question is to decide whether a given type in this "non-commutative" and relevant $\lambda$-calculus is inhabited. Padovani showed the problem to be decidable by applying a series of clever combinatorial transformations on proofs, and by establishing that the process terminates using an intricate Kruskal argument. The paper was accepted for publication in December 2011.

### 2.11 Resource control in higher order languages

Building on fragments of LL, a number of typed functional languages have been designed defining exactly the functions computable in, say, polynomial time. Since usual type systems are too poor to account for the behaviour of programs with effects, an important research issue is to integrate *effects* into these resource-bounded languages. This is typically achieved by abstracting the state space into *regions* following the *type and effect* discipline advocated by Lucassen and Gifford [LG88].

► *Complexity and execution time in LL.* D. De Carvalho, L. Tortora de Falco and Pagani generalized to LL earlier results by De Carvalho on the interpretation of the relational semantics in terms of computation time [DCPTDF08] with strong connections to the Taylor expansion of DiLL[32]. Dal Lago worked with P. Baillot and P. Coppola on optimal reduction [BCDL07] and quantum computations from a complexity point of view, and with S. Martini on the problem of finding good measures of execution time in the $\lambda$-calculus [LM08].

[30] This research has been supported by the ANR *Blanc* project CHOCO.
[31] This research is supported by the ANR *Blanc* project Logoi.
[32] This research was supported by the MIUR project *Réseau italo-français de recherche en logique et géométrie du calcul.*

▶ *Reducibility candidates and termination.* Amadio [Ama09b] proved using reducibility candidates that a suitable *stratification* of the type and effect system entails termination of the typable programs[33]. The proof technique covers a simply typed, multi-threaded, call-by-value $\lambda$-calculus, equipped with a variety of scheduling (preemptive, cooperative) and interaction mechanisms (references, channels, signals) as well as a fragment of the $\pi$-calculus [Ama11].

▶ *Regions and determinacy.* Building on this approach, Amadio and Madet [ABM10] designed an affine-intuitionistic system of types and effects which can be regarded as an extension of Barber-Plotkin Dual Intuitionistic LL to multi-threaded programs with effects. They introduced a discipline of region usage that entails the confluence (and hence determinacy, cf. section 4.2) of the typable programs.

▶ *Types for elementary and polynomial time.* Amadio and Madet [MA11] developed a type system which corresponds to *elementary time*. They provided a new combinatorial proof of termination in elementary time, developed an extension of the approach to a CBV $\lambda$-calculus with multithreading and side effects and introduced an elementary affine type system that guarantees the standard subject reduction and progress properties. The typing system is sufficiently flexible to allow the programming of iterative functions with side effects. Madet developed a *polytime* variant of these results.

### 2.12 Resources in differential linear logic

DiLL is an extension of LL, introduced by Ehrhard and L. Regnier [ER06], in which the structural rules of the exponentials (weakening, dereliction and contraction) have exactly dual counterparts: *costructural* rules have a strong algebraic flavour[30,32]. Coweakening is related to the presence of a *zero* proof object, cocontraction is related to the possibility of *adding* proof objects and codereliction corresponds to differentiation wrt. a given hypothesis. DiLL provides new mathematical foundations to resource $\lambda$-calculi introduced by Boudol [BL96]. DiLL-based $\lambda$-calculi have two kinds of application constructions: the ordinary one and an application which represents differentiation. Terms *without* ordinary application have strong normalization properties, and all terms can be represented as infinite sums in this restricted fragment (Taylor expansion).

▶ *DiLL and processes.* Ehrhard and Laurent have shown how DiLL can be used to represent concurrent processes by encoding a version of the $\pi$-calculus in an untyped DiLL[34]. They proved that the corresponding translation is a bisimulation [EL10b]. They also proposed a simpler and more direct encoding of the *calculus of solos* [EL10a]. Starting from the graphical intuitions behind these translations, Ehrhard developed with J. Ying a version of CSS which deals with trees instead of words; in this setting, parallel composition has a richer, graphical, structure[35]. Gimenez [Gim09] studied a generalization of the promotion rule of LL, completing the symmetrization of the LL exponentials initiated with DiLL. Deep inference (see Section 2.13) seems to provide a convenient setting to express this rule.

▶ *DiLL and exceptions.* Munch–Maccagnoni developed a symmetric syntax for DiLL [ER06] and gave a logical interpretation of exceptions using DiLL co-dereliction to model the fact that an exception binder can catch only one exception. Then, Herbelin's implementation of Markov's principle corresponds to the validity of co-dereliction on recursively positive formulae.

[33]This research is part of the ANR Complice project.
[34]This reaserch was supported by the ANR *Jeunes chercheurs, jeunes chercheuses* No-CoST.
[35]This research is funded by the French-China ANR project LOCALI.

► *DiLL, $\lambda$-calculus and nets.* Ehrhard investigated the connection between Taylor expansion and normalization of $\lambda$-terms by introducing a *finiteness* structure (in the sense of [Ehr05]) on finite resource terms whose definition uses differential $\beta$-reduction, showing that the Taylor expansion of terms typeable in system F are finitary in that sense [Ehr10]. With Carraro and A. Salibra, he designed a differential extension of combinatory algebras, providing a purely algebraic presentation of resource calculi [CES10]. Pagani [Pag11] discovered a correctness criterion for DiLL proof structures whose relational semantics is finitary in the sense of Ehrhard's finiteness spaces [Ehr05]. Pagani and Tasson [PT09a] characterized the DiLL nets which appear in the Taylor expansion of LL nets. Giminez proved [Pag09] combinatorially cut-elimination for simply typed DiLL nets and [Gim11] provided an alternative proof, based on reducibility and therefore extendable to higher order LL. Pagani and Tranquilli [PT09b] proved standardization and confluence for the resource calculus based on DiLL.

### 2.13 Deep inference

Deep inference is a formulation of proof theory where every proof is obtained as a series of symbolic transformations from the hypothesis to the conclusion. This approach to proof theory is developed by Parigot in the PPS lab and takes place within a rich European network of cooperations[36].

► *Quasipolynomial normalization in deep inference.* All known cut elimination procedures for usual proof systems for classical propositional logic are exponential and there were good reasons to think that this could not be improved. However, Jeřábek [Jer08] showed in 2008 that cuts in propositional-logic deep-inference proofs can be eliminated in quasipolynomial time. Together with P. Bruscoli, A. Guglielmi and T. Gundersen, Parigot [BGGP10] gave a direct proof of this result, using *atomic flows*.

► *Proof systems.* In the sequent calculus, only very limited means of combining proofs are available. Together with A. Guglielmi and T. Gundersen, Parigot [GGP10] devised a very simple and natural logic-independent proof calculus, Open Deduction, where proofs can be freely composed by connectives, and proved its basic properties. Open Deduction allows to increase the degree of parallelism in proofs. With Gundersen and W. Heijltjes, Parigot devised a new term calculus for natural deduction inspired from deep inference. Building on the new possibilities given by Open Deduction, Parigot devised a symmetric natural deduction system. The key point is the distinction between connectives and metaconnectives which reflect them at the level of proofs.

## 3 Theme: Mathematical Foundations of Programming

► *Participants (permanents).* Berline, Bucciarelli, Curien, Ehrhard, Faggian, Gaucher, Guiraud, Harmer, Herbelin, Joly, Krivine (Jean-Louis), Legrandgérard, Melliès, Métayer, Miquel, Rozière, Tasson, Varacca.

[36]This research is supported by the PHC PAI Germaine de Staël Deep Inference and the Essence of Proofs, by the PHC Nouveaux systèmes de déduction et méthodes de normalization pour l'inférence profonde (with UK) pursued with the PHC Outils logiques d'analyse des programmes and the ANR-FWF project Structural, and with the CNRS-GNSF project Structural and Computational Properties of Logics (with Georgia). It has also been supported by the ANR *Blanc* project Infer.

## 3.1 Game semantics and interactive models of computation

Games provide a mathematical interpretation of programs as strategies where moves are elementary data tokens. This interpretation extends LL and other logical systems, suggesting often refinement of these syntaxes.

► *Algebraic account af arena games.* Harmer, M. Hyland and Melliès [HHM07] developed an algebraic and combinatorial account of arena games and innocent strategies, inspired by simplicial sets in algebraic topology. The reconstruction of innocent strategies relies on the discovery of a distributive law $\lambda : !? \to ?!$ between a monad ? and a comonad ! living in the category of alternating games and sequential strategies. An innocent strategy between the games $A$ and $B$ is then recovered as a sequential strategy $!A \to ?B$. In that way, the subtle combinatorics of cut-elimination between innocent strategies (and thus derivation trees) is entirely handled by the distributivity law $\lambda$, and the traditional category of arena games and innocent strategies is recovered as its Kleisli category.

► *Dialogue categories.* The notion of dialogue category plays the same role for tensorial logic as the notion of cartesian closed category plays for the simply-typed $\lambda$-calculus. Accordingly, the shift from LL to tensorial logic comes together with a shift from $*$-autonomous categories to dialogue categories. A natural question is thus to understand which results obtained for $*$-autonomous categories may be lifted to dialogue categories. Melliès has developed a comprehensive study of dialogue categories with this question in mind. An interesting outcome has been the discovery of a microcosm principle in proof theory generalizing a similar microscosm principle in higher dimensional algebra. The idea is that logical negation is a duality at dimension 1 which relies on the involutive duality at dimension 2 between a category $\mathcal{C}$ and its opposite category $\mathcal{C}^{op}$. These two levels of duality are typically confused in LL, this forcing the logical negation of LL to be involutive. From this microcosm principle, Melliès deduces the surprising fact that the familiar decomposition of implication $A \Rightarrow B = A^* \vee B$ in LL already holds in cartesian closed categories, that is, in a purely intuitionistic setting. The formula requires however to decorrelate the category $\mathcal{C}$ from its opposite category $\mathcal{C}^{op}$ and to work in what Melliès calls a (cartesian closed) chirality.

► *Abstract machines for dialogue games.* Curien and Herbelin [CH09b] developed the paradigm of computation as interaction in the framework of abstract Böhm trees, introduced by Curien in earlier work. The approach can be understood as a type-free, operationally-oriented view of game semantics. The main benefit of the generalization is that it offers the right level of generality for explaining the mechanism of computation at hand in the $\lambda$-calculus and similar sequential languages. The paper presents syntactic support for this claim, as well as numerous examples (like CBV) illustrating the generality of the underlying computing device.

► *Fixpoints and Totality in Game Semantics.* During his PhD thesis, Clairambault worked on the game-theoretic aspects of the normalization problems encountered in typed $\lambda$-calculi. With Harmer [CH09a], he gave abstract conditions on strategies ensuring the finiteness of their interactions and as a consequence preservation of totality by composition. The tools introduced to that effect were later strengthened [Cla11] to give a complexity result, which provides bounds to the length of linear head reduction sequences on simply-typed $\lambda$-terms — such bounds were only known for standard beta-reduction. Clairambault [Cla09] also investigated the issue of totality in the presence of infinite data types such as inductive and coinductive datatypes.

### 3.2 Games, Ludics and Concurrency

Faggian investigated a game-semantical model of parallel computation based on Ludics, on which she has been working in collaboration with Curien [CF12] and M. Piccolo [FP07a, FP07b, FP09]. The results lead to a better understanding of the relationship between parallel and sequential strategies, and of the relationship with models of True Concurrency[37].

► *A parallel model of computation: graph strategies.* Starting with the pioneering paper by S. Abramsky and Melliès [AM99], several proposals have emerged — with different motivations — towards a notions of strategy where sequentiality is relaxed to capture a more asynchronous form of interaction. Faggian and Curien [CF12] relate parallel and sequential strategies and sequential strategies by showing how strategies represented by graphs, with partial ordering information, can be associated to a set of tree-like strategies, and how conversely, sequential strategies can be relaxed into more asynchronous ones.

► *Ludics, true concurrency and $\pi$-calculus.* Faggian and Piccolo [FP07a, FP09] investigated a Game Semantics where strategies are partial orders (called *po strategies*) and composition is a generalization of *merging of order*. The bridge between game semantics and concurrency theory is also the basis for a game semantical analysis of the linear $\pi$-calculus, introduced by N. Yoshida, K. Honda and M. Berger (2001), and whose typing is based on LL. Faggian and Piccolo [FP07b] established an exact correspondence between process calculi features and game-semantical notions, by showing that ludics is a model for the finitary linear $\pi$-calculus.

► *Ludics with repetitions.* Faggian and Basaldella [FB11, FB09] provided an extension of ludics which allows repetitions (exponentials). The solution proposed here consists in using *non-uniform* (non-deterministic) tests, which are obtained by using ideas developed in [FP09].

### 3.3 Vectorial models of differential linear logic

Investigations on denotational models of LL where formulae are interpreted as topological vector spaces led in the early 2000s to the introduction of differential LL and to a new understanding of resource $\lambda$-calculi.

► *Lefschetz spaces and Convenient spaces.* Starting from [Ehr05], Tasson [Tas09b] extended to more general linearly topologized vector spaces[38] the constructions required to interpret LL. The objective was to obtain a *basis-independent*, and therefore intrinsic and more geometrical, presentation of these constructions. Related to this work is the joint work on convenient spaces carried out by Richard Blute, Thomas Ehrhard and Christine Tasson [BET10]. They built a model of differential linear logic using convenient spaces, that is locally convex spaces that enjoy the same kind of duality.

► *Transport.* In the finiteness spaces model, fixed points cannot be interpreted [Ehr05, Vau]. Indeed, this semantics focusses on termination. Yet, some algebraic types such as integers, finitely branching trees can be built as fixed points and are finitary (that is they can be modeled using finiteness spaces). Tasson and L. Vaux [TV10] studied the constructions that allow the interpretation of such types. They devised a new *transport* method to build new finiteness spaces and applied it to the construction of algebraic types in finiteness spaces.

[37] This research is supported by the ANR *blanc* project Logoi.

[38] A notion of topological vector spaces introduced by Lefschetz in 1943 which differs radically from the usual ones since the field is discrete and the topology is generated by subspaces.

▸ *Categorical models of DiLL and of resource $\lambda$-calculi* Following the work of R. Blute, R. Cockett and R.A.G. Seely on differentiation in cartesian categories, Bucciarelli, Ehrhard and Manzonetto have designed a general notion of cartesian closed categories with differentiation [BEM10]. In a survey paper currently under revision, Ehrhard presents a categorical semantics of DiLL in the framework of linear logic models, in the line of the original presentation of DiLL in [ER06] and of the work of Fiore [Fio07]. He also introduces a surprisingly simple categorical axiomatization for an operation of *antiderivatives* which is based on the standard Poincarés's Lemma of analysis.

### 3.4 The structure of exponentials

The exponentials are unary connectives, or modalities, of LL which allow for the duplication of proofs (data) during cut-elimination (execution). They are thus essential to understand the complexity of computation, and their fine-grained analysis is crucial.

▸ *Exponentials as limits of tensor powers* The exponential modality of LL transports every formula $A$ to a commutative comonoid $!A$ which may be duplicated in the course of reasoning. Taking inspiration from the construction of the symmetric algebra $SA$ of a $k$-module, Melliès, Tabareau and Tasson [MTT09, MTT10] introduced a general recipe to compute the free exponential modality $!A$ as a sequential limit of symmetrized tensor powers $A^{\leq n}$, where each space $A^{\leq n}$ represents $k \leq n$ symmetric copies of the original space $A$. The idea is then to "glue" appropriately each space $A^{\leq n}$ in the next space $A^{\leq n+1}$ and to compute the limit. The formula works in any symmetric monoidal category where the sequential limit of the $A^{\leq n}$ exists and commutes with the tensor product. This basic recipe provides an unified account of apparently different constructions dispatched in the literature, either on coherence spaces, on sequential games, or on topological models. It also reveals an unexpected limitation of recursive types: indeed, the sequential limit construction of $!A$ cannot be expressed using a recursive type, and requires instead a series of advanced operadic ideas developed for that purpose by Melliès and Tabareau [MT08].

▸ *Exponentials with infinite multiplicities.* In the relational model of LL, the Taylor formula holds semantically. For that reason, any model of the pure $\lambda$-calculus in this model is sensible. To encompass this limited equational expressivity, Carraro, Ehrhard and Salibra [ECS10] have introduced new exponentials in the relational model, in which multiplicities can be infinite (in various different ways). The availability of so many different exponentials was a surprise, and Bulteau's PhD thesis aims at understanding their general structure.

▸ *Extensional collapse of the relational model.* The CCC associated with the relational model of LLis not well-pointed. It seemed therefore natural to try to characterize its "extensional collapse" (of course this notion has to be carefully defined beforehand). Ehrhard proved that this collapse coincides with a CCC of Scott domains (prime-algebraic complete lattices actually) and Scott-continuous functions. This result is obtained by means of a new linear duality on preordered sets, leading to a new model of LL which contains models of the pure $\lambda$-calculus [Ehr12b]. This construction can be used to reduce to purely combinatorial arguments normalization results which are usually proved by reducibility [Ehr12a]. Intuitively, all the logical complexity of reducibility is encapsulated in the model.

### 3.5 Models of the pure $\lambda$-calculus

The pure $\lambda$-calculus is a Turing-complete model of computations with deep connections to proof systems and to algebra and categories. Differential LL provides a new and refined appraoch to the

various aspects of the $\lambda$-calculus.

► *Lambda-calculi with resources and tests.* The differential $\lambda$-calculus of Ehrhard and L. Regnier and its syntactic variations mostly due to Tranquilli, referred to as *resource lambda-calculi*, have been extensively studied in recent years. The pure resource calculus may be interpreted in the simple reflexive object of the category of sets and relations described in [BEM07]. Motivated by the study of this interpretation, Bucciarelli, Carraro, Ehrhard and Manzonetto [EBCM11] devised an extension of the pure ressource calculus by the new syntactic category of *tests*, that can be thought of as a basic exception mechanism. The relational model is proven to be fully abstract for this extension. Then, *via* a syntactic operation of test-expansion, it is shown that full abstraction holds also for the promotion-free resource calculus without tests.

► *Expressive power of tests.* Somewhat surprisingly, Breuvart [Bre12] showed that the full abstraction property established in [EBCM11] does not extend to the resource calculus without tests. He also proved that the pure $\lambda$-calculus extended with tests is powerful enough to define all the (compact) elements of Scott's $D_\infty$ model. The full abstraction theorem for the pure $\lambda$-calculus with tests resulting from this definability property implies, by test elimination, the full abstraction of $D_\infty$ for the pure lambda-calculus. This provides a new proof of a classical result and a new approach for attacking open problems of the same family.

► *Model theory of the pure $\lambda$-calculus.* Berline, Manzonetto and A. Salibra [BMS07] introduced a notion of *effective* $\lambda$-model, which covers in particular all the models individually introduced in the literature and is just strong enough to force the interpretation of a normal term to be decidable. They proved that the order theory of an effective model is never r.e. It follows that its equational theory cannot be $\lambda_\beta$ nor $\lambda_{\beta\eta}$. In [BS08], Bucciarelli and A. Salibra showed that the class of *graph models* possesses a minimal theory. Recently, together with Carraro [CSB12], they generalized this result to any class of models having the *finite intersection property* and the *ultraproducts property*. Many natural classes of models have these properties.

### 3.6 Domain theoretic accounts of randomness and non determinism

Modeling probabilistic computations requires extending domains with stochastic features. The standard aproach consists in endowing the model with a stochastic monad but other approaches are possible, such as the notion of probabilistic coherence spaces.

► *Probabilistic coherence spaces.* Danos and Ehrhard [ED11] refined the notion of *probabilistic coherence spaces* [Gir04] and extended the interpretation to the whole of LL. They explored the properties of the associated CCC showing that it is a model of a probabilistic extension of PCF which enjoys a probabilistic version of adequacy. This CCC contains many models of the pure $\lambda$-calculus, including a probabilistic version of Scott's $D_\infty$. Ehrhard, M. Pagani and Tasson have proven a probabilistic adequacy of this model wrt. a probabilistic extension of the pure $\lambda$-calculus [EPT11][39].

► *Random variables and domains.* Varacca and J. Goubault-Larrecq developed a domain-theoretic description of random variables [GLV11]. The domain-theoretic version of measures are called *continuous valuations* and form a monad in the category of continuous domains; such monads are notoriously difficult to construct.

► *Monad-free semantics of non determinism.* Vaux's [Vau09] algebraic $\lambda$-calculus extends ordinary typed and untyped $\lambda$-calculi by the possibility of forming linear combinations of termes of the same

[39]This research was supported by the CNRS PEPS QuAND project.

type and can nicely be understood as an algebraization of non-determinism in a functional setting. Such extensions of logic are used to prove separation as in [FB11, FB09] or in the work of Breuvart. Introducing a notion of totality on finiteness spaces — which is simply a closed affine subspace of the space interpreting the corresponding type —, Tasson [Tas09a] built a model of barycentric $\lambda$-calculus, a natural restriction of Vaux's calculus. She proved a definability result for first order types (with P. Hyvernat). Bucciarelli, Manzonetto and Ehrhard provided a sound interpretation of a non-deterministic extension of the $\lambda$-calculus in the relational model, and showed that a term has a non-empty interpretation if and only if its head reduction converges [BEM09].

### 3.7 Realizability and models of ZF set theory

Jean-Louis Krivine has pursued his efforts in developing a theory of classical realizability, mainly in the logical language of Set Theory[40].

▶ *Realizing various forms of choice.* In earlier work [Kri03], J.-L. Krivine showed how the Axiom of Countable Choice could be realized using instructions which can be understood as implementing a clock. In [Kri08] he extended this work to a stronger form of choice, relating this properties with instructions which read and write in a global heap. This work needed an axiomatization of the structures required in his classical realizability, leading to the concept of *Realizability Algebra*. In [Kri11], J.-L. Krivine has extended this approach to Set Theory, for realizing a stronger choice principle. This work involves the construction of a model nicely combining classical realizability and forcing, on top of a classical realizability model. Munch studies a polarized version of realizability algebras with applications to normalization proofs. Herbelin investigated the computational content of the axiom of dependent choice in the presence of classical logic and expressed it in terms of call-by-need evaluation of a coinductive representation of universal quantification over natural numbers [Her12].

▶ *New models of ZF set theory.* Going in the opposite direction, J.-L. Krivine has also shown how to build classical realizability models in which the real line is "very far" from being well-orderable [Kri12b]. Such results seem out of reach of the standard forcing technique. More recently, J.-L. Krivine has considered models induced by realizability algebras coming from stable models and is exploring their properties.

▶ *Interactive realizability.* Programs extracted from classical proofs use control operators as a way to implement backtracking and processes of intelligent learning by trial and error. Such programs are often hard to write, difficult to understand and are *very inefficient*. To improve them, it is necessary to describe exactly what the programs learn and how this knowledge varies during the execution. A first step towards this goal is the theory of *Interactive Realizability*, based on a notion of *state*. Aschieri [Asc12] extended this semantics and discovered a new state passing style transformation. He is investigating a relation with the forcing semantics: it seems that his transformation is a very direct, new constructive formulation of forcing.

▶ *The computational contents of completeness proofs.* It is known from works on *normalization by evaluation* that completeness proofs for intuitionistic logic along models such as Beth models are basically tools to map proofs of the meta-language into proofs of an object language. This scales to classical logic if one considers models such as boolean algebras. However, the computational content of completeness for classical logic with respect to the truth-values model is of a different

[40] This research is supported by the ANR *Blanc* project Récré.

nature. Krivine started to investigate this topic in 1996. Herbelin and Ilik carried on this work and were able to extract a quite simple program which, when applied to a proof of validity of a first-order formula, produces a derivation of this formula.

► *Valid formulas, strategies and network protocols.* Legrandgérard and J.-L. Krivine associated a game with any formula of the predicate calculus, for which a winning strategy exists iff the formula is valid, and outlined an interpretation of these strategies in terms of network protocols, showing in particular that these protocols include some basic ones (*e.g.* acknowledgments) and can be composed [KL07b].

► *Sound axiomatization of Map Theory.* Map theory is a logical foundation of mathematics which replaces ZF set theory by the pure $\lambda$-calculus augmented with Hilbert's epsilon operator. Berline and K. Grue introduce in [BG12] a substantially simplified axiomatization of Map Theory called $MT$ and prove its consistency under the assumption that there exists an inaccessible ordinal. This is achieved by extending the minimal canonical model of a previous version $MT_0$ of Map Theory [BG97]. This establishes $MT$ as a reliable axiomatization of Map Theory.

### 3.8 Low level languages

An important question of a theoretical and practical nature is to extend the existing typing techniques from high level to low level languages. More specifically, one would like to establish that every the semantic properties of a high level program are preserved by compilation into machine code. To that purpose, A. Appel and D. McAllester have introduced in [AM01] a step-indexing technique where every type is interpreted as a set of machine code programs, each of them required to behave properly for a given number of computational steps. Together with A. Appel and his PhD student C. Richards, Melliès and Vouillon have provided clean semantic foundations to the model by understanding it as a Kripke model defined by a recursive equation between worlds and types. One main insight of this work is that the soundness property of the model (and thus the safety of the well-typed machine code) follows from the Gödel-Lob law satisfied by the necessity modality (called later) of the Kripke model. This idea has become mainstream in the field of low level language semantics [Ahm06, DAB09, BMSS11], and has been recently adapted by G. Jaber, Sozeau and N. Tabareau [JTS12] in order to define recursive types in Coq through a forcing layer.

### 3.9 Operadic tools in semantics

► *Monads for computational effects.* An important foundational question is to understand how proof theory (and more specifically linear logic) should integrate computational effects in a properly defined mathematical framework. A key ingredient is provided by the algebraic presentation by generators and relations of computational monads, typically for the state monad, as developed in [PP02]. This algebraic formulation is traditionally based on the assumption that the underlying monad is finitary in the category of sets. In order to adapt the notion of finitary monad to more sophisticated situations, typically the sheaf categories used to describe the local state monad, Melliès has advocated in [Mel12, BMW12] the use of *monads with arities* originally introduced by M. Weber in the field of higher dimensional algebra. Melliès introduces there the notion of algebraic theory in any category equipped with a notion of arities. The notion of algebraic theory with arities is then further investigated and applied to groupoids in collaboration with C. Berger and M. Weber [BMW12]. One main reason for introducing that framework is that the local store monad considered in [PP02] is a monad with arities in the category of presheaves [Inj, Set] equipped

with the finite sums of representables as arities. This notion of arities leads to the definition of *graded algebraic theory*, developed by Melliès, and to a graded algebraic presentation of local stores which provides a higher algebraic foundation to the pioneering work of Plotkin and Power [PP02].

► *Free models of operadic theories.* Melliès and Tabareau [MT08] developed a generic method to compute the free model $SA$ of an operadic theory generated by an object $A$ in a given monoidal category. The construction proceeds in two stages. First, one computes a coend formula providing a specific left Kan extension in the 2-category of categories, functors and natural transformations. Then, one shows that the formula defines in fact a left Kan extension in the 2-category of $T$-categories, $T$-functors and natural $T$-transformations, where $T$ is a 2-monad capturing a specific notion of operadic theory: genuine, symmetric, braided, algebraic. The construction was applied by Melliès, Tabareau and Tasson [MTT09, MTT10] in order to compute the free commutative comonoid $!A$ generated by an object $A$ in various models of linear or tensorial logic.

► *Operads and distributive laws.* From 2006 onwards, Curien became increasingly interested in the theory of operads and its generalizations. In [Cur12], inspired by conversations with M. Hyland, he shows how to decompose the notion of operad by means of two monads and a distributive law between them. Varying the monads, one gets known variants of the notion of operad, and one may suggest new ones.

► *Substitutions and isomorphisms.* Curien worked with M. Hofmann (Ludwig-Maximilians-Universität München) and R. Garner (MacQuarie University, Sydney) on comparing two categorical interpretations of Martin-Löf type theory both overcoming the following mismatch: syntax has exact substitutions, while categorical interpretations implements substitutions only up to isos. One can *strictify* the model [Hof94] or change the syntax by introducing explicit substitutions and type coercions [Cur93]. They showed that these approaches are related by an adjunction whose properties are still under study.

### 3.10 Homotopy theory and concurrency

Gaucher works on the relations between homotopy theory, in particular categorical homotopy theory, and concurrency in computer science. He has introduced several geometric models of concurrency, some of them variants of models studied by other authors: multipointed *d-spaces* [Gau09], topological locally presentable *higher dimensional transition systems* [Gau10b] and flows (identity-free small categories enriched over topological spaces). He has devoted a lot of work to model process algebras in this setting, the most challenging operation being of course parallel composition with synchronization [Gau08, Gau10a]. This necessitated the introduction of a new kind of degeneracy map [Gau10a] to make a non-functorial construction of [Gau08] functorial. A new homotopy theory for higher dimensional transition systems [Gau11] was introduced for that purpose, with tight connections with strong bisimulation. In [Gau09], he proved that Goubault's *globular CW-complexes* are the cellular objects of a combinatorial model category which provides a topological version of the model category of flows introduced by Gaucher in 2003. This proof adapted an idea of Fajstrup and Rosicky. Gaucher's recent work takes advantage of the most recent discoveries in model categories with non-standard class of cofibrations and illustrates the importance of topological categories.

### 3.11 Higher dimensional rewriting and homotopy theory

Higher-dimensional rewriting is a unified and computationally-oriented mathematical setting for various symbolic structures such as abstract, word and term rewriting systems, including first-order functional programs, Turing machines or Petri nets, (in Computer Science) and presentations of monoids, groups and algebraic theories, or braids and knot diagrams with Reidemeister moves (in Mathematics). It was initiated by Burroni [Bur93], followed by Lafont, Guiraud, Malbos, Métayer, Mimram and Rannou, see [Laf07, Mét03, Gui04, Gui06a, Gui06c, Gui06b, LR08, Mé08, BG09, GM09, Mim10, GM10a, GM10b, GM11].

► *Homotopy theory, rewriting and higher categories.* Métayer studies connections between rewriting, homotopy theory and higher categories. The original motivation lies in the following result by Squier [Squ87]: if a monoid $M$ can be presented by a finite, confluent and terminating rewriting system, then its third homology group $H_3(M)$ is of finite type. The key observation is that each rewriting system generates a space of computations naturally endowed with a structure of strict higher category, whence the idea of looking for homological or homotopical invariants of the latter. A major conceptual clarification was obtained by Y. Lafont, K. Worytkiewicz and Métayer in [LMW10], describing a natural ("folk") model structure on the category of strict higher categories. This new framework subsumes polygraphic resolution [Mét03], and cofibrant objects may be characterized as free higher categories on polygraphs [Mé08]. The homotopical invariance of polygraphic resolutions leads to the notion of *polygraphic homology* for higher categories shown by Y. Lafont and Métayer [LM09] to coincide with the usual definition in case of monoids.

► *Normalization strategies and polygraphic resolutions.* In a parallel line of work, Guiraud and Malbos interpreted Squier's construction in higher-dimensional rewriting, extending it from dimension 2 (words) to higher dimensions [GM09]. They gave an explicit way of building higher cells using overlaps of higher rewriting rules [GM10b] based on a mathematical understanding of *normalization strategies* in every dimension and yielding an algorithmic way to build a polygraphic resolution as defined in [Mét03]. This notion of polygraphic resolution has become a central element of the homotopical study of higher categories: it enables to build explicit resolutions for the formalization of mathematical objects (typically to allow symbolic computations in them) as well as the computation of homotopical and homological invariants, for convergence analysis and classification of normalization strategies.

► *Higher groupoids.* In collaboration with D. Ara (IMJ) Métayer was able to transfer the folk model structure from strict higher categories to strict higher groupoids. They prove in [AM11] that the resulting model structure on strict higher groupoids coincides with the model structure defined by Brown and Golasinski via crossed complexes [BG89].

## 4 Theme: Modeling, Analyzing and Conceiving Systems

► *Participants (permanents).* Abbes, Amadio, Balat, Castagna, Chroboczek, Di Cosmo, Harmer, Krivine (Jean), Legrandgérard, Manoury, Ruet, Treinen, Varacca, Vouillon, Zacchiroli.

### 4.1 Models for system biology

► *Foundation of rule-based modeling.* Rule-based modeling, such as with the $\kappa$-calculus, is a graph rewriting formalism with expressive patterns that enable one to describe a wide family of biological

observables with a single expression. The modeling style of $\kappa$ allows one to describe models of very large systems but it also requires fine analysis tools such as abstract interpretation, refinement techniques and causality analysis that Jean Krivine, Harmer and V. Danos contributed to develop [MDF+10, DFF+10, DFF+09a, DFF+07, DFFK08, DFF+08, DFF+09b][41]. Curien, V. Danos, Jean Krivine and Zhang studied the expressiveness of $\kappa$ and proved that any set of transformation rules can be simulated by rules each involving at most two nodes [CDKZ08][42].

To establish a proof of concept of the use of $\kappa$ in modelling real biological systems, Harmer developed a large model (about 300 rules) of the so-called `erbB` signalling network. Harmer, V. Danos, J. Feret, Jean Krivine and W. Fontana, analyzed the ways in which causal properties of this model impact upon its dynamics [DFFK07].

Sometimes, a modeler might wish to replace a rule by more specific sub-cases. However, in order to do this, we must identify the appropriate collection of non-overlapping sub-cases. This is called a *neutral refinement*. Harmer, V. Danos, E. Murphy, J. Feret, Jean Krivine and W. Fontana have developed a theory of rule refinement that enables the determination of the neutral refinement of a rule [DFF+08, MDF+10, DFF+10].

The work on rule refinement included the definition of a category of *site graphs* and embeddings in order to discuss the question of the instances of a rule in a site graph and its symmetries. Harmer, V. Danos and G. Winskel developed a major generalization of the previous categorical formulation in order to define the side-effect-free fragment of $\kappa$ in purely categorical terms [DHW11]. Harmer has developed a meta-language for $\kappa$ in order to allow the direct representation of shared interactions: the modeler describes a *hierarchy* of agents and writes *generic* rules that may mention any agent [DFF+09a, Har09].

A $\kappa$-model determines a dynamical system. This system may have many dimensions which can be reduced by performing a static analysis: if a collection of molecules cannot be distinguished by the rules, they may be grouped together. Harmer, J. Feret, V. Danos, Jean Krivine and W. Fontana have developed two distinct methods for performing such *coarse-graining* [FDK+09, DFF+10, HDF+10].

► *Tools.* All theoretical concepts presented have also been integrated in KaSim, a tool for the simulation and analysis of biological systems modeled in $\kappa$ [DFFK07, KDB09]. Krivine and J. Feret (ENS Ulm/INRIA) are the main developers of this tool which is available under the LGPL license and freely downloadable on GitHub[43]. It has around a hundred downloads at each new release of the binaries, plus the advanced users who regularly download the sources. KaSim was used by the Edinburgh team who won the *IGEM best model prize* in 2010 and 2011[44].

## 4.2 Models for concurrency

► *Determinacy in synchronous languages.* The original model of synchronous reactive programming (SL) [BdS96] assumes that signals are *pure* in the sense that they carry no values[45]. In this case, the computation is naturally *deterministic* and bisimulation coincides with trace equivalence.

[41] This research is supported by the ANR *Bioinformatique* project Iceberg.

[42] This research was supported by the *Programme franco-chinois de recherche avancée* project *Types, processus et leurs applications en sécurité et systèmes biologiques*.

[43] `http://github.com/jkrivine/KaSim/downloads`

[44] `http://igem.org/Main_Page`

[45] This research was supported by the ANR *Sécurité, Systèmes Embarqués et Intelligence Ambiante* ParSec project.

Amadio [Ama07a] has proposed an extension of the SL model where signals carry signal names. The model is called S$\pi$-calculus (S for synchronous). He showed that the notion of bisimulation developed for the (deterministic) SL language [Ama07b] is sufficiently robust to be extended to the S$\pi$-calculus. In the framework of *timed* CCS, Amadio [Ama09a] provided a characterisation of this bisimulation via the usual labelled transition system. Using this semantic framework, Amadio and Dogguy [AD09] studied determinism and confluence in the S$\pi$-calculus: the two notions turn out to be equivalent. They designed then a decidable type system [AD08] for the S$\pi$-calculus which allows to enforce statically a local confluence property. The type system is based on a notion of *affine usage* inspired by LL [ABM10].

Dogguy [Dog12] has continued this line of work by developing a type system which enforces confluence and determinism for a *timed* version of the $\pi$-calculus (called Tapis) where interaction is based on *channels* rather than on *signals*. Dogguy and Glondu have formalized in the Coq proof assistant the calculus and the type system along with a proof of subject reduction[46].

► *Handshake Protocol.* The Handshake protocol is an informal discipline for asynchronous communication. It was formalised by VanBerkel [VB93], but Fossati [Fos07] discovered that VanBerkel's composition of protocols is not associative. Together with Varacca who supervised part of his PhD work, they proposed another model that could account for all Handshake protocols, using a special form of Petri Nets [FV09a]. A second more syntactic model of the protocol was proposed, using a process calculus [FV09b].

► *Bigraphical reactive systems.* Bigraphical reactive systems (BRSs) are conceived as a unifying framework for designing models of concurrent and mobile systems. These reactive systems are construed as a set of rewriting rules together with an initial bigraph on which the rules operate. Jean Krivine developed a stochastic semantics for Bigraphical Reactive Systems [KMT08b] and suggested possible applications to the modeling of biological systems involving membrane interactions. This work led Jean Krivine to define later an algebraic graph rewriting formalism capturing compartments in the style of bigraphs and adjusted to the specific needs of biological systems [DHK12].

### 4.3 Models of service-oriented programming

A method for writing specifications for distributed software is to describe the behavior by means of *contracts*. A particular kind of contracts are those defined by using process algebras. The research on contracts is, thus, at the frontier between concurrency theory and service-oriented programming. On the one hand, Castagna, R. De Nicola, and Varacca have studied some aspects of concurrency theory, in particular how to define subtyping relations in the context of higher-order process algebras, resulting in the definition of $\mathbb{C}\pi$, an extension of the $\pi$-calculus by semantic subtyping [CDNV08]. On the other hand, Castagna, N. Gesbert, and L. Padovani developed a theory of contracts, that aims at defining in a formal way a notion of "compatibility" between clients and services, as well as ensuring safety aspects of service evolution and replacement [CGP08, CGP09]. Once the theoretical foundations have been settled, the research has followed several directions. One direction aimed at enriching contracts so as they could better model some aspects of service interactions, such as the specification of order preserving asynchronous communications [CP09a] A second direction aimed at using the theory of contracts to model financial contracts, a work that PPS has developed in collaboration with Lexifi, in the context of Froissart's master thesis. A last

[46] This is a rather challenging development available at
http://www.pps.jussieu.fr/~dogguy/~research/tapis

direction aimed for a better comparison between *contracts* and *session types*. The latter provide an alternative formalism to specify the behavior of services. Castagna, Giachino, M. Dezani, and L. Padovani, in the context of Giachino's PhD [Gia09], have developed a semantic characterization of the theory of session types which, up to that point, had only syntactic definitions [CDCGP09]. This study not only provides a mathematical foundation to session types, but also closes the gap between them and contracts. Castagna and L. Padovani have extended the theory of contracts with the main characteristic that contracts lacked with respect to session types, that is, higher-order capabilities [CP09b].

This has paved the way to the definition of a paradigm for describing global interactions that could be compatible both with contracts and with session types. This has resulted in the definition by Castagna, Dezani, and Padovani of global types for multi-party sessions [CDCP12, CDCP11].

## 4.4 Models for reversibility and causality

▶ *Causal Models.* Varacca provided an event structure semantics of the $\pi$-calculus. Together with N. Yoshida he had previously devised an event structure model for a linearly typed version of the calculus [VY10]. In two steps, Varacca, S. Crafa and N. Yoshida designed a model for the full calculus. First, a model for the *internal* fragment of the calculus was proposed [CVY07] which was later extended to the full calculus [CVY12].

▶ *Reversibility and concurrency.* In systems where distributed consensus needs to be found, no solution can be implemented without letting participants backtrack their local choices. Programming such consensus in a language that has a native reversible semantics eases both the implementation and the verification of produced code[47]. As a first result, Jean Krivine has proposed a benchmark that compares the "traditional" approach, which consists in implementing the dining philosopher problem using *ad hoc* reversible moves, with the one that benefits from the native reversibility of RCCS, a symmetrization of the operational semantics of Milner's CCS. The benchmarks show that the size of the LTS of the *ad hoc* code is exponential with respect to the size of the specification LTS, while the RCCS induced LTS scales linearly with the specification [Kri12a].

## 4.5 Probabilistic systems

The work of Abbes explores probabilistic models for concurrency based on trajectories where events are partially ordered by time[48]. The two models he has considered are safe Petri nets and their associated event structures and trace semigroups.

▶ *Topological and measurable structures for event structures and trace semigroups.* The probabilistic layers to be put on top of these two families of models are based on a natural topological structure. Both the topological and the measurable nature of the space of configurations can be investigated through a projective limit of finite sets, as shown in [Abb07]. The model of trace semigroups consists of the quotient of finitely generated semigroups under trace equivalence relations of the form $ab = ba$. The completion of the elements of the semigroup under the order structure has been the topic of [Abb08].

[47] In this context of research, Jean Krivine answered the ANR call *Ingéniérie Numérique et Sécurité 2011* and obtained the funding of the REVER ANR-11-INSE-007 project of which he is the main coordinator for the PPS partner.

[48] This work has been supported by the ANR *Blanc* project Panda.

▶ *Probabilistic models for distributed systems.* Abbes elaborated a model for probabilistic Petri nets based on the notion of *branching cells*. A restriction of his construction was that the corresponding event structure should be locally finite. The generalisation to the general case has been the topic of [AB09]. The ergodic theory of probabilistic Petri nets has been studied in [AB08]. The main contribution of the paper is a Law of Large Numbers (LLN) in the context of asynchronous systems, in a partially ordered time. It is based on the LLN for Markov chains.

▶ *Introduction of a new model.* A new direction of research has been explored by considering the problem of composing Markov chains. The trace semigroup model is adapted to this problem. Composition of Markov chains has been the subject of [Abb10], currently submitted for publication. The extension of the same problem to more than two chains introduces new technical challenges. The very existence of Markov multi-components processes on more than two sites is non trivial. This first problem has been solved in the research report [Abb11], justifying additional work to come.

### 4.6 Blazons

A surprising observation made by Manoury is that the *blazons* used by heraldists to describe emblems can be considered as programs describing very accurately these pictures in a hierarchical way [Man10][49].

### 4.7 Package-based software deployment and installation

Software packages are today ubiquitous in software deployment, most prominently in the form of packages known from Free and Open Source (FOSS) software distributions. Managing large amounts of software packages is a major challenge for the editors of software distributions and for the system administrators.

The activities of PPS on the management of large sets of software packages were structured by several cooperation projects. PPS participated in the European (FP 6) research project *Environment for the Development and Distribution of Open Source Software (EDOS)* which focused on several aspects of software packages from the point of view of the distribution editor and which terminated in July 2007. Di Cosmo from PPS was leader of WP2 which investigated the logical relations between software packages expressed in their so-called *meta-data*, like dependencies and conflicts. The final phase of the project was dedicated to turn the tools developed by the team into a service integrated into the Debian distribution development[50].

The EDOS project opened up research questions that have been the basis of the Mancoosi project (*Managing the Complexity of the Open Source Infrastructure*), which was funded by the European Commission in the FP 7 framework, and ran from February 2008 to May 2011. This project involved six academic partners and four industrial partners from six different countries, and was coordinated by Di Cosmo.

The Mancoosi project focused on managing upgrade problems from the point of view of a system administrator [DCZT08]. PPS contributed in particular to two aspects of the projects. Di Cosmo and Zacchiroli cooperated with the project site L'Aquila on using model-driven techniques to model the state of a system and the effect of executing *maintainer scripts*, *i.e.* small customized programs that get executed during installation and removal of software packages [CDRP+09, DRPPZ09,

[49] http://www.pps.univ-paris-diderot.fr/~eleph/Recherche/Hrld/img-dbs/index.html

[50] see edos.debian.net

DCDRP+11]. Abate, Di Cosmo, Treinen and Zacchiroli contributed to WP5, of which Treinen from PPS was the leader, on the organization of an international competition of upgrade problem solvers. They cooperated with the industrial partners of the project in the establishment of a data base of upgrade problem instances [AT11a], and organized an international competition of solvers [AT11b, ACTZ12] which took place in 2010, 2011 and 2012[51]. An important outcome of this project was the definition of CUDF as a common data interchange format for upgrade and installation problems [ADCTZ11, ACTZ12]. CUDF allows to encode several existing formats of package metadata like the ones used by Debian, RedHat and Eclipse [AGL+10], and also problems from related areas like feature diagrams in software product lines [DCZ10]. Furthermore, a prototype of a domain-specific language for defining user preferences in solving upgrade problems was proposed [TZ09].

An important line of work consists in analyzing complex package relationships according to the semantic properties in the context of a complete package repository. This program was started by Abate, Boender, Di Cosmo and Zacchiroli with the works on so-called *strong* — *i.e.* logically implied — conflicts and dependencies [ABDCZ09, CB10, Boe11]. Di Cosmo and Vouillon have shown how semantic properties of package relations can be exploited in order to make the logical problems of package installability representable in a very compact and understandable way. The algorithm behind the coinst tool [VDC11] yields a very understandable representation of a package repository, Abate, Di Cosmo, Treinen and Zacchiroli have shown how to detect logical flaws in package repositories by using temporal properties [ADC11, ADCTZ12].

Production and dissemination of software is an integral part of research that aims at improving software tools. The research performed in this theme has lead to the creation of software tools that are all available as Free Software, like the coinst tool[52] developed by Vouillon, the libcudf library[53] developed by Zacchiroli, and the dose library and toolsuite[54] developed mainly by Abate and Boender which comprises a collection of software that results form the EDOS and Mancoosi projects. Dissemination activities target both the scientific community, as with the series of LoCoCo workshops (*Logics for Component Configuration*) initiated by the Mancoosi project, and the FOSS community through journals [Tre09] and meetings [TZ08, DCDB+08] of the FOSS community.

The line of work started with EDOS and Mancoosi finds its natural continuation in two ongoing collaborative projects, Dorm[55] and Aeolus[56].

### 4.8 Programming for the Web

The main goal of this research, performed by Balat and his group, is to adapt Web programming techniques to the current evolution of the Web where browsers have become powerful virtual machines in which more and more programs are executed. The approach consists mainly in using abstractions to provide higher level programming techniques for the Web, and employing sophisticated typing features to create reliable Web applications and make them easy to maintain. Finally

[51] http://www.mancoosi.org/misc/

[52] coinst.irill.org

[53] http://www.mancoosi.org/cudf/

[54] http://www.mancoosi.org/software/#index2h1

[55] The DORM project is applying the expertise on components dependencies to industrial problems related to the management of software repositories, in particular in the Java world.

[56] The Aeolus project, funded by ANR in the *Arpege* program, aims at lifting the results obtained to the even more complex situation of computing services provided by a dynamic collection of machines.

they provide a new unified approach to program both the client and server parts of a Web application as a single program.

Most of the research results of the group are implemented and distributed widely as free software in the Ocsigen Web framework for the Ocaml language [BVY09]. Ocsigen is now used by several companies, like BeSport or MetaWeb (both San Francisco), Li-Cor (Lincoln, Nebraska), Hypios (Paris), etc. Several startups are currently being created using the framework.

► *Programming traditional Web interaction.* The first of their results concerns traditional Web interaction, that is: programming links, forms, back button, bookmarkable pages, etc[57]. This resulted in proposing a new model called *service based Web programming*. A service is a kind of function invoked in reaction to an HTTP request and that usually returns a Web page. The most striking feature is the service identification mechanism they propose [Bal09a, Bal09b], that is, the way the server choses the service to be executed to handle a request. Another very convenient feature is the ability to dynamically create new services, for example services customized to one user and that depend on previous interactions with him. This simplifies a lot programming sequences of pages, each depending on the previous ones and is usually known as *continuation based Web programming*. This service model has been implemented for Ocaml in the Eliom module of Ocsigen. They also worked on filling the gap between Eliom and the CDuce language by working on a CDuce version of Eliom, called OcCDuce[58].

► *Executing programs in a Web browser.* Today, most Web developers are using distinct languages for programming traditional Web interaction (*e.g.* forms, links and bookmarks) and client side features.

A significant step towards the implementation of Web applications as a single Ocaml program is to allow for Ocaml programs to run inside a browser. Two techniques have been experimented: one consists in programming in Javascript an Ocaml virtual machine, to run Ocaml bytecode programs inside a browser without recompiling them [CBC08, CCV12][59]. The second one consists in writing a compiler from Ocaml to Javascript (called Ocsigen Js_of_OCaml)[60]. More precisely, an original approach has been followed, consisting in taking Ocaml's bytecode as the source of the compiler [CCV12] which becomes very easy to maintain (as the bytecode is not evolving a lot) and also very easy to use: any Ocaml program may now be compiled to Javascript, to be used in a browser. This compiler produces programs with excellent performance on modern browsers, they run typically faster than the original bytecode version.

► *Client-server Web applications in Ocaml.* Balat, Chambart and Henry developed the possibility of writing client-server Web applications as a single program [BCH12]. Web programs are written like ordinary desktop applications, interfaces are built in the usual declarative way and sent together with the code corresponding to dynamic parts.

► *Typed Web programming.* Ocsigen's developers faced a few missing features in Ocaml's serialisation mechanism. Chambart and Henry proposed two patches on the Ocaml compiler: one to allow serialising closures with dynamic linking, and the other one introducing some kind of dynamic types. An essential use of static typing in Ocsigen is for checking at compile time the validity of functions generating HTML, thus guaranteeing that Ocsigen programs always generate pages that respect the W3C recommendations [Can11].

[57] ANR project PFW.

[58] ANR project Codex, Section 2.2.

[59] This research was supported by the DIM *logiciels et systèmes complexes* project PWT.

[60] This research is supported by the ANR project PWD.

▶ *Other software projects.* Besides Eliom and Js_of_OCaml, the Ocsigen team wrote several other pieces of software: Lwt, a monadic cooperative threading library which is now widely used amongst Ocaml's community (Vouillon)[61]; Ocsigen server, an extensible Web server written in Ocaml (Balat, Vouillon, Yakobowski); Macaque, a library for type safe database queries in Ocaml using *comprehensions* (Vouillon, Scherer); O'Closure, a binding for the Google Closure Library (Cardoso, Vouillon); Ocsimore, a wiki and content management system (Balat, Yakobowski, Becker)[62].

## 4.9 Networks, Concurrency

▶ *IPv6.* Since 1996, Legrandgérérard is a member of the G6[63] group, whose objective is to experiment and implement the new internet protocol IPv6 which will replace the current IPv4 protocol whose stock of adresses is almost exhausted. He was very active in the IPv6 Renater 2 project which led to the creation of a native IPv6 network within the Renater[64] infrastructure. He has worked in particular on the DNSv6 service (Domain Name Service with IPv6 extensions).

▶ *Continuation Passing C.* CPC [KC11, KC12a, Chr12] is an extension of the C programming language designed to easily write extremely lightweight and efficient concurrent programs, most notably network servers and peers in distributed systems. CPC is implemented as a series of source-to-source transformations familiar from programming language semantics, notably $\lambda$-lifting and a CPS transform. Although CPC is an extension of C, a language notoriously hostile to formal treatment, the correctness of the core of CPC has been formally proved [KC12a]. The most difficult part of this proof is the correctness of (a particular case of) $\lambda$-lifting in a CBV imperative language, a novel result of intrinsic theoretical interest [KC12b].

In order to show that CPC is usable in practice by non-specialists, Chroboczek and Kerneis have supervised two undergraduate students writing a highly-concurrent implementation of the BitTorrent file transfer protocol in it. The resulting program, called Hekate, is of production quality, and has successfully (and legally) served gigabytes of data over many weeks.

▶ *BitTorrent DHT.* One of the many sub-protocols found in BitTorrent uses a distributed hashtable (DHT) using a variant of the Kademlia algorithm. Hekate uses a home-brew implementation of the DHT sub-protocol (written by Chroboczek), which has been separated into a stand-alone library. This work has lead to the publication of the specification of the BitTorrent DHT's operation over IPv6 [Chr09], a specification implemented by multiple implementations of BitTorrent .

▶ *Babel and Babel-Z.* Chroboczek's experiments with large-scale distributed systems have lead to the design of Babel, a distance-vector routing protocol designed to be efficient and robust in both classical wired networks and wireless mesh networks (MANETs)[65]. Babel has gone through a number of iterations, but the basis has been stable for over two years now; the protocol has been published as an IETF[66] "Request for Comments" (RFC), RFC 6126. In small networks, Babel has been shown to be more efficient than the best community-driven protocols for mesh networks. While Chroboczek is aware of a number of evaluations of Babel in larger networks (up to a few

[61] This research was supported by the ANR *Jeunes chercheurs, jeunes chercheuses* project Programmation fonctionnelle pour le web.

[62] The full list of software projects of this group is available on http://ocsigen.org.

[63] See http://g6.asso.fr/.

[64] National Network for Education and Research.

[65] This research has been supported by the PICRI programme of *Région Île de France*.

[66] http://www.ietf.org/

thousand nodes), these are proprietary industrial deployments and the results have not been made available to him.

Babel-Z is an experimental variant of Babel which is able to use multiple radio frequencies in order to load-balance traffic in wireless mesh networks. Routing on varying frequencies raises a number of difficult theoretical problems (the *isotonicity* of the routing metric is violated) which have been little studied and are not well understood. Initial experiments with Babel-Z show promising results.

### 4.10 Software safety

Recently, Esterel Tech. decided to use the Ocaml language for the development of a code generator for critical embedded systems (typically for avionics and other real time critical applications). Manoury acted as an expert in functional programming languages, writing a technical report on code traceability in the Ocaml compiler. This report has served as a basis for Esterel Tech.'s engineers to produce the test sets and documentations required by the civil avionics authorities [PAM+09]. A natural approach to produce secure programs for real time critical embedded applications consists in using previously certified components. Manoury worked on the extension the refinement model of method B in order to take such components into account[67].

## 5 Appendix: Publications and Software productions

Names of co-authors not affiliated to PPS are written in italic.

### Journals


[AB08a] Samy Abbes and *Albert Benveniste*. Probabilistic true-concurrency models: Markov nets and a Law of large numbers. *Theoretical Computer Science*, 390:129–170, 2008. doi:10.1016/j.tcs.2007.09.018. 38

[Abb07] Samy Abbes. A projective formalism applied to topological and probabilistic event structures. *Mathematical Structures in Computer Science*, 17(4):819–837, 2007. doi:10.1017/S096012950700607X. 38

[Abb08] Samy Abbes. On Countable Completions of Quotient Ordered Semigroups. *Semigroup Forum*, 77(3):482–499, 2008. doi:10.1007/s00233-008-9111-3. 38

[ACTZ12] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. Dependency solving: a separate concern in component evolution management. *Journal of Systems and Software*, October 2012. To appear. 39

[AK12a] *Beniamino Accattoli* and Delia Kesner. Preservation of strong normalisation modulo permutations for the structural lambda-calculus. *Logical Methods in Computer Science*, 8(1:28):1–44, 2012. 18

[AM11] *Dimitri Ara* and François Métayer. The Brown-Golasinski model structure on strict $\infty$-groupoids revisited. *Homology, homotopy and Applications*, 13(1):121–142, 2011. 35


[67]This research is supported by the ANR *Arpège* Cercles 2 project.

[Ama07a] Roberto M. Amadio. A synchronous pi-calculus. *Information and Computation*, 205(9):1470–1490, 2007. 36

[Ama07b] Roberto M. Amadio. The SL synchronous language, revisited. *Journal of Logic and Algebraic Programming*, 70:121–150, 2007. 36

[BCEM12] Antonio Bucciarelli, Alberto Carraro, Thomas Ehrhard, and *Giulio Manzonetto*. Full abstraction for resource calculus with tests. *Logical Methods in Computer Science*, 2012. To appear.

[BEM12] Antonio Bucciarelli, Thomas Ehrhard, and *Giulio Manzonetto*. A relational semantics of parallelism and non-determinism in a functional setting. *Annals of Pure and Applied Logic*, 163(7):918–934, 2012.

[BHKM11] *Nick Benton*, Chung-Kil Hur, *Andrew Kennedy*, and *Conor McBride*. Strongly typed term representations in Coq. *Journal of Automated Reasoning*, doi:10.1007/s10817-011-9219-0 (Online First), 2011.

[BKS12] *Ana Bove*, *Alexander Krauss*, and Matthieu Sozeau. Partiality and Recursion in Interactive Theorem Provers - An Overview. *Mathematical Structures in Computer Science*, 2012. 21

[BMS09] Chantal Berline, Giulio Manzonetto, and *Antonio Salibra*. Effective lambda-models vs recursively enumerable lambda-theories. *Mathematical Structures in Computer Science*, 19(5):897–942, 2009.

[BMW12] *Clemens Berger*, Paul-André Melliès, and *Mark Weber*. Monads with arities and their associated theories. *Journal of Pure and Applied Algebra*, 216(8-9):2029–2048, 2012. doi:10.1016/j.jpaa.2012.02.039. 33

[BS08] Antonio Bucciarelli and *Antonino Salibra*. Graph Lambda Theories. *Mathematical Structures in Computer Science*, 18(5):975–1004, 2008. 31

[BW11] *Michael Batanin* and Mark Weber. Algebras of higher operads as enriched categories. *Applied Categorical Structures*, 19(1):93–135, 2011.

[CDCP12] Giuseppe Castagna, *Mariangiola Dezani-Ciancaglini*, and *Luca Padovani*. On global types and multi-party sessions. *Logical Methods in Computer Science*, 8(1):1–45, 2012. doi:10.2168/LMCS-8(1:24)2012. 37

[CDKZ08] Pierre-Louis Curien, Vincent Danos, *Jean Krivine*, and Min Zhang. Computational self-assembly. *Theoretical Computer Science*, 404((1-2)):61–75, 2008. 35

[CDNV08] Giuseppe Castagna, *Rocco De Nicola*, and Daniele Varacca. Semantic subtyping for the pi-calculus. *Theoretical Computer Science*, 398(1-3):217–242, 2008. doi:10.1016/j.tcs.2008.01.049. 37

[CF12] Pierre-Louis Curien and Claudia Faggian. An approach to innocent strategies as graphs. *Information and Computation*, 214:119–155, 2012. 25, 28, 29

[CGP09] Giuseppe Castagna, *Nils Gesbert*, and *Luca Padovani*. A theory of contracts for Web services. *ACM Transactions on Programming Languages and Systems*, 31(5):1–61, 2009. doi:10.1145/1538917.1538920. 37

[CH09a] Pierre Clairambault and Russ Harmer. Totality in arena games. *Annals of Pure and Applied Logic*, 161(5):673–689, 2009. doi:10.1016/j.apal.2009.07.016. 28

[CS12a] Alberto Carraro and *Antonino Salibra*. Easy lambda-terms are not always simple. *RAIRO Theoretical Informatics and Applications*, 46(2), 2012. doi:10.1051/ita/2012005.

[DCDCGM10] Roberto Di Cosmo, *Mariangiola Dezani-Ciancaglini*, *Elio Giovannetti*, and *Tatsuta Makoto*. On isomorphisms of intersection types. *ACM Transactions on Computational Logic*, 11(4):1–24, 2010. doi:10.1145/1805950.1805955.

[DCDRP+11] Roberto Di Cosmo, *Davide Di Ruscio*, *Patrizio Pelliccione*, *Alfonso Pierantonio*, and Stefano Zacchiroli. Supporting software evolution in component-based FOSS systems. *Science of Computer Programming*, 76(12):1144–1160, 2011. doi:10.1016/j.scico.2010.11.001. 39

[DCGPV08] *Mariangiola Dezani-Ciancaglini*, *Silvia Ghilezan*, *Jovanka Pantovic*, and Daniele Varacca. Security Types for Dynamic Web Data. *Theoretical Computer Science*, 402(2-3):156–171, 2008.

[DCLP07] Roberto Di Cosmo, Zheng Li, and *Susanna Pelagatti*. A calculus for parallel computations over multidimensional dense arrays. *Computer Languages, Systems and Structures*, 33(3-4):82–110, 2007.

[DCLPW08] Roberto Di Cosmo, Zheng Li, *Susanna Pelagatti*, and *Pierre Weis*. Skeletal Parallel Programming with OCAMLP3L 2.0. *Parallel Processing Letters*, 18(1):149–164, 2008.

[DD08] Vincent Danos and *Elie D'Hondt*. Classical knowledge for quantum cryptographic reasoning. *Electronic Notes in Theoretical Computer Science*, 192(3):39–58, 2008.

[Den07] Yuxin Deng. Axiomatizations for probabilistic finite-state behaviors. *Theoretical Computer Science*, 373(1-2):92–114, 2007.

[DFF+09a] *Vincent Danos*, *Jérôme Feret*, *Walter Fontana*, Russ Harmer, and *Jean Krivine*. Rule-Based Modelling and Model Perturbation. *Transactions on Computational Systems Biology*, 5750:116–137, 2009. doi:10.1007/978-3-642-04186-0_6. 35, 36

[DGF08] *Paolo Di Giamberardino* and Claudia Faggian. Proof nets sequentialisation in multiplicative linear logic. *Annals of Pure and Applied Logic*, 155(3):173–182, 2008. 25

[DGLGZ11] Mehdi Dogguy, Stephane Glondu, *Sylvain Le Gall*, and Stefano Zacchiroli. Enforcing Type-Safe Linking using Inter-Package Relationships. *Studia Informatica Universalis*, 9(1):129–157, 2011.

[DKP07] Vincent Danos, *Elham Kashefi*, and *Prakash Panangaden*. The Measurement Calculus. *Journal of the ACM*, 54(2), 2007.

[DL07] *Roy Dyckhoff* and Stéphane Lengrand. Call-by-Value Lambda-calculus and LJQ. *Journal of Logic and Computation*, 17(6):1109–1134, 2007.

[DL08a] Joachim De Lataillade. Curry-style type Isomorphisms and Game Semantics. *Mathematical Structures in Computer Science*, 18(4):647–692, 2008.

[DL08b] Joachim De Lataillade. Second-order type isomorphisms through game semantics. *Annals of Pure and Applied Logic*, 151(2-3):115–150, 2008.

[DLLT08] *Stéphanie Delaune*, *Pascal Lafourcade*, *Denis Lugiez*, and Ralf Treinen. Symbolic Protocol Analysis for Monoidal Equational Theories. *Information and Computation*, 206(2-4):312–351, 2008. doi:10.1016/j.ic.2007.07.005.

[DMS10] *Olivier Delande*, *Dale Miller*, and Alexis Saurin. Proof and Refutation in MALL as a game. *Annals of Pure and Applied Logic*, 161(5):654–672, 2010. doi:10.1016/j.apal.2009.07.017.

[ED11] Thomas Ehrhard and *Vincent Danos*. Probabilistic coherence spaces as a model of higher- order probabilistic computation. *Information and Computation*, 152(1):111–137, 2011. 31

[Ehr12a] Thomas Ehrhard. The Scott model of Linear Logic is the extensional collapse of its relational model. *Theoretical Computer Science*, 424:20–45, 2012. doi:10.1016/j.tcs.2011.11.027. 30

[EKF$^+$12] *Deeds J. Eric*, Jean Krivine, *Jérôme Feret*, *Vincent Danos*, and *Walter Fontana*. Combinatorial complexity and compositional drift in protein interaction networks. *PloS ONE*, 7(3), 2012. doi:10.1371/journal.pone.0032032.

[EL10a] Thomas Ehrhard and Olivier Laurent. Acyclic Solos and Differential Interaction Nets. *Logical Methods in Computer Science*, 6(3), 2010. doi:10.2168/LMCS-6(3:11)2010. 26

[EL10b] Thomas Ehrhard and *Olivier Laurent*. Interpreting a finitary pi-calculus in differential interaction nets. *Information and Computation*, 208(6):606–633, 2010. doi:10.1016/j.ic.2009.06.005. 26

[ER08] Thomas Ehrhard and *Laurent Regnier*. Uniformity and the Taylor expansion of ordinary lambda-terms. *Theoretical Computer Science*, 403(2-3):347–372, 2008. doi:10.1016/j.tcs.2008.06.001.

[FB11] Claudia Faggian and *Michele Basaldella*. Ludics with repetitions (Exponentials, Interactive types and Completeness). *Logical Methods in Computer Science*, 7(2):1–85, 2011. 29, 31

[FCB08] *Alain Frisch*, Giuseppe Castagna, and *Véronique Benzaken*. Semantic subtyping: Dealing set-theoretically with function, union, intersection, and negation types. *Journal of the ACM*, 55(4):1–64, 2008. doi:10.1145/1391289.1391293. 19

[FDK+09] *Jérôme Feret*, *Vincent Danos*, *Jean Krivine*, Russ Harmer, and *Walter Fontana*. Internal coarse-graining of molecular systems. *Proceedings of the National Academy of Sciences of the United States of America*, 106(16), 2009. doi:10.1073/pnas.0809908106. 36

[FH11] *Marcelo Fiore* and Chung-Kil Hur. On the mathematical synthesis of equational logic. *Logical Methods in Computer Science*, 7(3:12), 2011.

[FK07] *Julien Forest* and Delia Kesner. Expression Reduction Systems with Patterns. *Journal of Automated Reasoning*, 39(4):513–541, 2007. 17

[Gau07a] Philippe Gaucher. T-Homotopy and Refinement of Observation, Part II: Adding New T-Homotopy Equivalences. *International Journal of Mathematics and Mathematical Sciences*, 2007, 2007. doi:10.1155/2007/87404.

[Gau08a] Philippe Gaucher. Globular realization and cubical underlying homotopy type of time flow of process algebra. *New York Journal of Mathematics*, 14:101–137, 2008.

[Gau08b] Philippe Gaucher. Towards a homotopy theory of process algebra. *Homology, homotopy and Applications*, 10(1):353–388, 2008. 34

[Gau09a] Philippe Gaucher. Homotopical interpretation of globular complex by multipointed d-space. *Theory and Applications of Categories*, 22(22):588–621, 2009. 34

[Gau09b] Philippe Gaucher. T-homotopy and refinement of observation (I) : Introduction. *Electronic Notes in Theoretical Computer Science*, 230:103–110, 2009.

[Gau10a] Philippe Gaucher. Combinatorics of labelling in higher dimensional automata. *Theoretical Computer Science*, 411(11-13):1452–1483, 2010. doi:10.1016/j.tcs.2009.11.013. 34

[Gau10b] Philippe Gaucher. Directed algebraic topology and higher dimensional transition system. *New York Journal of Mathematics*, 16:409–461, 2010. 34

[Gau11a] Philippe Gaucher. Towards a homotopy theory of higher dimensional transition systems. *Theory and Applications of Categories*, 25(12):295–341, 2011. 34

[GM12] Yves Guiraud and Philippe Malbos. Higher-dimensional normalisation strategies for acyclicity. *Advances in Mathematics*, 231(3-4):2294–2351, 2012. Available from: http://hal.archives-ouvertes.fr/hal-00531242, doi:10.1016/j.aim.2012.05.010.

[Gou07] Eric Goubault. Components of the Fundamental Category II. *Applied Categorical Structures*, 2007.

[HDF+10] Russ Harmer, Vincent Danos, *Jérôme Feret*, Jean Krivine, and *Walter Fontana*. Intrinsic Information carriers in combinatorial dynamical systems. *Chaos*, 20(3), 2010. doi:10.1063/1.3491100. 36

[Het10a] Stefan Hetzl. On the form of witness terms. *Archive for Mathematical Logic*, 49(5):529–554, 2010. doi:10.1007/s00153-010-0186-7.

[HFC09] *Haruo Hosoya*, *Alain Frisch*, and Giuseppe Castagna. Parametric polymorphism for XML. *ACM Transactions on Programming Languages and Systems*, 32(1):1–56, 2009. doi:10.1145/1596527.1596529. 19

[HH07] Samuel Hym and *Matthew Hennessy*. Adding recursion to Dpi. *Theoretical Computer Science*, 373(3):182–212, 2007. doi:10.1016/j.tcs.2006.12.017.

[HL10] *Kohei Honda* and Olivier Laurent. An exact correspondence between a typed pi-calculus and polarised proof-nets. *Theoretical Computer Science*, 411(22–24):2223–2238, 2010. doi:10.1016/j.tcs.2010.01.028.

[HMC07] Grégoire Henry, *Michel Mauny*, and Emmanuel Chailloux. Typer la désérialisation sans sérialiser les types. *Techniques et Sciences Informatiques*, 26(9):1067–1090, 2007.

[Hym09] Samuel Hym. Mobility control via passports. *Information and Computation*, 207(2):171–193, 2009. doi:10.1016/j.ic.2007.11.011.

[ILH10] Danko Ilik, *Gyesik Lee*, and Hugo Herbelin. Kripke Models for Classical Logic. *Annals of Pure and Applied Logic*, 161(11):1367–1378, 2010. doi:10.1016/j.apal.2010.04.007. 24

[Ili12a] Danko Ilik. Continuation-passing style models complete for intuitionistic logic. *Annals of Pure and Applied Logic*, 2012. In press.

[Ili12b] Danko Ilik. Delimited control operators prove double-negation shift. *Annals of Pure and Applied Logic*, 163(11):1549–1559, 2012.

[JK09] *Barry Jay* and Delia Kesner. First-class patterns. *Journal of Functional Programming*, 19(2):191–225, 2009. 17

[Joi07a] Jean-Baptiste Joinet. Completeness of MLL proof-nets w.r.t. weak distributivity. *Journal of Symbolic Logic*, 72(1):159–170, 2007.

[KC12a] Gabriel Kerneis and Juliusz Chroboczek. Continuation-Passing C: compiling threads to events through continuations. *Higher-Order and Symbolic Computation*, 2012. doi:10.1007/s10990-012-9084-5. 42

[Kes09a] Delia Kesner. A Theory of Explicit Substitutions with Safe and Full Composition. *Logical Methods in Computer Science*, 5(3:1):1–29, 2009. 18

[KL07a] Delia Kesner and Stéphane Lengrand. Resource Operators for lambda-calculus. *Information and Computation*, 205(4):419–473, 2007. 18

[KMT12] *Steve Kremer*, *Antoine Mercier*, and Ralf Treinen. Reducing Equational Theories for the Decision of Static Equivalence. *Journal of Automated Reasoning*, 48(2):197–217, 2012. doi:10.1007/s10817-010-9203-0. 19

[KR11] Delia Kesner and Fabien Renaud. A prismoid framework for languages with resources. *Theoretical Computer Science*, 412(37):4867–4892, 2011. doi:10.1016/j.tcs.2011.01.026.

[Kri07] Jean-Louis Krivine. A call-by-name lambda-calculus machine. *Higher-Order and Symbolic Computation*, 20(3):199–207, 2007.

[Kri09] Jean-Louis Krivine. Realizability in classical logic. *Panoramas et Synthèses*, 27:197–229, 2009.

[Kri11] Jean-Louis Krivine. Realizability algebras: a program to well order R. *Logical Methods in Computer Science*, 7(3):1–47, 2011. 32

[Kri12a] Jean-Louis Krivine. Realizability algebras II : new models of ZF + DC. *Logical Methods in Computer Science*, 8(1), 2012. doi:10.2168/LMCS-8(1:10)2012. 32

[Lau09] Olivier Laurent. On the categorical semantics of Elementary Linear Logic. *Theory and Applications of Categories*, 22(10):269–301, 2009.

[Lau10] Olivier Laurent. Game semantics for first-order logic. *Logical Methods in Computer Science*, 6(4), 2010. doi:10.2168/LMCS-6(4:3)2010.

[LLT07] *Pascal Lafourcade*, *Denis Lugiez*, and Ralf Treinen. Intruder deduction for the equational theory of Abelian groups with distributive encryption. *Information and Computation*, 205(4):581–623, 2007. doi:10.1016/j.ic.2006.10.008.

[LM08a] Ugo Dal Lago and *Simone Martini*. The weak lambda calculus as a reasonable machine. *Theoretical Computer Science*, 398(1-3):32–50, 2008. 25

[LM08b] Stéphane Lengrand and Alexandre Miquel. Classical Fomega, orthogonality and symmetric candidates. *Annals of Pure and Applied Logic*, 153(1-3):3–20, 2008.

[LM09] *Yves Lafont* and François Métayer. Polygraphic resolutions and homology of monoids. *Journal of Pure and Applied Algebra*, 213:947–968, 2009. doi:10.1016/j.jpaa.2008.10.005. 35

[LMW10] *Yves Lafont*, François Métayer, and *Krzysztof Worytkiewicz*. A folk model structure on omega-cat. *Advances in Mathematics*, 224(3):1183–1231, 2010. doi:10.1016/j.aim.2010.01.007. 35

[LZD07] *Dan Li*, Min Zhang, and *Xiaoju Dong*. $\kappa$-Calculus Model for the Life-Cycle of Lambda Phage. *Journal of Shanghai Jiaotong University*, 44(1):42–44, 2007.

[Maz09] Damiano Mazza. Observational equivalence and full abstraction in the symmetric interaction combinators. *Logical Methods in Computer Science*, 5(4:6), 2009.

[McK12] Richard McKinley. Canonical proof nets for classical logic. *Annals of Pure and Applied Logic*, 2012. In press. Available from: http://www.sciencedirect.com/science/article/pii/S0168007212000838, doi:10.1016/j.apal.2012.05.007.

[Mel09a] Paul-André Melliès. Abstract Machines for Dialogue Games. *Panoramas et Synthèses*, 27:231–275, 2009.

[Mel09b] Paul-André Melliès. Categorical Semantics of Linear Logic. *Panoramas et Synthèses*, 27:1–196, 2009.

[MT10] Paul-André Melliès and Nicolas Tabareau. Resource modalities in tensor logic. *Annals of Pure and Applied Logic*, 161(5):632–653, 2010. doi:10.1016/j.apal.2009.07.018. 25

[MTT10] Paul-André Melliès, Nicolas Tabareau, and Christine Tasson. An explicit formula for the free exponential modality of linear logic (journal version). *Theoretical Computer Science*, 2010. To appear. 30, 34

[MVZ08] *Paolo Marinelli*, *Fabio Vitali*, and Stefano Zacchiroli. Towards the unification of formats for overlapping markup. *New Review of Hypermedia and Multimedia*, 14(1):57–94, 2008. doi:10.1080/13614560802316145.

[Mé08a] François Métayer. Cofibrant objects among higher-dimensional categories. *Homology, homotopy and Applications*, 10(1):181–203, 2008. 34, 35

[Pad10] Vincent Padovani. Ticket Entailment is decidable. *Mathematical Structures in Computer Science*, 2010. To appear. Submitted on 06/09/2010. Accepted for publication on 12/19/2011. Last revision on 03/06/2012. 25

[Pag09a] Michele Pagani. Strong normalization property for second order linear logic. *Theoretical Computer Science*, 411:410–444, 2009. doi:10.1016/j.tcs.2009.07.053.

[Pag11a] Michele Pagani. A semantic measure of the execution time in linear logic. *Theoretical Computer Science*, 412(20):1884–1902, 2011. doi:10.1016/j.tcs.2010.12.017.

[Pag11b] Michele Pagani. Visible acyclic differential nets, Part I: Semantics. *Annals of Pure and Applied Logic*, 163(3):238–265, 2011. doi:10.1016/j.apal.2011.09.001. 26

[Pet11a] Barbara Petit. Semantics of typed lambda-calculus with constructors. *Logical Methods in Computer Science*, 7(1):2;1–24, 2011.

[Sau10a] Alexis Saurin. Typing streams in the $\Lambda\mu$-calculus. *ACM Transactions on Computational Logic*, 11(4):28–61, 2010. doi:10.1145/1805950.1805958. 24

[Sau12] Alexis Saurin. Böhm theorem and Böhm trees for the Lambda-mu-calculus. *Theoretical Computer Science*, 435:106–138, 2012. doi:10.1016/j.tcs.2012.02.027.

[SCZ08] *Claudio Sacerdoti Coen* and Stefano Zacchiroli. Spurious Disambiguation Errors and How to Get Rid of Them. *Mathematics in Computer Science*, 2(2):355–378, 2008. doi:10.1007/s11786-008-0058-2.

[SDKO07] *Marcus Silva*, Vincent Danos, *Elham Kashefi*, and *Harold Ollivier*. A direct approach to fault-tolerance in measurement-based quantum computation via teleportation. *New Journal of Physics*, 2007.

[SH12] Vincent Siles and Hugo Herbelin. Pure Type System conversion is always typable. *Journal of Functional Programming*, 22(2):153–180, 2012. doi:10.1017/S0956796812000044. 22

[Sta11] Sam Staton. Relating coalgebraic notions of bisimulation. *Logical Methods in Computer Science*, 7(1):13:–13, 2011.

[Vou11] Jérôme Vouillon. A Solution to the POPLMARK Challenge Based on de Bruijn Indices. *Journal of Automated Reasoning*, pages 1–36, 2011. doi:10.1007/s10817-011-9230-5.

[VY10] Daniele Varacca and *Nobuko Yoshida*. Typed Event Structures and the linear pi-calculus. *Theoretical Computer Science*, 411(19):1949–1973, 2010. 38

[Web07] Mark Weber. Familial 2-functors and parametric right adjoints. *Theory and Applications of Categories*, 18:665–732, 2007.

[Web09] Mark Weber. Free products of higher operad algebras. *Journal of Pure and Applied Algebra*, 2009. To appear, arXiv:0909.4722.

## Invited talks in international conferences with proceedings

[Cas07b] Giuseppe Castagna. CDuce, an XML Processing Programming Language: From Theory to Practice. In *Proceedings of the XI Brazilian Symposium on Programming Languages*, pages 3–4, 2007. May 23-25, Natal, Rio Grande do Norte, Brazil.

[CDCP11] Giuseppe Castagna, *Mariangiola Dezani-Ciancaglini*, and *Luca Padovani*. On global types and multi-party sessions. In Roberto Bruni and Jürgen Dingel, editors, *Formal Techniques for Distributed Systems - Joint 13th IFIP WG 6.1 International Conference, FMOODS 2011, and 31st IFIP WG 6.1 International Conference, FORTE 2011, Reykjavik, Iceland, June 6-9, 2011. Proceedings*, volume 6722 of *Lecture Notes in Computer Science*, pages 1–28. Springer-Verlag, 2011. 37

[Chr12] Juliusz Chroboczek. Sequentialising a concurrent program using continuation-passing style. In *Proceedings of the 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2012, Philadelphia, Pennsylvania, USA, January 22-28, 2012*. Association for Computing Machinery, 2012. Tutorial lecture. 42

[Cur08] Pierre-Louis Curien. The joy of string diagrams. In *Computer Science Logic, CSL 2008, 17th Annual Conference of the EACSL, Bertinoro, Italy, September 16-19, 2008. Proceedings*, volume 5213 of *Lecture Notes in Computer Science*, pages 15–22. Springer-Verlag, 2008.

[Cur12] Pierre-Louis Curien. Operads, clones, and distributive laws. In *Proceedings of the International Conference on Operads and Universal Algebra*, volume 9 of *Nankai Series in Pure, Applied Mathematics and Theoretical Physics*, pages 25–50. World Scientific, 2012. 34

[DFF$^+$07] Vincent Danos, *Jérôme Feret*, *Walter Fontana*, Russell Harmer, and *Jean Krivine*. Rule-based modelling of cellular signalling. In *International Conference on Concurrency Theory (CONCUR'07)*, volume 4703 of *Lecture Notes in Computer Science*, pages 17–41. Springer-Verlag, 2007. 35

[DFF+10] Vincent Danos, *Jérôme Feret*, *Walter Fontana*, Russell Harmer, and Jean Krivine. Abstracting the differential semantics of rule-based models: exact and automated model reduction. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 362–381. IEEE Computer Society, 2010. 35, 36

[DFFK07] Vincent Danos, *Jérôme Feret*, *Walter Fontana*, and *Jean Krivine*. Scalable Simulation of Cellular Signaling Networks. In *Programming Languages and Systems, 5th Asian Symposium, APLAS 2007, Singapore, November 29-December 1, 2007, Proceedings*, volume 4807 of *Lecture Notes in Computer Science*, pages 139–157. Springer-Verlag, 2007. doi:10.1.1.139.5120. 36

[Ehr08] Thomas Ehrhard. Differential Linear Logic and Processes. In *Fifth IFIP International Conference on Theoretical Computer Science - TCS 2008, IFIP 20th World Computer Congress, TC 1, Foundations of Computer Science*, volume 273 of *IFIP*, page 283. Springer-Verlag, 2008. September 7-10, 2008, Milano, Italy. doi:10.1007/978-0-387-09680-3_19.

[Ehr11] Thomas Ehrhard. Resource Lambda-Calculus: the Differential Viewpoint. In *Computer Science Logic, 20th Annual Conference of the EACSL, CSL 2011, September 12-15, 2011, Bergen, Norway, Proceedings*, volume 12 of *LIPIcs*, pages 1–1. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2011. doi:10.4230/LIPIcs.CSL.2011.1.

[Gau08e] Philippe Gaucher. Cubes, homotopy and process algebra. In *Algebraic Topological Methods in Computer Science 2008*, 2008. A satellite conference to the 5th European Congress of Mathematics, Paris.

[Har07] Russ Harmer. Rule-based modeling of erbB signaling. In *Annual Society of Cell Biology Annual Meeting (SIG on Systems Biology of Receptor Tyrosine Kinase Networks)*, 2007.

[KDB09] Jean Krivine, *Vincent Danos*, and *Arndt Benecke*. Modelling epigenetic information maintenance a Kappa tutorial. In *Proceedings of the 21st International Conference on Computer Aided Verification*, volume 5643 of *Lecture Notes in Computer Science*, pages 17–32. Springer-Verlag, 2009. 36

[KMT08b] Jean Krivine, *Robin Milner*, and *Angelo Troina*. Stochastic Bigraphs. In *Proceedings of Mathematical Foundation of Programming Semantics (MFPS 2008)*, volume 218 of *Electronic Notes in Theoretical Computer Science*, pages 73–96. Springer-Verlag, 2008. 37

[Let08] Pierre Letouzey. Extraction in Coq, an Overview. In *Logic and Theory of Algorithms, Fourth Conference on Computability in Europe, CiE 2008*, volume 5028 of *Lecture Notes in Computer Science*. Springer-Verlag, 2008. doi:10.1007/978-3-540-69407-6.

[Mé08b] François Métayer. Homology of Higher Categories. In *Algebraic Topological Methods in Computer Science 2008*, 2008. A satellite conference to the 5th European Congress of Mathematics, Paris.

## Other invited talks


[Bal09b] Vincent Balat. Ocsigen : approche fonctionnelle typée de la programmation Web. In *Journées Françaises des Langages Applicatifs*, 2009. Saint-Quentin sur Isère. 40

[Ber07] Chantal Berline. Can a lambda-model have a recursively enumerable theory? In *Types and Computations: A Colloquium in Honor of Mario Coppo, Mariangiola Dezani-Ciancaglini, Simona Ronchi della Rocca*, 2007.

[DHK12] *Troels Damgaard*, *Espen Hojsgaard*, and Jean Krivine. Formal Cellular Machinery. In *Proceedings of the Second International Workshop on Static Analysis and Systems Biology*, volume 18228 of *Electronic Notes in Theoretical Computer Science*, pages 55–74. Elsevier, 2012. doi:10.1016/j.entcs.2012.05.015. 37

[Gau10c] Philippe Gaucher. About Higher Dimensional Transition Systems. In *Geometric and Topological Methods in Computer Science 2010*, 2010. Workshop at Aalborg University, Denmark (January 11-15, 2010).

[Har08] Russ Harmer. Rule-based modelling of erbB signalling. In *1st International Workshop on Computational Models for Cell Processes (CompMod)*, 2008. Turku, Finland.

[Har09b] Russ Harmer. Rule-based modelling of cellular signalling. In *The Tenth Annual BioPathways Meeting*, 2009. Stockholm.

[Har10] Russ Harmer. Rule-based modeling of cellular signaling. In *Developments in Computational Models (DCM 2010)*, 2010. Workshop affiliated to FLoC 2010, Edinburgh.

[Har12] Russ Harmer. Executable Knowledge. In *Workshop on Systems Biology and Formal Methods*, 2012.

[Kes07c] Delia Kesner. Parametric resources for lambda-calculi. In *The Eighth International Workshop on Rule-Based Programming (RULE 2007)*, June 2007. Paris, part of RDP'07.

[Kes07d] Delia Kesner. Pattern calculi. In *Meeting of the IFIP Working Group 1.6 on Term Rewriting*, June 2007.

[Kes09b] Delia Kesner. Untyped pattern calculi. In *Fourth Workshop on Logical and Semantic Frameworks, with Applications (LSFA)*, June 2009. Brasilia, Brazil.

[Kes10a] Delia Kesner. The structural lambda-calculus. In *Meeting of the IFIP Working Group 1.6 on Term Rewriting*, July 2010.

[Kes10b] Delia Kesner. The structural lambda-calculus. In *Workshop on Types for Robust Program Development*, September 2010.

[Mé11] François Métayer. Higher Categories and Rewriting. In *Operads and Rewriting*, 2011.

[Soz10c] Matthieu Sozeau. Elaborations in Type Theory. In *Dependently Typed Programming 2010 (DTP'10)*, 2010. Workshop affiliated to FLoC 2010, Edinburgh. 22

[Soz12] Matthieu Sozeau. Coq avec Classes. In *Journées Françaises des Langages Applicatifs*, 2012. Carnac. 20

[Var10] Daniele Varacca. A topological definition of fairness. In *Proceedings of the 17th Workshop on Expressiveness in Concurrency (EXPRESS 2010)*, Electronic Notes in Theoretical Computer Science. Elsevier, 2010. Workshop affiliated to CONCUR'10, Paris.

### Peer-reviewed international conferences with proceedings

[AB09] Samy Abbes and *Albert Benveniste*. Concurrency, sigma-algebras and probabilistic fairness. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 380–394. Springer-Verlag, 2009. 38

[ABDCZ09a] Pietro Abate, Jaap Boender, Roberto Di Cosmo, and Stefano Zacchiroli. Strong Dependencies between Software Components. In *Proceedings of the Third International Symposium on Empirical Software Engineering and Measurement, ESEM 2009, October 15-16, 2009, Lake Buena Vista, Florida, USA*, pages 89–99, 2009. doi:10.1109/ESEM.2009.5316017. 40

[Abe10] Andreas Abel. Towards normalization by evaluation for the *betaeta*-calculus of constructions. In *Functional and Logic Programming, 10th International Symposium, FLOPS 2010, Sendai, Japan, April 19-21, 2010. Proceedings*, volume 6009 of *Lecture Notes in Computer Science*, pages 224–239. Springer-Verlag, 2010. 22

[Abe11] Andreas Abel. Irrelevance in type theory with a heterogeneous equality judgement. In *Foundations of Software Science and Computational Structures - 14th International Conference, FOSSACS 2011, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2011, Saarbrücken, Germany, March 26-April 3, 2011. Proceedings*, volume 6604 of *Lecture Notes in Computer Science*, pages 57–71. Springer-Verlag, 2011. 23

[ACYFV10] *Eugene Asarin*, Raphael Chane-Yack-Fa, and Daniele Varacca. Fair Adversaries and Randomization in Two-Player Games. In *Foundations of Software Science and Computational Structures, 13th International Conference, FOSSACS 2010, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2010, Paphos, Cyprus, March 20-28, 2010. Proceedings*, volume 6014 of *Lecture Notes in Computer Science*, pages 64–78. Springer-Verlag, 2010.

[AD07] Roberto M. Amadio and *Frédéric Dabrowski*. Feasible reactivity in a synchronous pi-calculus. In *Proceedings of the 9th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, July 14-16, 2007, Wroclaw, Poland*, pages 221–231. Association for Computing Machinery, 2007.

[AD08] Roberto M. Amadio and Mehdi Dogguy. On affine usages in signal-based communication. In *Programming Languages and Systems, 6th Asian Symposium, APLAS 2008, Bangalore, India, December 9-11, 2008. Proceedings*, volume 5356 of *Lecture Notes in Computer Science*, pages 221–236. Springer-Verlag, 2008. 36

[ADC11] Pietro Abate and Roberto Di Cosmo. Predicting upgrade failures using dependency analysis. In *Workshops Proceedings of the 27th International Conference on Data Engineering, ICDE 2011, April 11-16, 2011, Hannover, Germany*, pages 145–150. IEEE Computer Society, 2011. doi:10.1109/ICDEW.2011.5767626. 40

[ADCS+12] *Cyrille Artho*, Roberto Di Cosmo, *Kuniyasu Suzaki*, Ralf Treinen, and Stefano Zacchiroli. Why Do Software Packages Conflict? In *9th Working Conference on Mining Software Repositories (MSR'12)*, pages 141–150. IEEE Computer Society, 2012.

[ADCSZ11] *Cyrille Artho*, Roberto Di Cosmo, *Kuniyasu Suzaki*, and Stefano Zacchiroli. Sources of Inter-package Conflicts in Debian. In *Proceedings Second Workshop on Logics for Component Configuration*, volume 65, pages 1–9. Electronic Proceedings in Theoretical Computer Science, 2011.

[ADCTZ11] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. MPM : a modular package manager. In *Proceedings of the 14th International ACM Sigsoft Symposium on Component Based Software Engineering, CBSE 2011, part of Comparch '11 Federated Events on Component-Based Software Engineering and Software Architecture, Boulder, CO, USA, June 20-24, 2011*, pages 179–188. Association for Computing Machinery, 2011. doi:10.1145/2000229.2000255. 39

[ADCTZ12] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. Learning from the Future of Component Repositories. In *The 15th International ACM SIGSOFT Symposium on Component Based Software Engineering (CBSE-2012), Bertinoro, Italy, June 26-28, 2012*. Association for Computing Machinery, 2012. To appear. 40

[ADH+12] *Zena Ariola*, *Paul Downen*, Hugo Herbelin, *Keiko Nakata*, and Alexis Saurin. Classical call-by-need sequent calculi : The unity of semantic artifacts. In *Functional and Logic Programming - 11th International Symposium, FLOPS 2012, Kobe, Japan, May 23-25, 2012. Proceedings*, volume 7294 of *Lecture Notes in Computer Science*, pages 32–46. Springer-Verlag, 2012.

[AG09] Beniamino Accattoli and *Stefano Guerrini*. Jumping boxes. In *Computer Science Logic, CSL 2009, 18th Annual Conference of the EACSL, Coimbra, Portugal, September 7-11, 2009. Proceedings*, volume 5771 of *Lecture Notes in Computer Science*, pages 55–70. Springer-Verlag, 2009. 18

[AHS11] *Zena Ariola*, Hugo Herbelin, and Alexis Saurin. Classical Call-by-need and duality. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 27–44. Springer-Verlag, 2011. doi:10.1007/978-3-642-21691-6_6. 23

[AK10a] Beniamino Accattoli and Delia Kesner. The structural lambda-calculus. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 381–395. Springer-Verlag, 2010. 18

[AK12b] *Beniamino Accattoli* and Delia Kesner. The permutative lambda-calculus. In *Logic for Programming, Artificial Intelligence, and Reasoning - 18th International Conference, LPAR-18, Mérida, Venezuela, March 11-15, 2012. Proceedings*, volume 7180 of *Lecture Notes in Computer Science*, pages 23–36. Springer-Verlag, 2012. 18

[Ama09a] Roberto M. Amadio. On convergence-sensitive bisimulation and the embedding of CCS in timed CCS. In *Proceedings of the 15th Workshop on Expressiveness in Concurrency (EXPRESS 2008)*, volume 242 of *Electronic Notes in Theoretical Computer Science*, pages 3–17. Elsevier, 2009. 36

[Ama09b] Roberto M. Amadio. On stratified regions. In *Proceedings of the 7th Asian Symposium on Programming Languages and Systems*, Springer Lecture Notes in Computer Science 5904, pages 210–225, 2009. 25

[ARG12] Roberto M. Amadio and Yann Regis-Gianas. Certifying and reasoning on cost annotations of functional programs. In *Foundational and Practical Aspects of Resource Analysis (FOPARA'12)*, volume 7177 of *Lecture Notes in Computer Science*, pages 72–88. Springer-Verlag, 2012. 22

[Bal09a] Vincent Balat. Keeping sums under control. In *Proceedings of the 2009 Workshop on Normalization by Evaluation, colocated with LICS 2009, Los Angeles, USA*, pages 11–20, 2009.

[Bal10a] Thibaut Balabonski. On the Implementation of Dynamic Patterns. In *Proceedings 5th International Workshop on Higher-Order Rewriting*, pages 29–33. Electronic Proceedings in Theoretical Computer Science, 2010. 18

[Bal10b] Thibaut Balabonski. Optimality for Dynamic Patterns. In *Proceedings of the 12th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, July 26-28, 2010, Hagenberg, Austria*, pages 231–242. Association for Computing Machinery, 2010. 18

[Bal12a] Thibaut Balabonski. A Unified Approach to Fully Lazy Sharing. In *Proceedings of the 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2012, Philadelphia, Pennsylvania, USA, January 22-28, 2012*, pages 469–480. Association for Computing Machinery, 2012. 18

[Bal12b] Thibaut Balabonski. Axiomatic Sharing-via-Labelling. In *23rd International Conference on Rewriting Techniques and Applications (RTA'12), May 28 - June 2, 2012, Nagoya, Japan*, volume 15 of *LIPIcs*, pages 85–100. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. 18

[BCCM08] *Véronique Benzaken*, Giuseppe Castagna, *Dario Colazzo*, and *Cédric Miachon*. Pattern by example: type-driven visual programming of XML queries. In *Proceedings of the 10th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, July 15-17, 2008, Valencia, Spain*, pages 131–142. Association for Computing Machinery, 2008. doi:10.1145/1389449.1389466. 19

[BCDL07] *Patrick Baillot*, *Paolo Coppola*, and Ugo Dal Lago. Light Logics and Optimal Reduction: Completeness and Complexity. In *Proceedings of the 22nd IEEE Symposium on Logic in Computer Science, LICS 2007, 10-12 July 2007, Wroclaw, Poland*, pages 421–430, 2007. 25

[BCG+09a] *Bruno Barras*, *Pierre Corbineau*, *Benjamin Grégoire*, Hugo Herbelin, and *Jorge Luis Sacchini*. A new elimination rule for the calculus of inductive constructions. In *Types for Proofs and Programs, International Conference, TYPES 2008, Torino, Italy, March 26-29, 2008, Revised Selected Papers*, volume 5497 of *Lecture Notes in Computer Science*, pages 32–48. Springer-Verlag, 2009.

[BCH12] Vincent Balat, Pierre Chambart, and Grégoire Henry. Client-server Web applications with Ocsigen. In *Proceedings of the 21st international conference on World Wide Web, Lyon, France, April 16 - 20, 2012*. Association for Computing Machinery, 2012. 41

[BECS09] Antonio Bucciarelli, Thomas Ehrhard, Alberto Carraro, and *Antonino Salibra*. On linear information systems. In *Proceedings First International Workshop on Linearity*, volume 22 of *Electronic Notes in Theoretical Computer Science*, pages 38–48. Elsevier, 2009.

[BEM07] Antonio Bucciarelli, Thomas Ehrhard, and Giulio Manzonetto. Not enough points is enough. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 298–312. Springer-Verlag, 2007. 30

[BEM09] Antonio Bucciarelli, Thomas Ehrhard, and Giulio Manzonetto. A relational model of a parallel and non-deterministic lambda-calculus. In *Logical Foundations of Computer Science, International Symposium, LFCS 2009, Deerfield Beach, FL, USA, January 3-6, 2009. Proceedings*, volume 5407 of *Lecture Notes in Computer Science*, pages 107–121. Springer-Verlag, 2009. 31

[BEM10] Antonio Bucciarelli, Thomas Ehrhard, and *Giulio Manzonetto*. Categorical Models for Simply Typed Resource Calculi. In *Proceedings of the Twenty-Sixth Conference on the Mathematical Foundations of Programming Semantics - MFPS XXVI*, volume 265 of *Electronic Notes in Theoretical Computer Science*, pages 213–230. Elsevier, 2010. 29

[BGGP10] *Paola Bruscoli*, *Alessio Guglielmi*, *Tom Gundersen*, and Michel Parigot. A Quasipolynomial Cut-Elimination Procedure in Deep Inference via Atomic Flows and Threshold Formulae. In *Logic for Programming, Artificial Intelligence, and Reasoning - 16th International Conference, LPAR-16, Dakar, Senegal, April 25-May 1, 2010, Revised Selected Papers*, volume 6355 of *Lecture Notes in Computer Science*, pages 136–153. Springer-Verlag, 2010. 27

[BH10a] Thibaut Balabonski and *Emmanuel Haucourt*. A Geometric Approach to the Problem of Unique Decomposition of Processes. In *Concurrency Theory, 21th International Conference, CONCUR 2010, Paris, France, August 31-September 3, 2010.*

*Proceedings*, Lecture Notes in Computer Science, pages 132–146. Springer-Verlag, 2010.

[BH10b] *Nick Benton* and Chung-Kil Hur. Step-indexing: the good, the bad and the ugly. In *Proceedings of the Dagstuhl Seminar 10351: Modelling, Controlling and Reasoning About State, August 29 - September 3, 2010*. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2010.

[BH10c] *Nick Benton* and Chung-Kil Hur. Step-indexing: the good, the bad and the ugly. In *Syntax and Semantics of Low Level Languages, 9th July 2010, Edinburgh, Scotland, UK. A satellite workshop of LICS 2010*, 2010.

[BKLR12] *Eduardo Bonelli*, Delia Kesner, Carlos Lombardi, and *Alejandro Ríos*. Normalisation for Dynamic Pattern Calculi. In *23rd International Conference on Rewriting Techniques and Applications (RTA'12), May 28 - June 2, 2012, Nagoya, Japan*, volume 15 of *LIPIcs*, pages 117–132. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. 17

[BMM+10] Vincent Balat, Séverine Maingaud, Alexandre Miquel, *Richard Bubel*, and *Reiner Hähnle*. Specifying Imperative ML-like Programs using Dynamic Logic. In *Formal Verification of Object-Oriented Software - International Conference, FoVeOOS 2010, Paris, France, June 28-30, 2010, Revised Selected Papers*, volume 6528 of *Lecture Notes in Computer Science*, pages 122–137. Springer-Verlag, 2010.

[BMS07] Chantal Berline, Giulio Manzonetto, and *Antonino Salibra*. Lambda theories of effective lambda models. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 268–282. Springer-Verlag, 2007. doi:10.1007/978-3-540-74915-8. 31

[BST10] *Michele Basaldella*, Alexis Saurin, and *Kazushige Terui*. From Focalization of Logic to the Logic of Focalization. In *Proceedings of the Twenty-Sixth Conference on the Mathematical Foundations of Programming Semantics - MFPS XXVI*, volume 265 of *Electronic Notes in Theoretical Computer Science*, pages 161–176. Elsevier, 2010. doi:10.1016/j.entcs.2010.08.010.

[BT09] *Nick Benton* and Nicolas Tabareau. Compiling Functional Types to Relational Specifications for Low Level Imperative Code. In *Proceedings of TLDI'09: 2009 ACM SIGPLAN International Workshop on Types in Languages Design and Implementation, Savannah, GA, USA, January 24, 2009*, pages 3–14. Association for Computing Machinery, 2009.

[BVY09] Vincent Balat, Jérôme Vouillon, and Boris Yakobowski. Experience report : Ocsigen, a web programming framework. In *Proceeding of the 14th ACM SIGPLAN international conference on Functional programming, ICFP 2009, Edinburgh, Scotland, UK, August 31 - September 2, 2009*, pages 311–316. Association for Computing Machinery, 2009. doi:10.1145/1631687.1596595. 40

[CB10a] Roberto Di Cosmo and Jaap Boender. Using strong conflicts to detect quality issues in component-based complex systems. In *Proceeding of the 3rd Annual India Software Engineering Conference, ISEC 2010, Mysore, India, February 25-27, 2010*, pages 163–172. Association for Computing Machinery, 2010. 40

[CBC08] Benjamin Canou, Vincent Balat, and Emmanuel Chailloux. O'Browser : Objective Caml on browsers. In *Proceedings of the ACM Workshop on ML, 2008, Victoria, BC, Canada, September 21, 2008*, pages 69–78. Association for Computing Machinery, 2008. 41

[CCV12] *Benjamin Canou*, *Emmanuel Chailloux*, and Jérôme Vouillon. How to Run your Favorite Language in Web Browsers. In *Proceedings of the 21st international conference on World Wide Web, Lyon, France, April 16 - 20, 2012*, 2012. 41

[CDCGP09] Giuseppe Castagna, *Mariangiola Dezani-Ciancaglini*, Elena Giachino, and *Luca Padovani*. Foundation of Session Types. In *Proceedings of the 11th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, September 7-9, 2009, Coimbra, Portugal*, pages 219–230. Association for Computing Machinery, 2009. doi:10.1145/1599410.1599437. 37

[CDRP+09] *Antonio Cicchetti*, *Davide Di Ruscio*, *Patrizio Pelliccione*, *Alfonso Pierantonio*, and Stefano Zacchiroli. A Model Driven Approach to Upgrade Package-Based Software Systems. In *ENASE 2009 - Proceedings of the 4th International Conference on Evaluation of Novel Approaches to Software Engineering, Milan, Italy, May 2009*, volume 69 of *CCIS*, pages 262–276. INSTICC Press, 2009. doi:10.1007/978-3-642-14819-4_19. 39

[CES10] Alberto Carraro, Thomas Ehrhard, and *Antonino Salibra*. Resource Combinatory Algebras. In *Mathematical Foundations of Computer Science 2010, 35th International Symposium, MFCS 2010, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6281 of *Lecture Notes in Computer Science*, pages 233–245. Springer-Verlag, 2010. 26

[CGP08] Giuseppe Castagna, *Nils Gesbert*, and *Luca Padovani*. A Theory of Contracts for Web Services. In *Proceedings of the 35th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2008, San Francisco, California, USA, January 7-12, 2008*, pages 261–272. Association for Computing Machinery, 2008. doi:10.1145/1328897.1328471. 37

[Cla09] Pierre Clairambault. Least and greatest fixpoints in game semantics. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 16–31. Springer-Verlag, 2009. doi:10.1007/978-3-642-00596-1_3. 28

[Cla11] Pierre Clairambault. Estimation of the length of interactions in arena game semantics. In *Foundations of Software Science and Computational Structures - 14th International Conference, FOSSACS 2011, Held as Part of the*

*Joint European Conferences on Theory and Practice of Software, ETAPS 2011, Saarbrücken, Germany, March 26-April 3, 2011. Proceedings*, volume 6604 of *Lecture Notes in Computer Science*, pages 335–349. Springer-Verlag, 2011. doi:10.1007/978-3-642-19805-2_23. 28

[CMM10] Pierre-Louis Curien and Guillaume Munch-Maccagnoni. The duality of computation under focus. In *Theoretical Computer Science - 6th IFIP TC 1/WG 2.2 International Conference, TCS 2010, Held as Part of WCC 2010, Brisbane, Australia, September 20-23, 2010. Proceedings*, volume 323 of *Lecture Notes in Computer Science*, pages 165–181. Springer-Verlag, 2010. 23

[CN08] Giuseppe Castagna and *Kim Nguyen*. Typed iterators for XML. In *Proceeding of the 13th ACM SIGPLAN international conference on Functional programming, ICFP 2008, Victoria, BC, Canada, September 20-28, 2008*, pages 15–26. Association for Computing Machinery, 2008. doi:10.1145/1411204.1411210. 18

[CP09a] Giuseppe Castagna and *Luca Padovani*. Contracts for Mobile Processes. In *Concurrency Theory, 20th International Conference, CONCUR 2009, Bologna, Italy, September 1-4, 2009. Proceedings*, volume 5710 of *Lecture Notes in Computer Science*, pages 211–228. Springer-Verlag, 2009. 37

[CS09] Alberto Carraro and *Antonino Salibra*. Reflexive Scott domains are not complete for the extensional lambda-calculus. In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 91–100. IEEE Computer Society, 2009.

[CS10] Alberto Carraro and *Antonino Salibra*. Easy terms are not always simple. In *Proceedings of the 12th Italian Conference on Theoretical Computer Science, ICTCS 2010, Camerino, Italy, September 15-17, 2010*, 2010.

[Cur07] Pierre-Louis Curien. Definability and full abstraction. In *Computation, Meaning, and Logic: Articles dedicated to Gordon Plotkin*, volume 172 of *Electronic Notes in Theoretical Computer Science*, pages 301–310. Elsevier, 2007.

[CVY07] *Silvia Crafa*, Daniele Varacca, and *Nobuko Yoshida*. Compositional Event Structure Semantics of the Internal pi-Calculus. In *Concurrency Theory, 18th International Conference, CONCUR 2007, Lisbon, Portugal, September 3-8, 2007, Proceedings*, volume 4703 of *Lecture Notes in Computer Science*, pages 317–332. Springer-Verlag, 2007. 38

[CVY12] *Silvia Crafa*, Daniele Varacca, and *Nobuko Yoshida*. Event structure semantics of the parallel extrusion in the pi-calculus. In *Foundations of Software Science and Computational Structures - 15th International Conference, FOSSACS 2012, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS 2012, Tallinn, Estonia, March 24 - April 1, 2012. Proceedings*, Lecture Notes in Computer Science, pages 225–239. Springer-Verlag, 2012. doi:10.1007/978-3-642-28729-9_15. 38

[CX11] Giuseppe Castagna and Zhiwu Xu. Set-theoretic foundation of parametric polymorphism and subtyping. In *Proceeding of the 16th ACM SIGPLAN international conference on Functional Programming, ICFP 2011, Tokyo, Japan, September 19-21, 2011*, pages 94–106. Association for Computing Machinery, 2011.

[dBDKR08] *J. Niel de Beaudrap*, Vincent Danos, *Elham Kashefi*, and *Martin Rötteler*. Quadratic form expansions for unitaries. In *Theory of Quantum Computation, Communication, and Cryptography, Third Workshop, TQC 2008, Tokyo, Japan, January 30 - February 1, 2008. Revised Selected Papers*, volume 5106 of *Lecture Notes in Computer Science*, pages 29–46. Springer-Verlag, 2008.

[DCDB+08] Roberto Di Cosmo, *Berke Durak*, Jaap Boender, Fabio Mancinelli, and Jérôme Vouillon. Improving the Quality of GNU/Linux Distributions. In *Proceedings of the 32nd Annual IEEE International Computer Software and Applications Conference, COMPSAC 2008, 28 July - 1 August 2008, Turku, Finland*, pages 1240–1246. IEEE Computer Society, 2008. doi:10.1109/COMPSAC.2008.226. 40

[DCDCG08] Roberto Di Cosmo, *Mariangiola Dezani-Ciancaglini*, and *Elio Giovannetti*. On Isomorphisms of Intersection Types. In *Computer Science Logic, CSL 2008, 17th Annual Conference of the EACSL, Bertinoro, Italy, September 16-19, 2008. Proceedings*, Lecture Notes in Computer Science, pages 461–477. Springer-Verlag, 2008. doi:10.1007/978-3-540-87531-4_33.

[DCLM11] Roberto Di Cosmo, *Olivier Lhomme*, and *Claude Michel*. Aligning component upgrades. In *Proceedings Second Workshop on Logics for Component Configuration*, volume 65, pages 1–11. Electronic Proceedings in Theoretical Computer Science, 2011. doi:10.4204/EPTCS.65.1.

[DCZ10] Roberto Di Cosmo and Stefano Zacchiroli. Feature Diagrams as Package Dependencies. In *Software Product Lines: Going Beyond - 14th International Conference, SPLC 2010, Jeju Island, South Korea, September 13-17, 2010. Proceedings*, volume 6287 of *Lecture Notes in Computer Science*, pages 476–480. Springer-Verlag, 2010. doi:10.1007/978-3-642-15579-6_40. 39

[DCZT08] Roberto Di Cosmo, Stefano Zacchiroli, and *Paulo Trezentos*. Package upgrades in FOSS distributions: details and challenges. In *Proceedings of the 1st ACM Workshop on Hot Topics in Software Upgrades, HotSWUp 2008, Nashville, TN, USA, October 20, 2008*. Association for Computing Machinery, 2008. doi:10.1145/1490283.1490292. 39

[DDC12] *Marco Danelutto* and Roberto Di Cosmo. A "minimal disruption" skeleton experiment: seamless map & reduce embedding in OCaml. In *Proceedings of the 12th International Conference on Computational Science (ICCSA 2012)*, volume 9 of *Procedia Computer Science*, pages 1837–1846. Elsevier, 2012.

[DDKP07] Vincent Danos, *Ellie D'Hondt*, *Elham Kashefi*, and *Prakash Panangaden*. Distributed measurement-based quantum computation. In *Proceedings of the 3rd International Workshop on Quantum Programming Languages (QPL 2005)*, volume

170 of *Electronic Notes in Theoretical Computer Science*, pages 73–94. Elsevier, 2007.

[DFF⁺08] Vincent Danos, *Jérôme Feret*, *Walter Fontana*, Russell Harmer, and *Jean Krivine*. Rule-based modelling, symmetries, refinements. In *Formal Methods in Systems Biology, First International Workshop, FMSB 2008, Cambridge, UK, June 4-5, 2008. Proceedings*, volume 5054 of *Lecture Notes in Computer Science*, pages 103–122. Springer-Verlag, 2008. doi:10.1007/978-3-540-68413-8_8. 35, 36

[DFF⁺09b] *Vincent Danos*, *Jérôme Feret*, *Walter Fontana*, Russell Harmer, and *Jean Krivine*. Investigation of a biological repair scheme. In *Membrane Computing - 9th International Workshop, WMC 2008, Edinburgh, UK, July 28-31, 2008, Revised Selected and Invited Papers*, volume 5391 of *Lecture Notes in Computer Science*, pages 1–12. Springer-Verlag, 2009. doi:10.1007/978-3-540-95885-7_1. 35

[DFFK08] Vincent Danos, *Jérôme Feret*, *Walter Fontana*, and *Jean Krivine*. Abstract Interpretation of Cellular Signalling Networks. In *Verification, Model Checking, and Abstract Interpretation*, volume 4905 of *Lecture Notes in Computer Science*, pages 83–97, 2008. doi:10.1007/978-3-540-78163-9_11. 35

[DIVRZ09] *Angelo Di Iorio*, *Fabio Vitali*, *Davide Rossi*, and Stefano Zacchiroli. Where are your manners?: Sharing best community practices in the web 2.0. In *Proceedings of the 2009 ACM Symposium on Applied Computing (SAC), Honolulu, Hawaii, USA, March 9-12, 2009*, pages 681–687. Association for Computing Machinery, 2009.

[DK07a] Vincent Danos and *Elham Kashefi*. Pauli Measurements are Universal. In *Proceedings of the 3rd International Workshop on Quantum Programming Languages (QPL 2005)*, volume 170 of *Electronic Notes in Theoretical Computer Science*, pages 95–100. Elsevier, 2007.

[DK07b] Vincent Danos and *Jean Krivine*. Formal Molecular Biology done in CCS. In *Proceedings of the First Workshop on Concurrent Models in Molecular Biology (Bio-Concur 2003)*, volume 180 of *Electronic Notes in Theoretical Computer Science*, pages 31–49. Elsevier, 2007.

[DKS07] Vincent Danos, *Jean Krivine*, and *Pawel Sobocinski*. General Reversibility. In *Proceedings of the 13rd Workshop on Expressiveness in Concurrency (EXPRESS 2006)*, volume 175 of *Electronic Notes in Theoretical Computer Science*, pages 75–86. Elsevier, 2007.

[DLF11] *Ugo Dal Lago* and Claudia Faggian. On Multiplicative Linear Logic, Modality and Quantum Circuits. In *Proceedings of the 8th Workshop on Quantum Physics and Logic (QPL'11)*, pages 81–96. Electronic Proceedings in Theoretical Computer Science, 2011.

[DLL08] *Ugo Dal Lago* and Olivier Laurent. Quantitative Game Semantics for Linear Logic. In *Computer Science Logic, CSL 2008, 17th Annual Conference of the EACSL, Bertinoro, Italy, September 16-19, 2008. Proceedings*, volume 5213

of *Lecture Notes in Computer Science*, pages 230–245. Springer-Verlag, 2008. doi:10.1007/978-3-540-87531-4_18.

[DLMP07] Ugo Dal Lago, *Angelo Montanari*, and *Gabriele Puppis*. Equivalence of automaton-based representations of time granularities. In *14th International Symposium on Temporal Representation and Reasoning (TIME 2007), 28-30 June 2007, Alicante, Spain*, pages 82–93. IEEE Computer Society, 2007.

[DPP07] Yuxin Deng, *Catuscia Palamidessi*, and *Jun Pang*. Weak Probabilistic Anonymity. In *Proceedings of the International Workshop on Security and Concurrency (SecCo 2005)*, volume 180 of *Electronic Notes in Theoretical Computer Science*, pages 55–76. Elsevier, 2007. doi:10.1016/j.entcs.2005.05.043.

[DRPPZ09] *Davide Di Ruscio*, *Patrizio Pelliccione*, *Alfonso Pierantonio*, and Stefano Zacchiroli. Towards maintainer script modernization in FOSS distributions. In *Proceedings of the 1st International Workshop on Open Component Ecosystems*, pages 11–20. Association for Computing Machinery, 2009. 39

[DTK07] Vincent Danos, Fabien Tarissan, and *Jean Krivine*. Self-assembling Trees. In *Proceedings of the Third Workshop on Structural Operational Semantics (SOS 2006)*, volume 175 of *Electronic Notes in Theoretical Computer Science*, pages 19–32. Elsevier, 2007.

[DVZ10] *Gabriele D'Angelo*, *Fabio Vitali*, and Stefano Zacchiroli. Content Cloaking: Preserving Privacy with Google Docs and other Web Applications. In *Proceedings of the 2010 ACM Symposium on Applied Computing (SAC), Sierre, Switzerland, March 22-26, 2010*, pages 826–830. Association for Computing Machinery, 2010.

[EBCM11] Thomas Ehrhard, Antonio Bucciarelli, Alberto Carraro, and *Giulio Manzonetto*. Full Abstraction for Resource Calculus with Tests. In *Computer Science Logic, 20th Annual Conference of the EACSL, CSL 2011, September 12-15, 2011, Bergen, Norway, Proceedings*, volume 12 of *LIPIcs*, pages 97–111. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2011. doi:10.4230/LIPIcs.CSL.2011.97. 30, 31

[EBM09] Thomas Ehrhard, Antonio Bucciarelli, and *Giulio Manzonetto*. A Relational Model of a Parallel and Non-deterministic lambda-Calculus. In *Logical Foundations of Computer Science, International Symposium, LFCS 2009, Deerfield Beach, FL, USA, January 3-6, 2009. Proceedings*, volume 5407 of *Lecture Notes in Computer Science*, pages 107–121. Springer-Verlag, 2009.

[ECS10] Thomas Ehrhard, Alberto Carraro, and *Antonino Salibra*. Exponentials with Infinite Multiplicities. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 170–184. Springer-Verlag, 2010. 30

[Ehr10] Thomas Ehrhard. A finiteness structure on resource terms. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14*

*July 2010, Edinburgh, United Kingdom*, pages 402–410. IEEE Computer Society, 2010. doi:10.1109/LICS.2010.38. 26

[Ehr12b] Thomas Ehrhard. Collapsing non-idempotent intersection types. In *Computer Science Logic, 21nd Annual Conference of the EACSL, CSL 2012, September, 2012, Fontaineblau, France, Proceedings*, LIPIcs. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. To appear. 30

[EL07] Thomas Ehrhard and Olivier Laurent. Interpreting a Finitary Pi-Calculus in Differential Interaction Nets. In *Concurrency Theory, 18th International Conference, CONCUR 2007, Lisbon, Portugal, September 3-8, 2007, Proceedings*, volume 4703 of *Lecture Notes in Computer Science*, pages 333–348. Springer-Verlag, 2007. doi:10.1007/978-3-540-74407-8.

[EPT11] Thomas Ehrhard, Michele Pagani, and Christine Tasson. The computational meaning of probabilistic coherent spaces. In *Proceedings of the 26th Annual IEEE Symposium on Logic in Computer Science, LICS 2011, June 21-24, 2011, Toronto, Ontario, Canada*, pages 87–96. IEEE Computer Society, 2011. doi:10.1109/LICS.2011.29. 31

[ES09] Elie Soubiran. A unified framework and a transparent name-space for the Coq module system. In *Proceedings of the First International Workshop on Modules and Libraries for Proof Assistants (MLPA'09)*, pages 28–42, Montreal, Canada, August 2009. Electronic Notes in Theoretical Computer Science. 20

[FB09] Claudia Faggian and *Michele Basaldella*. Ludics with Repetitions (Exponentials, Interactive Types and Completeness). In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 375–384. IEEE Computer Society, 2009. 29, 31

[FH10] *Marcelo Fiore* and Chung-Kil Hur. Second-order equational logic. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 320–335. Springer-Verlag, 2010.

[Fos07] Luca Fossati. Handshake Games. In *Proceedings of the Second International Workshop on Developments in Computational Models (DCM 2006)*, volume 171 of *Electronic Notes in Theoretical Computer Science*, pages 21–41. Elsevier, 2007. doi:10.1016/j.entcs.2006.11.034. 37

[FP07a] Claudia Faggian and Mauro Piccolo. A Graph Abstract Machine Describing Event Structure Composition. In *Proceedings of the Workshop on Graph Transformation for Concurrency and Verification (GT-VC 2006)*, volume 175 of *Electronic Notes in Theoretical Computer Science*, pages 21–36. Elsevier, 2007. 28, 29

[FP07b] Claudia Faggian and Mauro Piccolo. Ludics is a model for the finitary linear Pi-calculus. In *Typed Lambda Calculi and Applications, 8th International Conference, TLCA 2007, Paris, France, June 26-28, 2007, Proceedings*, volume 4538 of *Lecture Notes in Computer Science*, pages 148–162. Springer-Verlag, 2007. 28, 29

[FP09] Claudia Faggian and Mauro Piccolo. Partial Orders, Event Structures and Linear Strategies. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 95–111. Springer-Verlag, 2009. 28, 29

[FV09a] Luca Fossati and Daniele Varacca. A Petri Net Model of HandShake Protocols. In *Proceedings of the First Interaction and Concurrency Experiences Workshop (ICE 2008)*, volume 229 of *Electronic Notes in Theoretical Computer Science*, pages 59–76. Elsevier, 2009. 37

[FV09b] Luca Fossati and Daniele Varacca. The calculus of HandShake Configurations. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 227–241. Springer-Verlag, 2009. 37

[GGP10] *Alessio Guglielmi*, *Tom Gundersen*, and Michel Parigot. A Proof Calculus Which Reduces Syntactic Bureaucracy. In *Proceedings of the 21st International Conference on Rewriting Techniques and Applications, RTA 2010, July 11-13, 2010, Edinburgh, Scottland, UK*, volume 6 of *LIPIcs*, pages 135–150. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2010. doi:10.4230/LIPIcs.RTA.2010.135. 27

[Gim11] Stéphane Gimenez. Realizability proof for normalization of full differential linear logic. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 107–122. Springer-Verlag, 2011. 27

[GLV11] *Jean Goubault-Larrecq* and Daniele Varacca. Continuous Random Variables. In *Proceedings of the 26th Annual IEEE Symposium on Logic in Computer Science, LICS 2011, June 21-24, 2011, Toronto, Ontario, Canada*, pages 97–106. IEEE Computer Society, 2011. 31

[Har09a] Russ Harmer. Rule-based modelling and tunable resolution. In *Proceedings Fifth Workshop on Developments in Computational Models–Computational Models From Nature*, volume 9 of *Electronic Proceedings in Theoretical Computer Science*, pages 65–72, 2009. 36

[HD11] Chung-Kil Hur and *Derek Dreyer*. A Kripke Logical Relation Between ML and Assembly. In *Proceedings of the 38th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2011, Austin, TX, USA, January 26-28, 2011*, pages 133–146. Association for Computing Machinery, 2011.

[Her10] Hugo Herbelin. An intuitionistic logic that proves Markov's principle. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 50–56. IEEE Computer Society, 2010. 23

[Her12] Hugo Herbelin. A Constructive Proof of Dependent Choice, Compatible with Classical Logic. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*, pages 365–374. IEEE Computer Society, 2012. 32

[Het10b] Stefan Hetzl. A Sequent Calculus with Implicit Term Representation. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 351–365. Springer-Verlag, 2010.

[HG08a] Hugo Herbelin and *Silvia Ghilezan*. An Approach to Call-by-Name Delimited Continuations. In *Proceedings of the 35th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2008, San Francisco, California, USA, January 7-12, 2008*, pages 383–394. Association for Computing Machinery, 2008. doi:10.1145/1328438.1328484. 24

[HHM07] Russ Harmer, *Martin Hyland*, and Paul-André Melliès. Categorical Combinatorics for Innocent Strategies. In *Proceedings of the 22nd IEEE Symposium on Logic in Computer Science, LICS 2007, 10-12 July 2007, Wroclaw, Poland*, pages 379–388. IEEE Computer Society, 2007. 27

[HL09a] Hugo Herbelin and *Gyesik Lee*. Forcing-based cut-elimination for Gentzen-style intuitionistic sequent calculus. In *Logic, Language, Information and Computation, 16th International Workshop, WoLLIC 2009, Tokyo, Japan, June 21-24, 2009. Proceedings*, volume 5514 of *Lecture Notes in Computer Science*, pages 209–217. Springer-Verlag, 2009. 24

[HMCM12] Grégoire Henry, *Michel Mauny*, *Emmanuel Chailloux*, and Pascal Manoury. Typing unmarshalling without marshalling types. In *Proceeding of the 17th ACM SIGPLAN international conference on Functional Programming, ICFP 2012, Copenhagen, Denmark, 10-12, 2012*. Association for Computing Machinery, 2012. To appear.

[Hym07] Samuel Hym. Mobility control via passports (Extended abstract). In *Concurrency Theory, 18th International Conference, CONCUR 2007, Lisbon, Portugal, September 3-8, 2007, Proceedings*, volume 4703 of *Lecture Notes in Computer Science*, pages 349–363. Springer-Verlag, 2007. doi:10.1007/978-3-540-74407-8_24.

[HZ09] Hugo Herbelin and Stéphane Zimmermann. An Operational Account of Call-By-Value Minimal and Classical λ-calculus in "Natural Deduction" Form. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 142–156. Springer-Verlag, 2009. 23

[JLTV11] *Florent Jacquemard*, *Etienne Lozes*, Ralf Treinen, and *Jules Villard*. Multiple Congruence Relations, First-Order Theories on Terms, and the Frames of the Applied Pi-Calculus. In *Theory of Security and Applications - Joint Workshop, TOSCA 2011, Saarbrücken, Germany, March 31 - April 1, 2011, Revised Selected Papers*,

volume 6993 of *Lecture Notes in Computer Science*, pages 166–185. Springer-Verlag, 2011. doi:10.1007/978-3-642-27375-9. 19

[JTS12] *Guilhem Jaber*, *Nicolas Tabareau*, and Matthieu Sozeau. Extending Type Theory with Forcing. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*. IEEE Computer Society, 2012. To appear. 21, 33

[KC11] Gabriel Kerneis and Juliusz Chroboczek. CPC: programming with a massive number of lightweight threads. In *Proceedings of the Fourth Workshop on Programming Language Approaches to Concurrency and Communication-Centric Software (PLACES'11)*, pages 30–34, 2011. 42

[Kes07a] Delia Kesner. The theory of calculi with explicit substitutions revisited. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 238–252. Springer-Verlag, 2007. 18

[Kes08] Delia Kesner. Perpetuality for full and safe composition (in a constructive setting). In *Automata, Languages and Programming, 35th International Colloquium, ICALP 2008, Reykjavik, Iceland, July 7-11, 2008, Proceedings, Part II - Track B: Logic, Semantics, and Theory of Programming & Track C: Security and Cryptography Foundations*, volume 5126 of *Lecture Notes in Computer Science*, pages 311–322. Springer-Verlag, 2008. 18

[KMT08a] *Steve Kremer*, *Antoine Mercier*, and Ralf Treinen. Proving Group Protocols Secure Against Eavesdroppers. In *Automated Reasoning, 4th International Joint Conference, IJCAR 2008, Sydney, Australia, August 12-15, 2008, Proceedings*, volume 5195 of *Lecture Notes in Computer Science*, pages 116–131. Springer-Verlag, 2008. doi:10.1007/978-3-540-71070-7_9. 19

[KMT09] *Steve Kremer*, *Antoine Mercier*, and Ralf Treinen. Reducing Equational Theories for the Decision of Static Equivalence. In *Advances in Computer Science - ASIAN 2009. Information Security and Privacy, 13th Asian Computing Science Conference, Seoul, Korea, December 14-16, 2009. Proceedings*, volume 5913 of *Lecture Notes in Computer Science*, pages 94–108. Springer-Verlag, 2009. doi:10.1007/978-3-642-10622-4_8. 19

[KR09] Delia Kesner and Fabien Renaud. The Prismoid of Resources. In *Mathematical Foundations of Computer Science 2009, 34th International Symposium, MFCS 2009, Novy Smokovec, High Tatras, Slovakia, August 24-28, 2009. Proceedings*, volume 5734 of *Lecture Notes in Computer Science*, pages 464–476. Springer-Verlag, 2009.

[Kri12b] Jean Krivine. A verification technique for reversible process algebra. In *Reversible Computation - Third International Workshop, RC 2012, Copenhagen, Denmark, July 2-3, 2011. Proceedings*, Lecture Notes in Computer Science. Springer-Verlag, 2012. To appear. 38

[Leb08a] Sylvain Lebresne. A System F with call-by-name exceptions. In *Automata, Languages and Programming, 35th International Colloquium, ICALP 2008, Reykjavik, Iceland, July 7-11, 2008, Proceedings, Part II - Track B: Logic, Semantics, and Theory of Programming & Track C: Security and Cryptography Foundations*, volume 5126 of *Lecture Notes in Computer Science*, pages 323–335. Springer-Verlag, 2008.

[LM08c] Olivier Laurent and *Roberto Maieli*. Cut Elimination for Monomial MALL Proof Nets. In *Proceedings of the 23rd Annual IEEE Symposium on Logic in Computer Science, LICS 2008, 24-27 June 2008, Pittsburgh, PA, USA*, pages 486–497. IEEE Computer Society, 2008. doi:10.1109/LICS.2008.31.

[LT07] *Cosimo Laneve* and Fabien Tarissan. A simple calculus for proteins and cells. In *Proceedings of the First Workshop on Membrane Computing and Biologically Inspired Process Calculi (MeCBIC 2006)* , volume 171 of *Electronic Notes in Theoretical Computer Science*, pages 139–154. Elsevier, 2007.

[MA11a] Antoine Madet and Roberto M. Amadio. An Elementary Affine $\lambda$-Calculus with Multithreading and Side Effects. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 138–152. Springer-Verlag, 2011. doi:10.1007/978-3-642-21691-6_13. 26

[McK10] Richard McKinley. Expansion nets: proof-nets for propositional classical logic. In *Logic for Programming, Artificial Intelligence, and Reasoning - 16th International Conference, LPAR-16, Dakar, Senegal, April 25-May 1, 2010, Revised Selected Papers*, volume 6355 of *Lecture Notes in Computer Science*, pages 535–549. Springer-Verlag, 2010.

[Mel10] Paul-André Melliès. Segal condition meets computational effects. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 150–159. IEEE Computer Society, 2010.

[Mel12] Paul-André Melliès. Game semantics in string diagrams. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*, pages 481–490. IEEE Computer Society, 2012. 33

[MI07] Fabio Mancinelli and *Paola Inverardi*. Quantitative resource-oriented analysis of Java (Adaptable) applications. In *Proceedings of the 6th international workshop on Software and performance*, pages 15–25, 2007. doi:10.1145/1216993.1216998.

[Mim09] Samuel Mimram. The Structure of First-Order Causality. In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 212–221. IEEE Computer Society, 2009. doi:10.1109/LICS.2009.19.

[Mim10a] Samuel Mimram. Computing Critical Pairs in 2-Dimensional Rewriting Systems. In Christopher Lynch, editor, *Proceedings of the 21st International Conference on Rewriting Techniques and Applications, RTA 2010, July*

*11-13, 2010, Edinburgh, Scottland, UK*, volume 6 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 227–242, Edinburgh Royaume-Uni, 2010. Available from: http://hal.inria.fr/inria-00473983/en/, doi:10.4230/LIPIcs.RTA.2010.227. 34

[Mim10b] Samuel Mimram. Focusing in asynchronous games. Ferreira, Fernando (ed.) et al., Programs, proofs, processes. 6th conference on computability in Europe, CiE 2010, Ponta Delgada, Azores, Portugal, June 30–July 4, 2010. Proceedings. Berlin: Springer. Lecture Notes in Computer Science 6158, 331-341 (2010)., 2010. doi:10.1007/978-3-642-13962-8_37.

[Miq07] Alexandre Miquel. Classical program extraction in the calculus of constructions. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 313–327. Springer-Verlag, 2007.

[MM07a] Paul-André Melliès and Samuel Mimram. Asynchronous games: Innocence without alternation. In *Concurrency Theory, 18th International Conference, CONCUR 2007, Lisbon, Portugal, September 3-8, 2007, Proceedings*, 2007. doi:10.1007/978-3-540-74407-8_27.

[MM09] Guillaume Munch-Maccagnoni. Focalisation and Classical Realisability (version with appendices). In *Computer Science Logic, CSL 2009, 18th Annual Conference of the EACSL, Coimbra, Portugal, September 7-11, 2009. Proceedings*, volume 5771 of *Lecture Notes in Computer Science*, pages 409–423. Springer-Verlag, 2009. doi:10.1007/978-3-642-04027-6_30. 23

[MT07a] Paul-André Melliès and Nicolas Tabareau. Resource modalities in game semantics. In *Proceedings of the 22nd IEEE Symposium on Logic in Computer Science, LICS 2007, 10-12 July 2007, Wroclaw, Poland*, pages 389–398. IEEE Computer Society, 2007.

[MT09] Paul-André Melliès and Nicolas Tabareau. An algebraic account of references in game semantics. In *Proceedings of Mathematical Foundation of Programming Semantics (MFPS 2009)*, volume 249 of *Electronic Notes in Theoretical Computer Science*, pages 377–405. Elsevier, 2009. doi:10.1016.

[MTT09] Paul-André Melliès, Nicolas Tabareau, and Christine Tasson. An explicit formula for the free exponential modality of linear logic. In *Automata, Languages and Programming, 36th International Collogquium, ICALP 2009, Rhodes, greece, July 5-12, 2009, Proceedings, Part II*, volume 5556 of *Lecture Notes in Computer Science*, pages 247–260. Springer-Verlag, 2009. doi:10.1007/978-3-642-02930-1. 30, 34

[NZ10] *Lucas Nussbaum* and Stefano Zacchiroli. The Ultimate Debian Database: Consolidating Bazaar Metadata for Quality Assurance and Data Mining. In *Proceedings of the 7th International Working Conference on Mining Software Repositories, MSR 2010 (Co-located with ICSE), Cape Town, South Africa, May 2-3, 2010, Proceedings*, pages 52–61. IEEE Computer Society, 2010.

[PAC+08] *Bruno Pagano*, *Olivier Andrieu*, Benjamin Canou, Emmanuel Chailloux, *Jean-Louis Colaço*, *Thomas Moniot*, and *Philippe Wang*. Certified development tools implementation in objective caml. In *Practical Aspects of Declarative Languages, 10th International Symposium, PADL 2008, San Francisco, CA, USA, January 7-8, 2008*, volume 4902 of *Lecture Notes in Computer Science*, pages 1–15. Springer-Verlag, 2008.

[Pag09b] Michele Pagani. The Cut-Elimination Theorem for Differential Nets with Boxes. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 219–233. Springer-Verlag, 2009. doi:10.1007/978-3-642-02273-9_17. 27

[PAM+09] *Bruno Pagano*, *Olivier Andrieu*, *Thomas Moniot*, Benjamin Canou, *Emmanuel Chailloux*, *Philippe Wang*, Pascal Manoury, and *Jean-Louis Colaço*. Experience Report: Using Objective Caml to develop safety-critical embedded tool in a certification framework. In *Proceeding of the 14th ACM SIGPLAN international conference on Functional programming, ICFP 2009, Edinburgh, Scotland, UK, August 31 - September 2, 2009*, pages 215–220. Association for Computing Machinery, 2009. 42

[Pet09] Barbara Petit. A polymorphic type system for the lambda-calculus with constructors. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, pages 234–248, 2009.

[PT09a] Michele Pagani and Christine Tasson. The inverse Taylor expansion problem in linear logic. In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 222–231. IEEE Computer Society, 2009. doi:10.1109/LICS.2009.19. 26

[PT09b] Michele Pagani and Paolo Tranquilli. Parallel Reduction in Resource Lambda-Calculus. In *Programming Languages and Systems, 7th Asian Symposium, APLAS 2009, Seoul, Korea, December 14-16, 2009. Proceedings*, volume 5904 of *Lecture Notes in Computer Science*, pages 226–242. Springer-Verlag, 2009. doi:10.1007/978-3-642-10672-9_17. 27

[RES11] *Møgelberg Rasmus Ejlers* and Sam Staton. Linearly-used state in models of call-by-value. In *Algebra and Coalgebra in Computer Science - 4th International Conference, CALCO 2011, Winchester, UK, August 30 - September 2, 2011. Proceedings*, volume 6859 of *Lecture Notes in Computer Science*, pages 298–313. Springer, 2011.

[RGP08] Yann Regis-Gianas and *François Pottier*. A Hoare Logic for Call-by-Value Functional Programs. In *Mathematics of Program Construction, 9th International Conference, MPC 2008, Marseille, France, July 15-18, 2008. Proceedings*, volume 5133 of *Lecture Notes in Computer Science*, pages 305–335. Springer-Verlag, 2008. doi:10.1007/978-3-540-70594-9_17. 21

[Sau10b] Alexis Saurin. A Hierarchy for Delimited Continuations in Call-by-Name. In *Foundations of Software Science and Computational Structures, 13th International Conference, FOSSACS 2010, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2010, Paphos, Cyprus, March 20-28, 2010. Proceedings*, volume 6014 of *Lecture Notes in Computer Science*, pages 374–388. Springer-Verlag, 2010. doi:10.1007/978-3-642-12032-9_26. 24

[Sau10c] Alexis Saurin. Standardization and Böhm Trees for $\Lambda\mu$-Calculus. In *Functional and Logic Programming, 10th International Symposium, FLOPS 2010, Sendai, Japan, April 19-21, 2010. Proceedings*, volume 6009 of *Lecture Notes in Computer Science*, pages 134–149. Springer-Verlag, 2010. doi:10.1007/978-3-642-12251-4_11.

[SBT11] Alexis Saurin, *Michele Basaldella*, and *Kazushige Terui*. On the Meaning of Focalization. In *Ludics, Dialogue and Interaction - PRELUDE Project - 2006-2009. Revised Selected Papers*, volume 6505 of *Lecture Notes in Computer Science*, pages 78–87. Springer-Verlag, 2011.

[SH10] Vincent Siles and Hugo Herbelin. Equality is typable in Semi-Full Pure Type Systems. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 21–30. IEEE Computer Society, 2010. 22

[Soz10a] Matthieu Sozeau. Equations: A dependent pattern-matching compiler. In *Interactive Theorem Proving, First International Conference, ITP 2010, Edinburgh, UK, July 11-14, 2010. Proceedings*, volume 6172 of *Lecture Notes in Computer Science*, pages 419–434. Springer-Verlag, July 2010.

[SVV07] *Matthias Schmalz*, *Hagen Völzer*, and Daniele Varacca. Model Checking Almost All Paths Can Be Less Expensive than Checking All Paths. In *FSTTCS 2007: Foundations of Software Technology and Theoretical Computer Science, 27th International Conference, New Delhi, India, December 12-14, 2007, Proceedings*, volume 4855 of *Lecture Notes in Computer Science*, pages 532–543. Springer-Verlag, 2007.

[SVV09] *Matthias Schmalz*, Daniele Varacca, and *Hagen Völzer*. Counterexamples in Probabilistic LTL Model Checking. In *Concurrency Theory, 20th International Conference, CONCUR 2009, Bologna, Italy, September 1-4, 2009. Proceedings*, volume 5710 of *Lecture Notes in Computer Science*, pages 587–602. Springer-Verlag, 2009.

[Tas09a] Christine Tasson. Algebraic totality, towards completeness. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 325–340. Springer-Verlag, 2009. doi:10.1007/978-3-642-02273-9. 31

[Tra09a] Paolo Tranquilli. Confluence of pure differential nets with promotion. In *Computer Science Logic, CSL 2009, 18th Annual Conference of the EACSL, Coimbra, Portugal, September 7-11, 2009. Proceedings*, volume 5771, pages 500–514. Springer-Verlag, 2009.

[TZ08a] Ralf Treinen and Stefano Zacchiroli. Solving package dependencies: from EDOS to Mancoosi. In *Proceedings of the 9th Annual Debian Conference, Mar del Plata, Argentina, August 3-18, 2008*, pages 18–43, 2008. 40

[TZ09] Ralf Treinen and Stefano Zacchiroli. Expressing advanced user preferences in component installation. In *Proceedings of the 1st International Workshop on Open Component Ecosystems*, pages 31–40. Association for Computing Machinery, 2009. doi:10.1145/1595800.1595806. 39

[VDC11a] Jérôme Vouillon and Roberto Di Cosmo. On software component co-installability. In *SIGSOFT/FSE'11 19th ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE-19) and ESEC'11: 13rd European Software Engineering Conference (ESEC-13), Szeged, Hungary, September 5-9, 2011*, pages 256–266. Association for Computing Machinery, 2011. doi:10.1145/2025113.2025149. 40

[Vou08] Jérôme Vouillon. Lwt: a cooperative thread library. In *Proceedings of the ACM Workshop on ML, 2008, Victoria, BC, Canada, September 21, 2008*, pages 3–12. Association for Computing Machinery, 2008. doi:10.1145/1411304.1411307.

[VY07] Daniele Varacca and *Nobuko Yoshida*. Probabilistic pi-calculus and Event Structures. In *Proceedings of the Fifth Workshop on Quantitative Aspects of Programming Languages (QAPL 2007)* , volume 190 of *Electronic Notes in Theoretical Computer Science*, pages 147–166. Elsevier, 2007.

[WAMDRV07] *Andrew W. Appel*, Paul-André Melliès, *Christopher D. Richards*, and Jérôme Vouillon. A very modal model of a modern, major, general type system. In *Proceedings of the 34th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2007, Nice, France, January 17-19, 2007*, pages 109–122. Association for Computing Machinery, 2007. doi:10.1145/1190216.1190235.

[Zei10] Noam Zeilberger. Polarity and the Logic of Delimited Continuations. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 219–227. IEEE Computer Society, 2010. doi:10.1109/LICS.2010.23. 24

### Peer-reviewed national conferences with proceedings

[BCCM07] *Véronique Benzaken*, Giuseppe Castagna, *Dario Colazzo*, and *Cédric Miachon*. Pattern by Example: type-driven visual programming of XML queries. In *Actes des vingt troisièmes Journées de Bases de Données Avancées*, 2007. 19

[BM08] *David Baelde* and Samuel Mimram. De la webradio lambda à la $\lambda$-webradio. In *Actes des dix neuvièmes Journées Françaises des Langages Applicatifs (JFLA 2008), 26 - 29 janvier 2008, Étretat*, pages 47–61, 2008.

[Bou12] Pierre Boutillier. A relaxation of Coq's guard condition. In *Actes des vingt troisièmes Journées Françaises des Langages Applicatifs (JFLA 2012), 4-7 février 2012, Carnac*, pages 1–14, 2012. 22

[DGLGZ10] Mehdi Dogguy, Stephane Glondu, *Sylvain Le Gall*, and Stefano Zacchiroli. Enforcing Type-Safe Linking using Inter-Package Relationships. In *Actes des vingt et unièmes Journées Françaises des Langages Applicatifs (JFLA 2010), 30 janvier - 2 février 2010, La Ciotat*, Studia Informatica Universalis, pages 29–54. Hermann, 2010.

[Man08a] Pascal Manoury. Vérification formelle du tri fonctionnel par tas - Etude opérationnelle. In *Actes des dix neuvièmes Journées Françaises des Langages Applicatifs (JFLA 2008), 26 - 29 janvier 2008, Étretat*, pages 107–122, 2008.

[Man10] Pascal Manoury. De l'interprétation algorithmique du blason. In *Actes des vingt et unièmes Journées Françaises des Langages Applicatifs (JFLA 2010), 30 janvier - 2 février 2010, La Ciotat*, Studia Informatica Universalis, pages 217–244. Hermann, 2010. 39

[SG09] Stéphane Glondu. Extraction certifiée dans Coq-en-Coq. In *JFLA 2009, Vingtièmes Journées Francophones des Langages Applicatifs, Saint Quentin sur Isère, France, January 31 - February 3, 2009. Proceedings*, 2009. 21

[SV10] *Gabriel Scherer* and Jérôme Vouillon. Macaque : Interrogation sûre et flexible de base de données depuis OCaml. In *Actes des vingt et unièmes Journées Françaises des Langages Applicatifs (JFLA 2010), 30 janvier - 2 février 2010, La Ciotat*, Studia Informatica Universalis, pages 165–194. Hermann, 2010.

### Communications at national or international conferences without proceedings

[ABM10a] Roberto M. Amadio, *Patrick Baillot*, and Antoine Madet. An affine-intuitionistic system of types and effects: confluence and termination. In *Workshop LOLA "Syntax and Semantics of Low Level Languages"*, 2010. 25, 36

[Bal08a] Vincent Balat. Exploiting the full power of OCaml in Web programming. In *Ocaml Meeting 2008*, 2008.

[Bal10c] Vincent Balat. Preview of Ocsigen 2.0. In *Ocaml Meeting 2010*, 2010.

[Bal11a] Vincent Balat. Client-server Web applications with Eliom. In *Ocaml Meeting 2011*, 2011.

[Cas07a] Giuseppe Castagna. A Theory of Contracts for Web Services. In *Workshop on Formal Languages and Analysis of Contract-Oriented Software*, 2007.

[Cas10] Giuseppe Castagna. Tackling parametric polymorphism for XML. In *Symposium on Computer Science and Novel Technologies*, 2010.

[CGP07] Giuseppe Castagna, *Nils Gesbert*, and *Luca Padovani*. A Theory of Contracts for Web Services. In *PLAN-X, ACM-SIGPLAN Workshop on Programming Language Technologies for XML*, 2007.

[CP09b] Giuseppe Castagna and *Luca Padovani*. A preliminary proposal of decidable testing relations for infinitary asynchronous CCS (position paper). In *INFINITY 2009: 11th International Workshop on Verification of Infinite-State Systems*, 2009. 37

[Fre10] Jonas Frey. A double categorical analysis of the tripos-to-topos construction. In *International Category Theory Conference CT2010*, June 2010.

[Gau07b] Philippe Gaucher. Globular realization and cubical underlying homotopy type. In *Rencontre du projet ANR "Invariants algébriques des systèmes informatiques"*, 2007.

[Gau07c] Philippe Gaucher. Homotopical semantics of parallel composition in CCS. In *PSSL86*, 2007.

[Gau07d] Philippe Gaucher. Sémantique purement homotopique des algèbres de processus. In *Rencontre du projet ANR "Invariants algébriques des systèmes informatiques"*, 2007.

[Gau08c] Philippe Gaucher. A topological model for studying branching and merging homologies of flows. In *Conférence internationale de théorie des catégories 2008*, 2008.

[Gau08d] Philippe Gaucher. Combinatorics of labelling in higher dimensional automata. In *Rencontre du projet ANR "Invariants algébriques des systèmes informatiques"*, 2008.

[Gau09c] Philippe Gaucher. Higher Dimensional Transition System and Labelled Symmetric Precubical Set. In *Séminaire Itinérant de Catégories*, 2009.

[Gau11b] Philippe Gaucher. Towards a Homotopy Theory of Higher Dimensional Transition Systems. In *Séminaire Itinérant de Catégories*, 2011.

[MRG10] Puech Matthias and Yann Regis-Gianas. Towards typed repositories of proofs. In *Mathematically Intelligent Proof Search - MIPS 2010*, 2010. 21

[MRG12] Puech Matthias and Yann Régis-Gianas. Safe Incremental Type Checking. In *Proceedings of TLDI'12: 2012 ACM SIGPLAN International Workshop on Types in Languages Design and Implementation, Philadelphia, PA, USA, January 28, 2012*, 2012.

[Roz11] Paul Rozière. Proof search in intuitionistic sequent calculus and admissible rules. In *Workshop on Admissible Rules and Unification, Utrecht*, 2011.

### Editing of collective works

[AAC09] Roberto M. Amadio, *Andrea Asperti*, and Giuseppe Castagna. *From Type Theory to Morphological Complexity. Special issue of Information and Computation, volume 207(5).* Academic Press, 2009.

[AH08] Roberto M. Amadio and *Thomas Hildebrandt*. *Proceedings 14th International Workshop on Expressiveness in Concurrency.* Electronic Notes in Theoretical Computer Science, 194(2), 2008., 2008.

[Ama08] Roberto M. Amadio. *Proceedings Foundations of Software Science and Computation Structures (FOSSACS), Springer Lecture Notes in Computer Science, 4962.* Springer Verlag, 2008.

[AP07] Roberto M. Amadio and *Iain Phillips*. *Proceedings of the 13th International Workshop on Expressiveness in Concurrency (EXPRESS 2006), Electronic Notes in Theoretical Computer Science, Volume 175(3).* Elsevier, 2007.

[Cas09] Giuseppe Castagna. *Programming Languages and Systems: Proceedings of the 18th European Symposium on Programming, ESOP 2009, volume 5502 of Lecture Notes in Computer Science.* Springer, 2009.

[CB10b] Giuseppe Castagna and *John Boyland*. *Selected Papers of the "18th European Symposium on Programming", volume 411, Issue 51-52 of Theoretical Computer Science.* Elsevier, 2010.

[CW09] Giuseppe Castagna and *Igor Walukiewicz*. *Selected Papers of the Conference "International Colloquium on Automata, Languages and Programming 2008" (ICALP). Special issue of Logical Methods in Computer Science.* IfCoLog, 2009.

[DLT11] *Conrad Drescher*, *Ines Lynce*, and Ralf Treinen. *Proceedings Second Workshop on Logics for Component Configuration.* Electronic Proceedings in Theoretical Computer Science, 2011. doi:10.4204/EPTCS.65.

[EFL11] Thomas Ehrhard, Claudia Faggian, and *Olivier Laurent*. *Girard's Festschrift, Theoretical Computer Science (Volume 412, Issue 20).* Elsevier, 2011.

[HG10] Russ Harmer and *Dan Ghica*. *Special Issue of APAL (vol 161(5)) for GaLoP 3.* Elsevier, 2010.

[Joi07b] Jean-Baptiste Joinet. *Logique, dynamique et cognition.* Publications de la Sorbonne, 2007.

[JT09] Jean-Baptiste Joinet and *Samuel Tronçon*. *Ouvrir la logique au monde : Philosophie et mathématique de l'interaction.* Editions Hermann (Paris), 2009.

[LT10] *Inês Lynce* and Ralf Treinen. *Proceedings First International Workshop on Logics for Component Configuration*, volume 29. Electronic Proceedings in Theoretical Computer Science, 2010. doi:10.4204/EPTCS.29.

[Tre09a] Ralf Treinen. *Rewriting Techniques and Applications. 20th International Conference, RTA 2009. Brasília, Brazil, June 29-July 1, 2009. Proceedings.* Springer Verlag, 2009.

## Book chapters

[AD09] Roberto M. Amadio and Mehdi Dogguy. Determinacy in a synchronous pi-calculus. In *From semantics to computer science: essays in honour of Gilles Kahn*, pages 1–27. Cambridge University Presse, 2009. 36

[BDG+10] *Olivier Bournez*, *Gilles Dowek*, *Rémi Gilleron*, *Serge Grigorieff*, *Jean-Yves Marion*, Simon Perdrix, and *Sophie Tison*. Décidabilité et Complexité. In *IA Handbook*, pages 1–63. Cépaduès, 2010.

[CBH+09] Giuseppe Castagna, *Véronique Benzaken*, *Haruo Hosoya*, *Benjamin C. Pierce*, and *Stijn Vansummeren*. XML Typechecking. In *The Encyclopedia of Database Systems*, pages 3646–3650. Springer, 2009.

[CH09b] Pierre-Louis Curien and *Hugo Herbelin*. Abstract machines for dialogue games. In *Interactive models of computation and program behavior*, Panoramas et Synthèses, pages 231–275. Société Mathématique de France, 2009. 28

[Cur09a] Pierre-Louis Curien. Sequential algorithms as bistable maps. In *From semantics to computer science: essays in honour of Gilles Kahn*, pages 51–71. Cambridge University Press, 2009.

[DIVZ09] *Angelo Di Iorio*, *Fabio Vitali*, and Stefano Zacchiroli. Web Semantics via Wiki Templating. In *Handbook of research on Web 2.0, 3.0 and x.0: technologies, business and social applications*. San Murugesan, 2009. doi:10.1000/ISBN978-1605663845.

[MDF+10] *Elaine Murphy*, *Vincent Danos*, *Jérôme Feret*, *Jean Krivine*, and Russell Harmer. Rule Based Modeling and Model Refinement. In *Elements of Computational Systems Biology*, Wiley Book Series on Bioinformatics, pages 83–114. John Wiley & Sons, 2010. doi:10.1002/9780470556757.ch4. 35, 36

[Mel09c] Paul-André Melliès. Categorical semantics of linear logic. In *Panoramas et Synthèses*, volume 27. Société Mathématique de France, 2009.

### Scientific popularization works

[DC09a] Roberto Di Cosmo. La science du logiciel libre. *La Recherche*, pages 70–73, December 2009. Les cahiers de l'INRIA. Available from: http://hal.inria.fr/inria-00511691/fr.

[DC09b] Roberto Di Cosmo. Offrons aux jeunes les clés du pouvoir et de la liberté. *Science et Avenir*, 751:42–45, September 2009. Available from: http://sciencesetavenirmensuel.nouvelobs.com/hebdo/parution/p751/articles/a407123-.htm

[DCS09] Roberto Di Cosmo and *Jean-Bernard Stefani*. La science du logiciel libre par Roberto Di Cosmo. Entre auto-organisation et méritocratie, entretien avec Jean-Bernard Stefani, propos recueillis par Dominique Chouchan. *La Recherche Les Cahiers de l'Inria*, 2009.

[DDC09] *Andrew Donohogue* and Roberto Di Cosmo. Open for business. *I-CIO, Global Intelligence for the CIO*, August 2009. Available from: http://www.i-cio.com/blog/july/roberto-di-cosmo.

[Roz12] Paul Rozière. Kurt Gödel, le fossoyeur du rêve de Hilbert. *Dossier Pour la Science*, (74), 2012.

[Tre09b] Ralf Treinen. Debianopolis. *Linux Magazin*, 2009. 40

### PhD Thesis

[Boe11] Jaap Boender. *Etude formelle des distributions de logiciel libre*. PhD thesis, Université Paris Diderot - Paris 7, 2011. 40

[Can11] Benjamin Canou. *Programmation Web Typée*. These, Université Pierre et Marie Curie - Paris VI, October 2011. Available from: http://tel.archives-ouvertes.fr/tel-00640566. 41

[Car11] Alberto Carraro. *Théories et modèles du lambda calcul pur et avec ressources*. PhD thesis, Université Paris Diderot, Università Ca' Foscari Venezia, 2011. Thèse de Doctorat.

[Cla10] Pierre Clairambault. *Logique et Interaction : une Étude Sémantique de la Totalité*. PhD thesis, Université Paris Diderot - Paris 7, 2010.

[Dab07] Frédéric Dabrowski. *Programmation Réactive Synchrone, Langage et Contrôle des Ressources*. PhD thesis, Université Paris Diderot - Paris 7, 2007.

[dL07] Joachim de Lataillade. *Quantification du second ordre en sémantique des jeux - Application aux isomorphismes de types*. PhD thesis, Université Paris Diderot, November 2007.

[Dog12] Mehdi Dogguy. *Déterminisme et Confluence dans des systèmes concurrents et synchrones*. PhD thesis, Université Paris Diderot - Paris 7, 2012. 36

[Fos09] Luca Fossati. *Modeling the Handshake Protocol for Asynchrony*. PhD thesis, Université Paris Diderot and University of Torino, February 2009.

[Gia09] Elena Giachino. *Session Types: Semantic Foundations and Object-Oriented Applications*. PhD thesis, Università degli Studi di Torino – Université Paris 7, December 2009. Available from: http://www.di.unito.it/~giachino/thesis/thesis.pdf. 37

[Gim09] Stéphane Gimenez. *Programmer, calculer et raisonner avec les réseaux de la Logique Linéaire*. PhD thesis, Université Paris Diderot - Paris 7, 2009. 26

[Glo12] Stéphane Glondu. *Vers une certification de l'extraction de Coq*. PhD thesis, Université Paris Diderot, June 2012. Available from: http://stephane.glondu.net/these/. 21

[Gui08] Mauricio Guillermo. *Jeux de Réalisabilité en Arithmétique Classique*. PhD thesis, Université Paris Diderot - Paris 7, 2008.

[Hen11] Grégoire Henry. *Typer la désérialisation sans sérialiser les types*. PhD thesis, Université Paris Diderot - Paris 7, 2011.

[Hes08] Philippe Hesse. *Réalisabilité Classique et protocoles réseaux*. PhD thesis, Université Paris Diderot - Paris 7, 2008.

[Ili10b] Danko Ilik. *Preuves constructives de complétude et contrôle délimité*. PhD thesis, École Polytechnique, 2010. 21, 24

[Leb08b] Stéphane Lebresne. *Une approche de la détection statique d'exceptions non rattrapées en appel par nom*. PhD thesis, Université Paris Diderot, December 2008.

[Mai11] Séverine Maingaud. *Certification de programmes impératifs en logique dynamique: le cas du lambda-calcul avec références*. PhD thesis, Université Paris Diderot, December 2011.

[Man08b] Giulio Manzonetto. *Models and Theories of Lambda Calculus*. PhD thesis, Università Ca'Foscari, Venezia, 2008.

[Mim08b] Samuel Mimram. *Sémantique des jeux asynchrones et réécriture 2-dimensionnelle*. PhD thesis, Université Paris Diderot - Paris 7, 2008.

[Mon07] Raphaël Montelatici. *Langages fonctionnels, typage et interopérabilité : Objective Caml sur .NET*. PhD thesis, Université Paris Diderot - Paris 7, 2007.

[Pet11b] Barbara Petit. *Autour du lambda-calcul avec constructeurs*. PhD thesis, ENS Lyon, July 2011.

[Pic11] Mauro Piccolo. *Linearity and Beyond in Denotational Semantics*. PhD thesis, Université Paris Diderot and University of Torino, December 2011.

[Ren11] Fabien Renaud. *Les ressources explicites vues par la théorie de la réécriture*. PhD thesis, Université Paris Diderot - Paris 7, 2011.

[Sil10] Vincent Siles. *Etude sur le typage de l'égalité dans les systèmes de types*. PhD thesis, École Polytechnique, 2010. 22

[Sou10] Elie Soubiran. *Développement modulaire de théories et gestion de l'espace de nom pour l'assistant de preuve Coq*. PhD thesis, École Polytechnique, 2010.

[Tab08] Nicolas Tabareau. *Modalités de ressource et contrôle en logique tensorielle*. PhD thesis, Université Paris Diderot - Paris 7, 2008.

[Tas09b] Christine Tasson. *Sémantiques et syntaxes vectorielles de la logique linéaire*. PhD thesis, Université Paris Diderot - Paris 7, 2009. 29

[Tra09b] Paolo Tranquilli. *Nets Between Determinism and Nondeterminism*. PhD thesis, Université Paris Diderot and University Roma 3, April 2009.

[Zha07] Min Zhang. *Modélisation et analyse de processus biologiques dans des algèbres de processus*. PhD thesis, Université Paris Diderot - Paris 7, 2007.

### Technical reports

[AARG12] Nicolas Ayache, Roberto Amadio, and Yann Régis-Gianas. Certifying and reasoning on cost annotations in C programs. Technical report, Preuves, Programmes et Systèmes, 2012.

[AARGS10] Roberto M. Amadio, Nicolas Ayache, Yann Régis-Gianas, and Ronan Saillard. Certifying cost annotations in compilers. Technical report, Preuves, Programmes et Systèmes, 2010. 22

[AB08b] Samy Abbes and *Albert Benveniste*. Concurrency, sigma-algebras, and probabilistic fairness. Technical report, Preuves, Programmes et Systèmes, 2008.

[Abb09] Samy Abbes. Ordre préfixe et temps d'arrêt. Technical report, Preuves, Programmes et Systèmes, 2009.

[Abb10] Samy Abbes. Markov concurrent processes. Technical report, Preuves, Programmes et Systèmes, 2010. 38

[Abb11] Samy Abbes. Distributed Markov Processes. Technical report, Preuves, Programmes et Systèmes, 2011. 38

[ABDCZ09b] Pietro Abate, Jaap Boender, Roberto Di Cosmo, and Stefano Zacchiroli. Strong Dependencies between Software Components. Technical report, Preuves, Programmes et Systèmes, 2009.

[ABM10b] Roberto Amadio, *Patrick Baillot*, and Antoine Madet. An affine-intuitionistic system of types and effects: confluence and termination. Technical report, Preuves, Programmes et Systèmes, 2010.

[AGL+10] Pietro Abate, *André Guerreiro*, *Stéphane Laurière,* , Ralf Treinen, and Stefano Zacchiroli. Manccosi Deliverable D5.2: Extension of an existing package manager to produce traces of ugradeability problems in CUDF format. Technical report, Preuves, Programmes et Systèmes, 2010. 39

[AK10b] Beniamino Accattoli and Delia Kesner. The structural lambda-calculus. Technical report, Preuves, Programmes et Systèmes, 2010.

[Ama07c] Roberto M. Amadio. Outils Logiques pour l'Informatique. Technical report, Preuves, Programmes et Systèmes, 2007.

[Ama09c] Roberto M. Amadio. Introduction à l'analyse syntaxique et à la compilation. Technical report, Preuves, Programmes et Systèmes, 2009.

[Ama11] Roberto Amadio. A decompilation of the pi-calculus and its application to termination. Technical report, Preuves, Programmes et Systèmes, 2011. 25

[Asc12b] Federico Aschieri. Interactive Realizability for Classical Peano Arithmetic with Skolem Axioms. Technical report, Preuves, Programmes et Systèmes, 2012.

[Asc12a] Federico Aschieri. Interactive Realizability for Second-Order Heyting Arithmetic with EM1 and SK1. Technical report, Preuves, Programmes et Systèmes, 2012. 32

[AT11a] Pietro Abate and Ralf Treinen. Mancoosi Deliverable D5.3: UPDB infrastructure to collect traces of upgradeability problems in CUDF format. Technical report, Preuves, Programmes et Systèmes, 2011. 39

[AT11b] Pietro Abate and Ralf Treinen. Mancoosi Deliverable D5.4: Report on the international competition. Technical report, Preuves, Programmes et Systèmes, 2011. 39

[AZ12] Federico Aschieri and *Margherita Zorzi*. Eliminating Skolem Functions in Peano Arithmetic with Interactive Realizability. Technical report, Preuves, Programmes et Systèmes, 2012.

[Bal08b] Thibaut Balabonski. Calculs avec Motifs Dynamiques. Technical report, Preuves, Programmes et Systèmes, 2008.

[Bal09c] Vincent Balat. Rethinking Web interaction. Technical report, Preuves, Programmes et Systèmes, 2009. 40

[Bal10d] Thibaut Balabonski. Optimality for Dynamic Patterns. Technical report, Preuves, Programmes et Systèmes, 2010.

[Bal11b] Thibaut Balabonski. A Unified Approach to Fully Lazy Sharing. Technical report, Preuves, Programmes et Systèmes, 2011.

[BCD+11] *Véronique Benzaken*, Giuseppe Castagna, *Julien Demouth*, *Alain Frisch*, *Cédric Miachon*, *Kim Nguyen*, and Stefano Zacchiroli. ℂDuce User's Manual. Technical report, Preuves, Programmes et Systèmes, 2011. 18

[BCF07] *Véronique Benzaken*, Giuseppe Castagna, and *Alain Frisch*. ℂDuce Tutorial. Technical report, Preuves, Programmes et Systèmes, 2007. 18

[BET10] *Richard Blute*, Thomas Ehrhard, and *Christine Tasson*. A convenient differential category. Technical report, Preuves, Programmes et Systèmes, 2010. 29

[BG12] Chantal Berline and *Klaus Grue*. A synthetic axiomatization of Map Theory. Technical report, Preuves, Programmes et Systèmes, 2012. 78 p. incluant TOC détaillée, index et appendices. 33

[BGGP09b] *Paola Bruscoli*, *Alessio Guglielmi*, *Tom Gundersen*, and Michel Parigot. Quasipolynomial Normalisation in Deep Inference via Atomic Flows and Threshold Formulae. Technical report, Preuves, Programmes et Systèmes, 2009.

[Bre12] Flavien Breuvart. On the discriminating power of tests in resource lambda-calculus. Technical report, Preuves, Programmes et Systèmes, 2012. 31

[Buc10] Antonio Bucciarelli. Extensional Collapse Situations I: non-termination and unrecoverable errors. Technical report, Preuves, Programmes et Systèmes, 2010.

[Chr09] Juliusz Chroboczek. BitTorrent DHT Extensions for IPv6. Technical report, Preuves, Programmes et Systèmes, 2009. 42

[Chr11] Juliusz Chroboczek. The babel routing protocol. RFC 6126 (Experimental), April 2011. Available from: `http://www.ietf.org/rfc/rfc6126.txt`.

[CL08] Juliusz Chroboczek and Sylvain Lebresne. Juppix: a Linux Live-CD for Undergraduate Students. Technical report, Preuves, Programmes et Systèmes, 2008.

[CS12b] *Pierre Castéran* and Matthieu Sozeau. A gentle introduction to type classes and relations in Coq. Technical report, Preuves, Programmes et Systèmes, 2012. 32 pages.

[CSB12] Alberto Carraro, *Antonino Salibra*, and Antonio Bucciarelli. Minimal lambda-theories by ultraproducts. Technical report, Preuves, Programmes et Systèmes, 2012. 31

[DC07] Roberto Di Cosmo. On privacy and anonymity in electronic and non electronic voting: the ballot-as-signature attack. Technical report, Preuves, Programmes et Systèmes, 2007.

[DCPTDF08] *Daniel De Carvalho*, Michele Pagani, and *Lorenzo Tortora De Falco*. A semantic measure of the execution time in Linear Logic. Technical report, Preuves, Programmes et Systèmes, 2008. 25

[DE08] Vincent Danos and Thomas Ehrhard. On probabilistic coherence spaces. Technical report, Preuves, Programmes et Systèmes, 2008. 29 pages.

[DH07] *Gilles Dowek* and Olivier Hermant. A simple proof that super-consistency implies cut elimination. Technical report, Preuves, Programmes et Systèmes, 2007.

[DHW11] *Vincent Danos*, Russ Harmer, and *Glynn Winskel*. Constraining rule-based dynamics with types. Technical report, Preuves, Programmes et Systèmes, 2011. 36

[Ehr07] Thomas Ehrhard. On finiteness spaces and extensional presheaves over the Lawvere theory of polynomials. Technical report, Preuves, Programmes et Systèmes, 2007. 14 pages.

[FM09] *Germain Faure* and Alexandre Miquel. A Categorical Semantics for The Parallel Lambda-Calculus. Technical report, Preuves, Programmes et Systèmes, 2009.

[Fre11] Jonas Frey. A 2-Categorical Analysis of the Tripos-to-Topos Construction. Technical report, Preuves, Programmes et Systèmes, 2011. 59 pages.

[GGM12] *Stéphane Gaussent*, Yves Guiraud, and *Philippe Malbos*. Coherent presentations and actions on categories. Technical report, Preuves, Programmes et Systèmes, 2012. 66 pages.

[Goy09] Alexis Goyet. Discovering new languages from the study of games semantics. Technical report, Preuves, Programmes et Systèmes, 2009. This is a master thesis for the MPRI (http://mpri.master.univ-paris7.fr). The main body of the thesis is 18 pages long. A 4 pages summary in French is given.

[Het11] Stefan Hetzl. Proofs as Tree Languages. Technical report, Preuves, Programmes et Systèmes, 2011.

[HPA$^+$09] *Nicolas Hernandez*, *Fabien Poulard*, *Stergos D. Afantenos*, *Matthieu Vernier*, and Jérôme Rocheteau. Apache UIMA pour le Traitement Automatique des Langues. Technical report, Preuves, Programmes et Systèmes, 2009.

[HS09] Hugo Herbelin and *Alexis Saurin*. $\lambda\mu$-calculus and $\Lambda\mu$-calculus: a Capital Difference. Technical report, Preuves, Programmes et Systèmes, 2009. 24

[Ili10c] Danko Ilik. Continuation-passing Style Models Complete for Intuitionistic Logic. Technical report, Preuves, Programmes et Systèmes, 2010.

[Ili10a] Danko Ilik. Delimited control operators prove Double-negation Shift. Technical report, Preuves, Programmes et Systèmes, 2010. 23

[Joi08] Jean-Baptiste Joinet. Nature et logique, de G.Gentzen à J-Y.Girard. Technical report, Preuves, Programmes et Systèmes, 2008. Article commandé en 2008 pour le

premier numéro de la revue De scientia (revue semestrielle du groupe de recherche franco-italien ”Pensée des sciences” (dir. Charles Alunni, ENS Paris, et Mario Castellana, Università degli studi di Bari), qui était censé paraître en 2008. Patient, l'auteur du présent article en est encore à se demander si le premier numéro de cette revue paraîtra un jour.

[KC09] Gabriel Kerneis and Juliusz Chroboczek. Are events fast? Technical report, Preuves, Programmes et Systèmes, 2009.

[KC12b] Gabriel Kerneis and Juliusz Chroboczek. Lambda-lifting and CPS conversion in an imperative language. Technical report, Preuves, Programmes et Systèmes, 2012. 42

[Kes07b] Delia Kesner. The theory of calculi with explicit substitutions revisited. Technical report, Preuves, Programmes et Systèmes, 2007.

[KL07c] Jean-Louis Krivine and Yves Legrandgérard. Formules valides, jeux et protocoles réseau. Technical report, Preuves, Programmes et Systèmes, 2007. 12 pages.

[KL07b] Jean-Louis Krivine and Yves Legrandgérard. Valid formulas, games and network protocols. Technical report, 2007. 12 pages. 32

[Kri08] Jean-Louis Krivine. Structures de réalisabilité, RAM et ultrafiltre sur N. *CoRR*, abs/0809.2394, 2008. 23, 32

[Kri10] Jean-Louis Krivine. Algèbres de réalisabilité: un programme pour bien ordonner R. Technical report, Preuves, Programmes et Systèmes, 2010. 45 pages.

[LMW07] *Yves Lafont*, François Métayer, and *Krzysztof Worytkiewicz*. A folk model structure on omega-cat. Technical report, Preuves, Programmes et Systèmes, 2007. 17 pages.

[MA11b] Antoine Madet and Roberto M. Amadio. Elementary affine $\lambda$-calculus with multithreading and side effects. Technical report, Preuves, Programmes et Systèmes, 2011.

[Man11] Pascal Manoury. Programmation de droite à gauche. Technical report, Preuves, Programmes et Systèmes, 2011.

[Mim08a] Samuel Mimram. Presentation of a Game Semantics for First-Order Propositional Logic. Technical report, 2008.

[Miq08] Alexandre Miquel. On Skolemising Zermelo's Set Theory. Technical report, Preuves, Programmes et Systèmes, 2008. 19 pages.

[MM07b] Paul-André Melliès and Samuel Mimram. Asynchronous games: innocence without alternation. Technical report, Preuves, Programmes et Systèmes, 2007.

[MM11] Guillaume Munch-Maccagnoni. From delimited CPS to polarisation. Technical report, Preuves, Programmes et Systèmes, 2011. 24

[MT07b] Paul-André Melliès and Nicolas Tabareau. Linear continuations and duality. Technical report, Preuves, Programmes et Systèmes, 2007.

[MT08] Paul-André Melliès and Nicolas Tabareau. Free models of T-algebraic theories computed as Kan extensions. Technical report, Preuves, Programmes et Systèmes, 2008. 30, 33

[Mé07] François Métayer. Cofibrant complexes are free. Technical report, Preuves, Programmes et Systèmes, 2007. 16 pages, soumis.

[PS08] Michele Pagani and *Alexis Saurin*. Stream Associative Nets and Lambda-mu-calculus. Technical report, Preuves, Programmes et Systèmes, 2008.

[TV10] Christine Tasson and *Lionel Vaux*. Transport of finiteness structures and applications. Technical report, Preuves, Programmes et Systèmes, 2010. 29

[TZ08b] Ralf Treinen and Stefano Zacchiroli. Description of the CUDF Format. Technical report, Preuves, Programmes et Systèmes, 2008.

[VDC11b] Jérôme Vouillon and Roberto Di Cosmo. On Software Component Co-Installability (extended version). Technical report, Preuves, Programmes et Systèmes, 2011.

[VLT08] *Jules Villard*, *Etienne Lozes*, and Ralf Treinen. A Spatial Equational Logic for the Applied pi-calculus. Technical report, Preuves, Programmes et Systèmes, 2008.

### Other publications

[BGGP09a] *Paola Bruscoli*, *Alessio Guglielmi*, Tom Gundersen, and Michel Parigot. Quasipolynomial normalisation in deep inference via atomic flows and threshold formulae. *CoRR*, abs/0903.5392, 2009.

[Cur09b] Pierre-Louis Curien. Introduction to "Interactive models of computation and program behaviour". *Panoramas et Synthèses*, 27, 2009.

[Cur11] Pierre-Louis Curien. Preface to Girard's Festschrift. *Theoretical Computer Science*, 412(20):1853–1859, 2011.

[HL09b] Hugo Herbelin and Gyesik Lee. Formalising logical meta-theory - semantical normalisation using kripke models for predicate logic. submitted in November 2009 to APAL, 2009.

[HS] Hugo Herbelin and Alexis Saurin. $\lambda\mu$-calculus and $\Lambda\mu$-calculus, a capital difference. submitted to APAL.

### Publications prior to the affiliation to PPS

[AB07] Samy Abbes and Albert Benveniste. Truly Concurrent Synchronization of Markov Chains, 2007.

[AH07] Zena Ariola and Hugo Herbelin. Control Reduction Theories: the Benefit of Structural Substitution. *Journal of Functional Programming*, 2007.

[AHS07a] Zena Ariola, Hugo Herbelin, and Amr Sabry. A Proof-Theoretic Foundation of Abortive Continuations. *Higher-Order and Symbolic Computation*, 20(4), 2007. doi:10.1007/s10990-007-9007-z.

[AHS07b] Zena Ariola, Hugo Herbelin, and Amr Sabry. A Type-Theoretic Foundation of Delimited Continuations. *Higher-Order and Symbolic Computation*, 2007.

[BCG+09b] Bruno Barras, Pierre Corbineau, Benjamin Grégoire, Hugo Herbelin, and Jorge Luis Sacchini. A New Elimination Rule for the Calculus of Inductive Constructions. In *Types for Proofs and Programs, International Conference, TYPES 2008, Torino, Italy, March 26-29, 2008, Revised Selected Papers*, volume 5497 of *Lecture Notes in Computer Science*, pages 32–48, 2009. doi:10.1007/978-3-642-02444-3_3.

[CR08] Anne Crumière and Paul Ruet. Spatial differentiation and positive circuits in a discrete framework. In *Electronic Notes in Theoretical Computer Science*, volume 192, pages 85–100, 2008. doi:10.1016/j.entcs.2008.10.029.

[HG08b] Herbelin Hugo and Silvia Ghilezan. An approach to call-by-name delimited continuations. In *Proceedings of the 35th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2008, San Francisco, California, USA, January 7-12, 2008*, pages 383–394. Association for Computing Machinery, 2008.

[IR08] Pierre Ille and Paul Ruet. Cyclic extensions of order varieties. *Electronic Notes in Theoretical Computer Science*, 212:119–132, 2008. doi:10.1016/j.entcs.2008.04.057.

[RR07] Elisabeth Remy and Paul Ruet. On differentiation and homeostatic behaviours of Boolean dynamical systems. *Transactions on Computational Systems Biology VIII*, 4780:92–101, 2007. doi:10.1007/978-3-540-76639-1_6.

[RR08] Elisabeth Remy and Paul Ruet. From minimal signed circuits to the dynamics of Boolean regulatory networks. *Bioinformatics*, 24(16), 2008. doi:10.1093/bioinformatics/btn287.

[RRT08] Elisabeth Remy, Paul Ruet, and Denis Thieffry. Graphic requirements for multistability and attractive cycles in a Boolean dynamical framework. *Advances in Applied Mathematics*, 41(3):335–350, 2008. doi:10.1016/j.aam.2007.11.003.

[Sau08a] Alexis Saurin. On the Relations between the Syntactic Theories of $\lambda\mu$-Calculi. In *Computer Science Logic, CSL 2008, 17th Annual Conference of the EACSL, Bertinoro, Italy, September 16-19, 2008. Proceedings*, volume 5213 of *Lecture Notes in Computer Science*, pages 154–168, 2008. doi:10.1007/978-3-540-87531-4_13. 24

[Sau08b] Alexis Saurin. Towards Ludics Programming: Interactive Proof Search. In *Logic Programming, 24th International Conference, ICLP 2008, Udine, Italy, December 9-13 2008, Proceedings*, Lecture Notes in Computer Science, pages 253–268, 2008. doi:10.1007/978-3-540-89982-2_27.

[SCM08] Alexis Saurin, Kaustuv C. Chaudhuri, and Dale Miller. Canonical Sequent Proofs via Multi-Focusing. In *Fifth IFIP International Conference on Theoretical Computer Science - TCS 2008, IFIP 20th World Computer Congress, TC 1, Foundations of Computer Science*, pages 383–396, 2008. doi:10.1007/978-0-387-09680-3_26.

[SM07] Alexis Saurin and Dale Miller. From Proofs to Focused Proofs: A Modular Proof of Focalization in Linear Logic. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, Lecture Notes in Computer Science, pages 405–419, 2007. doi:10.1007/978-3-540-74915-8_31.

[SN08] Matthieu Sozeau and Oury Nicolas. First-Class Type Classes. *Lecture Notes in Computer Science*, 2008. doi:10.1007/978-3-540-71067-7_23. 20

[Soz07] Matthieu Sozeau. Subset Coercions in Coq. *Lecture Notes in Computer Science*, (4502):237–252, 2007. doi:10.1007/978-3-540-74464-1_16.

[Soz09] Matthieu Sozeau. A New Look at Generalized Rewriting in Type Theory. *Journal of Formalized Reasoning*, 2(1):41–62, 2009. 20

[Soz10b] Matthieu Sozeau. Equations: A Dependent Pattern-Matching Compiler. *Lecture Notes in Computer Science*, 6172, 2010. doi:10.1007/978-3-642-14052-5_29. 22

## Software development

[AARGa] Roberto Amadio, Nicolas Ayache, and Yann Régis Gianas. (Prototype) Within the CerCo project (Section 6.4), Amadio has developed with Ayache and Regis-Gianas tools to certify and reason on the execution cost of C programs and functional programs.

[AARGb] Nicolas Ayache, Roberto Amadio, and Yann Régis-Gianas. Cerco is a cost annotating compiler for C.

[ABDC+] Pietro Abate, Jaap Boender, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. Dose, a software library and a tool suite for the analysis of software package repositories. This software is published und the LGPL.

[ACCK] Pejman Attar, Yoann Canal, Juliusz Chroboczek, and Gabriel Kerneis. Hekate is a highly-concurrent BitTorrent seeder.

[ARG] Christine Audebaud, Philippe Paulin-Mohring and Yann Régis Gianas. (Prototype)In 2008, in collaboration with P. Audebaud (team Plume of LIP lab, ENS Lyon) and C. Paulin-Mohring (LRI lab of Université Paris Sud and INRIA team Proval), Régis-Gianas worked on proofs of probabilistic programs. He extended the Why proof system with randomized primitives in the programming language and predicates over random distributions in the specification language in an experimental version of this system.

[Bal] Vincent Balat. Ocsforge is a collaborative software development platform (forge). Based on Ocsigen and Ocsimore.

[BBM] David Baelde, Romain Beauxis, and Samuel Mimram. Liquidsoap is a scripting language for generating audio Streams.

[BDa] Jaap Boender and Berke Durak. Pkglab is a domain-specific query language for open-source software distribution problems.

[BDb] Jaap Boender and Berke Durak. Tart is a tool to repartition an open-source software distribution over several media (CDs, DVDs).

[Bo] Jaap Boender. Ceve is a generalized open-source software package parser and translator.

[BV] Vincent Balat and Jérôme Vouillon. Eliom is a framework for programming client/server Web applications in Ocaml.

[BVY+] Vincent Balat, Jérôme Vouillon, Boris Yakobowski, Stéphane Glondu, and Gabriel Kerneis. Ocsigen server is a Web server developed in Ocaml, with the LWT cooperative thread library. It has been designed in order too been extended easily by writing Ocaml modules. Many extensions already exist (like a module for executing CGI script, a reverse proxy, access control, redirections, URL rewriting, page compression, user configuration files, etc.).

[Can] Benjamin Canou. O'Browser is an Ocaml virtual machine written in Javascript, to run Ocaml program in Web browsers.

[CBL] Roberto Di Cosmo, Vincent Balat, and Jean-Vincent Loddo. Demolinux is one of the first Linux Live-CD.

[Chaa] Emmanuel Chailloux. OCamlIL is an experimental Ocaml compiler that targets Microsoft .NET.

[Chab] Emmanuel Chailloux. O'Jacare is a code generator to help in interoperability between Java and Ocaml through their object model.

[Chra] Juliusz Chroboczek. AHCP is an autoconfiguration protocol for IPv6 and dual-stack IPv6/IPv4 networks designed to be used in place of router discovery and DHCP on networks where it is difficult or impossible to configure a server within every link-layer broadcast domain, for example mobile ad-hoc networks.

[Chrb] Juliusz Chroboczek. Juppix is a LiveCD GNU/Linux based on Knoppix including programs used by Université Paris Diderot L students.

[Chrc] Juliusz Chroboczek. Polipo is a caching web proxy.

[Chrd] Juliusz Chroboczek. Stochastic Fair Blue (SFB) is an active queue management algorithm for packet routers that attempts to simultaneously bound queue length (and hence latency), minimise packet drops, maximise link utilisation, be fair to reactive aggregates, reliably detect non-reactive aggregates (aggregates that don't respond to congestion control indications) and put them into a so-called penalty box.

[CKa] Juliusz Chroboczek and Gabriel Kerneis. Babel is a distance-vector routing protocol for IPv6 and IPv4 with fast convergence properties. It is based on the ideas in DSDV, AODV and Cisco's EIGRP, but uses a variant of ETX link cost estimation rather than a simple hop-count metric.

[CKb] Juliusz Chroboczek and Gabriel Kerneis. CPC is a programming language designed for writing concurrent systems. The CPC programmer manipulates cooperatively scheduled

threads; the CPC program is then processed by the CPC translator, which produces highly efficient event-loop code. In the author's opinion, this approach gives the best of the two worlds: the convenience of programming with threads, and the low memory usage of event-loop code.

[Cos] Roberto Di Cosmo. OCamlP3l is a compiler for Caml parallel programs.

[FCA] Alain Frisch, Giuseppe Castagna, and Pietro Abate. CDuce is a modern XML-oriented functional language with innovative features. A compiler is available under the terms of an open-source license. CDuce is type-safe, efficient, and offers powerful constructions to work with XML documents.

[Gim] Stephane Gimenez. Laby is a teaching software: learn how to program with ants and spider webs.

[HLS] Hugo Herbelin, Pierre Letouzey, and Matthieu Sozeau. Coq is an interactive proof assistant.

[HV] Haruo Hosoya and Jérôme Vouillon. XDuce is a typed programming language that is specifically designed for processing XML data.

[Kri] Jean Krivine. KaSim is a stochastic simulator for the $\kappa$-calculus, a rule-based language for the modeling of protein-protein interaction networks.

[PVJ] Benjamin Pierce, Jérôme Vouillon, and Trevor Jim. Unison is a file synchroniser.

[RGa] Yann Régis-Gianas. Menhir is an LR parser generator for Ocaml.OCaml.

[RGb] Yann Régis Gianas. (Prototype) Since 2008, Régis-Gianas develops of Pangolin, a prover for functional programs based on higher-order logic.

[RGc] Yann Régis Gianas. (Prototype) Since 2011, Régis-Gianas develops of lamcost, a cost annotating compiler for functional programs.

[VCR] Julien Verlaguet, Emmanuel Chailloux, and Vivien Ravet. HirondML is an experimental Ocaml library that implements migrating threads. To minimize data transfers when a thread migrates, HirondML distinguishes local variables from global ones: the former are copied during the migration process, whereas the latter are rebound in the target process.

[VD] Jérôme Vouillon and Jérémie Dimino. Lwt is a cooperative threads library for Ocaml, written in monadic style.

[Voua] Jérôme Vouillon. Debcheck is a tool to check for broken packages in an open-source software distribution (*e.g.* Linux, FreeBSD).

[Voub] Jérôme Vouillon. Js_of_ocaml is a compiler from Ocaml bytecode to Javascript.

[VTCB] Jérôme Vouillon, Ralf Treinen, Roberto Di Cosmo, and Jaap Boender. EDOSLib is a library which provides the foundation of some tools that are used in the framework. In particular EDOSLib implements: an object model for representing package repositories

information and their structure; a set of functionalities to explore manage the package repository structure (*e.g.* extracting subrepositories and dependency closures); EGraph input/output functionalities.

[YB] Boris Yakobowski and Vincent Balat. Ocsimore is a content management system written with Eliom, containing a Wiki, forum, blog, news, etc (under development)[68].

# 6 Research Projects

The PPS lab is and has been involved in many research projects during the period 2007-2012. We provide here a comprehensive list, with references to pages of this activity report where the corresponding research is described.

## 6.1 Université Paris Diderot projects

PPS lab and IMJ initiated two interdisciplinary partnerships:

- *Sémantique, algèbre opéradique et catégorication*, 2011.
- *Sémantique, algèbre opéradique et catégorication: un point de convergence novateur entre informatique, mathématique et physique* in 2010.

Both projects were supervised and animated by Melliès and received a funding of 15 000€ from Université Paris Diderot, used for invitation and organization of small meetings. These projects have allowed to reinforce the cooperation between the two laboratories on the above mentioned topics.

## 6.2 CNRS *groupements de recherche*

Several members of the PPS lab take part to the activities of the CNRS GDR-IM[69], and more specifically to the working groups GEOCAL and LAC, this latter being animated and organized by Kesner. The PPS lab participates also to the GDR *Topologie Algébrique et Applications*[70], as a team led by Gaucher. In that way, the PPS lab deepens its rich connections with the Mathematics community on topics such as higher dimensional algebra and homotopy. Last, the PPS lab is a team of the GDR *Théorie des jeux: modélisation mathématique et applications*; Melliès is particularly active in this GDR.

## 6.3 National projects

- ANR[71] *Arpège* project Aeolus. Partners: team Cep of the I3S lab (Université de Nice Sophia Antipolis), team Focus (located in Bologna, Italy) of INRIA Sophia Antipolis, company Mandriva. Leader: Di Cosmo (PPS). Number of local researchers (men months): 54. Started in 2011, ending in 2014 (48 months). Local funding: 208 023€. Quality label of competitivity poles PEGASE, SCS and SYSTEMATIC Paris Région. See page 40.
  http://www.aeolus-project.org/

[68] Ocsimore is used on www.pps.univ-paris-diderot.fr.
[69] *Informatique Mathématique* http://www.gdr-im.fr/, directed by Brigitte Vallée.
[70] See http://math.univ-lille1.fr/~gdrtop05/index.html.
[71] ANR: *Agenge Nationale pour la Recherche*, http://www.agence-nationale-recherche.fr/

- INRIA ARC project CeProMi. Partners: team ProVal of INRIA Saclay, team DCS of the Verimag lab (Université Joseph Fourier), team Gallium of INRIA Rocquencourt, team Cassis of INRIA Besançon and Nancy. Local leader: Yann-Régis Gianas. Started in 2008, ended in 2009. Local funding: 30 000€.
  http://www.lri.fr/cepromi/

- ANR *Arpège* project Cercles 2 (*Certification compositionnelle des logiciels embarqués et sûrs*). Partners: team APR of the LIP6 lab (Université Pierre et Marie Curie), companies Sagem Défense et Sécurité, Clearsy. Local leader: Manoury. Number of local researchers (men months): 12. Local funding: 139 123€. Started in 2011, ending in 2014 (44 months). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 43.
  http://www.algo-prog.info/cercles/

- ANR *Blanc* project Choco (*Curry-Howard pour la concurrence*). Partners: team LCR of the LIPN lab (Université Paris Nord – Villetaneuse), team LDP of the IML (Université d'Aix-Marseille 2), LIF lab (Université d'Aix-Marseille 1), team LIMD of Lama lab (Université de Chambéry), team Plume of the LIP lab (ENS Lyon). Leader: Ehrhard (PPS). Number of local researchers (men months): 24. Local funding: 134 974€. Started in 2007, ended in 2011 (42 months). See page 24.
  http://choco.pps.jussieu.fr/

- ANR *Domaines émergents* Codex (Efficiency, Dynamicity and Composition for XML: Models, Algorithms and Systems). Partners: INRIA Grenoble (team WAM, and LIF lab of Université d'Aix-Marseille 1), team Mostrare of INRIA Lille, team Gemo of INRIA Saclay, company Innovimax SARL, Laboratoire d'informatique), Université Paris Sud (BD of the LRI lab (Université François Rabelais). Local leader: Castagna (PPS). Number of local researchers (men months): 20. Local funding: 118 224€. Started in 2009, ended in 2012 (48 months). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 41.
  http://codex.saclay.inria.fr/

- Digiteo *domaine d'intérêt majeur (DIM) Région Île de France* *Logiciels et Systèmes Complexes (LSC)* project COLLODI (*Complexité et concurrence à travers la ludique et la logique linéaire différentielle*). Other partner: team LCR of the LIPN lab (Université Paris Nord – Villetaneuse). Local leader: Ehrhard (PPS). Global funding: 138 000€. Started in 2009, ended in 2010 (12 months). See page 33.
  http://www-lipn.univ-paris13.fr/~mazza/Collodi/

- ANR *Sécurité, Systèmes Embarqués et Intelligence Ambiante* CompCert (*Certification formelle de compilateurs optimisants pour logiciel embarqué critique*). Partners: team Gallium of INRIA Rocquencourt, team Marelle of INRIA Sophia Antipolis, CEDRIC lab (CNAM and ENSIIE). Local leader: Letouzey (PPS). Number of local researchers (men months): 24. Local funding: 19 760€. Started in 2005, ended in 2008 (48 monts). See page 20.
  http://compcert.inria.fr/

- INRIA ADT[72] project Coq. Partners: INRIA teams TypiCal, ProVal, Marelle and pi.r2. Leader: Herbelin (PPS). Started in 2009. It supports visits and meetings between developers and

[72] *Action de Développement Technologique*

aims at strengthening the community of Coq users and contributors. Four national-level ***Coq meetings*** have been organized as part of this ADT (two in 2009 and two in 2010). The ADT has also supported two ***Coq Asian summer schools*** organized by Jean-Pierre Jouannaud in Beijing (one in 2009 and one in 2010). A new ADT about Coq has been launched in 2011. http://coq.inria.fr/adt/

- PICRI *Région Île de France* project Déploiement d'une plate-forme pour réseaux maillés. Other partner: association TMPLAB. Leader: Chroboczek (PPS). Number of local researchers (men months): 7. Local funding: 26 200€. Started in 2009, ended in 2011. See page 42.

- INRIA ARC project Eternal (Interactive Resource Analysis). Partners: team Focus (located in Bologna, Italy) of INRIA Sophia Antipolis, team Parsifal of INRIA Saclay. Local leader: Régis-Gianas. Number of local researchers (men months): 12. Local funding: 6 000€. Started in 2011, ending in 2012 (12 months). See page 22.
http://eternal.cs.unibo.it/

- FEDER *domaine d'intérêt majeur (DIM) Région Île de France Logiciels et Systèmes Complexes (LSC)* project DORM. Partners: companies NUXEO, ZENIKA. Local leader: Di Cosmo. Number of local researchers (men months): 24. Local funding: 120 120€. Started in 2010, ending in 2012 (24 months). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 40.
http://www.systematic-paris-region.org/fr/projets/dorm-0

- ANR *Investissements d'avenir recherche, bio-informatique* project Iceberg (*Des modèles de population aux populations de modèles: observation, modélisation et contrôle de l'expression génique au niveau de la cellule unique*). Partners: team Contraintes of INRIA Rocquencourt, Institut Jacques Monod and MSC lab (Université Paris Diderot), team BM2A of the CGPHMC lab (Université Lyon 1), LIFL (Université de Lille 1). Local leader: Jean Krivine. Number of local researchers (men months): 24. Local funding: 40 976€. Started in 2011, ending in 2016 (60 months). See page 35.

- ANR *Blanc* project Infer (Theory and Application of Deep Inference). Partners: team Parsifal of the LIX lab (École Polytechnique), team Calligramme of the LORIA lab (Université de Lorraine). Local leader: Parigot. Number of local researchers (men months): 16. Local funding: 58 842€. Started in 2006, ended in 2009 (36 months). See page 27.
http://www.lix.polytechnique.fr/~lutz/orgs/infer.html.

- ANR *Blanc* project Inval (*Invariants algébriques des systèmes informatiques*). Partners: team MeaSI of LIST lab of CEA, team LDP of the IML lab (Université d'Aix-Marseille 2), team GTA of the I3M lab (Université de Montpellier), team Algèbre, topologie, groupes quantiques, représentations of the IRMA lab (Université de Strasbourg), team Calligramme of the LORIA lab (Université de Lorraine), Algèbre, géométrie, logique team of the ICJ lab (Université Lyon 1). Local leader: Gaucher. Number of local researchers (men months): 48. Local funding: 30 000€. Started in 2005, ended in 2008. See page 34.
http://www.pps.univ-paris-diderot.fr/~inval/

- ANR *Blanc* project Logoi (*Logique et géometrie de l'interaction*). Partners: team LDP of the IML lab (Université d'Aix-Marseille 2), team LCR of the LIPN lab (Université Paris Nord

– Villetaneuse). Leader: Faggian. Number of local researchers (men months): 48. Local funding: 126 152€. Started in 2010, ended in 2013 (48 months). See pages 25,28.

- Digiteo *domaine d'intérêt majeur (DIM) Région Île de France* *Logiciels et Systèmes Complexes (LSC)* project MoDy (*Motifs dynamiques*). Other partner: team TypiCal of the LIX lab (École Polytechnique). Local leader: Kesner. Local funding: 88 955€. Started in 2010, ending in 2012. Voir page 18.

- ANR *Jeunes chercheurs, jeunes chercheuses* project No-CoST (*Nouveaux outils pour la complexité: sémantique et types*). Partners: team Plume of the LIP lab (ENS Lyon), team LCR of the LIPN lab (Université Paris Nord – Villetaneuse). Local leader: Olivier Laurent. Number of local researchers (men months): 14. Local funding: 10 000€. Started in 2006, ended in 2009. See page 26.

- ANR *Blanc* project Panda (Parallel and Distributed Analysis). Partners: teams Comete and Parsifal of INRIA Saclay, LIST lab of CEA, team LCR of the LIPN lab (Université Paris Nord – Villetaneuse), team Infini of the LSV lab (ENS Cachan), team Plume of the LIP lab (ENS Lyon), team LIMD of the LAMA lab (Université de Chambéry), team Comète of the LIX lab (École Polytechnique), team Move of the LIF lab (Université d'Aix-Marseille 1), team LDP of the IML lab (Université d'Aix-Marseille 2), company Airbus. Local members: Abbes and Melliès. Number of local researchers (men months): 27. Local funding: 23 000€. Started in 2008, ended in 2011. See page 38.
http://www.lipn.univ-paris13.fr/~mazza/Panda/

- ANR *Sécurité, Systèmes Embarqués et Intelligence Ambiante* project ParSec (*Parallélisme et Sécurité*). Partners: team Moscova of INRIA Saclay, INRIA Sophia Antipolis, team Lande of INRIA Rennes. Local leader: Amadio. Local funding: 126 444€. Started in 2007, ended in 2010 (48 months). See page 36.
http://www.di.ens.fr/~zappa/projects/parsec/

- ANR *Ingénierie Numérique et Sécurité* project Paral-ITP (*Parallélisation des systèmes de preuve interactifs de haute fiabilité*). Partners: team TypiCal of INRIA Saclay, team ForTesSE of LRI lab (Université Paris Sud). Local leader: Herbelin. Number of local researchers (men months): 36. Local funding: 139 212€. Started in 2011, ending in 2014 (40 months). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 20.
http://paral-itp.lri.fr/

- ANR *Jeunes chercheurs, jeunes chercheuses* project *Programmation fonctionnelle pour le web*. Other partner: team LCR of the LIPN lab (Université Paris Nord – Villetaneuse). Local leader: Vouillon. Number of local researchers (men months): 36. Global funding: 100 000€. Started in 2006, ended in 2010 (48 months). See page 41.

- ANR *Domaines émergents* PWD (*Programmation du Web diffus*). Partners: team Indes of INRIA Sophia Antipolis, team APR of the LIP6 lab (Université Pierre et Marie Curie). Local leader: Balat. Number of local researchers (men months): 36. Local funding: 170 872€. Started in 2010, ending in 2013 (48 mois). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 41.
http://www-sop.inria.fr/indes/pwd/

- CNRS PEPS program QuAND (*Approche quantitative au non-déterminisme*). Other partner: team LDP of the IML lab (Université d'Aix-Marseille 2). Local leader: Tasson. Started in 2010, ended in 2011. See page 31.
  http://iml.univ-mrs.fr/~vaux/quand/

- ANR *Blanc* project Récré (*Réalisabilité pour la logique classique, la concurrence, les références et la réécriture*). Partners: team Plume of the LIP lab (ENS Lyon), team LDP of the IML lab (Université d'Aix-Marseille 2), team LIMD of the LAMA lab (Université de Chambéry). Local leader: Herbelin. Number of local researchers (men months): 28. Local funding: 226 720€. Started in 2011, ending in 2015 (48 months). See page 32.
  http://recre.ens-lyon.fr/

- ANR *Ingénierie Numérique et Sécurité* project REVER (Programming reversible recoverable systems). Partners: team MeaSI of LIST lab of CEA, team Focus (located in Bologna, Italy) of INRIA Sophia Antipolis, team Sardes of INRIA Grenoble-Rhône-Alpes. Local leader: Jean Krivine. Number of local researchers (men months): 48. Local funding: 139 457€. Started in 2012, ending in 2015 (48 months). Quality label of competitivity poles MINALOGIC and SYSTEMATIC Paris Région. See page 38.
  http://www.pps.univ-paris-diderot.fr/~jkrivine/REVER/

- ACI *Masses de données* project TraLaLa (XML Transformation Languages: logic and applications). Partners: teams Gemo and Mostrare of INRIA Futurs, team Vérification of LIAFA lab (Université Paris Diderot), team Langages of LIENS lab (ENS Ulm), team Move of LIF lab (Université d'Aix-Marseille 1), team STC of LIFL lab (Université de Lille 1), team Bases de Données of LRI lab (Université Paris Sud). Local leader: Castagna. Started in 2007, ended in 2010 (48 months)[73]. See page 18.
  http://www.cduce.org/tralala.html

- ANR *Blanc* project Typex (*Intégration des approches langage, logique et orientée données pour un traitement XML certifié, dirigé par les types*). Partners: team WAM of INRIA Grenoble-Rhône-Alpes, team Bases de Données of LRI lab (Université Paris Sud). Leader: Castagna. Number of local researchers (men months): 36. Local funding: 125 689€. Started in 2012, ending in 2014 (36 months). Quality label of competitivity pole SYSTEMATIC Paris Région. See page 18.
  http://www.systematic-paris-region.org/fr/projets/typex.

### 6.4 European projects and partnerships

- FP 7 ICT project CerCo (Certified Complexity). Partners: Department of Computer Science of University of Bologna, LFCS of University of Edinburgh. Coordinator: University of Bologna. Local leader: Amadio. Local funding: 314 457€. Started in 2010, ending in 2013 (36 months). See page 22.
  http://cerco.cs.unibo.it/.

[73] This project was initiated by G. Castagna when he was still a member of the LIENS lab, and has been administratively managed from LIENS until its ending.

- PHC[74] PAI[75] Germaine de Staël (Suisse) project Deep Inference and the Essence of Proofs. Partners: team Parsifal of INRIA Saclay, Group for theoretical computer science and logic of University of Bern. Local leader: Parigot. Local funding: 3 250€. Started in 2006, ended in 2007. See page 27.

- FP 6 IST project EDOS (Environment for the Distribution of Open Source software). Coordinator: Mandriva. Local leader: Di Cosmo. Local funding: 245 300€. Started in 2004, ended in 2007. See page 39.
  http://www.mancoosi.org/edos/.

- CNRS-CNR[76] *Coopération bilatérale avec l'Italie* project Interaction et Complexité 2. Other partner: Department of Computer Science of University of Bologna. Local leader: Olivier Laurent. Started in 2006, ended in 2007.

- CNRS PICS project Logique linéaire et applications. Partners: team PLUME of LIP (ENS Lyon), team LCR of LIPN (Université Paris Nord – Villetaneuse), Department of Computer Science of University of Bologna, Department of Computer Science of University of Torino, Department of Philosophy of University of Roma 3. Local leader: Ehrhard. Started in 2010, ending in 2012. Local funding: 2 000€.
  See page 26.
  http://perso.ens-lyon.fr/patrick.baillot/PROJETS/PICS_LL/

- FP 7 ICT project Mancoosi (Managing the Complexity of the Open Source Infrastructure). Partners: Université de Nice Sophia Antipolis, University of L'Aquila, Tel Aviv University, Université Catholique de Louvain, companies Mandriva/Edge-IT (France), ILOG/IBM (France), INESC-ID (Portugal), Caixa Magica (Portugal), Pixart (Argentina). Coordinator: Université Paris Diderot. Global leader: Di Cosmo. Started in 2008, ended in 2011. Local funding: 639 390€. See page 39.
  http://www.mancoosi.org/

- PHC *Alliance* (UK) project Nouveaux systèmes de déduction et méthodes de normalisation pour l'inférence profonde. Other partner: Department of Computer Science of Bath University. Local leader: Parigot. Started in 2006, ended in 2007. See page 27.

- PHC *Amadeus* (Austria) project Outils logiques d'analyse des programmes. Other partner: Institute of Computer Science (University of Innsbruck). Local leader: Parigot. Started in 2009, ended in 2010. See page 27.

- FP 6 IST project QICS (Foundational Structures in Quantum Information and Computation). Partners: University of Oxford, University of Bristol, University of York, team CAPP of the LIG (CNRS *Grenoble*), TU Braunschweig, University of Innsbruck, McGill University. Coordinator: University of Oxford, Local leader: Danos. Started in 2007, ended in 2009. Local funding: 212 500€.

[74] *Partenariat Hubert Curien*
[75] *Programme d'Action Intégrée*
[76] CNR: Consiglio Nazionale della Ricerca (Italy)..

- MIUR[77] *Internazionalizzazione del sistema universitario* project *Réseau italo-français de recherche en logique et géométrie du calcul*. Partners: Department of Philosophy of University of Roma 3, Department of Computer Science of University of Bologna, Department of Computer Science of University of Torino, Department of Computer Science of University of Roma *La Sapienza*, Department of Pure and Applied Mathematics of University of Padova, team LDP of the IML (Université d'Aix-Marseille 2), team Calligramme of LORIA (Université de Lorraine), team LCR of LIPN (Université Paris Nord – Villetaneuse). Coordinator: University of Roma 3. Local leader: Bucciarelli. Started in 2006, ended in 2008. Local funding: 10 000€. See page 25.

- ANR-FWF (Austria) *Blanc international II* project Structural (Structural and Computational Proof Theory). Partners: team Computational Logic Group of the Institute of Computer Science (University of Innsbruck), research unit Computational Logic of the Institute of Discrete Mathematics and Geometry (University of Technology, Vienna), team Parsifal of the LIX lab (École Polytechnique). Local leader: Parigot. Number of local researchers (men months): 46. Local funding: 222 610€. Started in 2011, ending in 2014 (39 months). See page 27.
  http://www.lix.polytechnique.fr/~lutz/orgs/structural.html.

### 6.5 Extra-european projects and partnerships

- STIC-Amsud project Formal Development of Computer Programs and Applications. Partners: Department of Computer Science of University of Brasilia, Department of Computer Science of National University of Quilmes. Coordinator: University of Brasilia. Local leader: Bucciarelli. Started in 2012, ending in 2013. See page 18.
  http://www.sticamsud.org/

- International Laboratory INFINIS. Partners: Université Paris Diderot, CNRS, CONICET. Leaders: Kesner (France) and Sergio Yovine (Argentina). Started in 2011. Local funding: 30 000€. See page 18.

- ECO-NET project Computational Interpretation of Modal Logics. Partners: Tbilissi State University and University of Moscow. Local leader: Parigot. Started in 2007, ended in 2008. Local funding: 15 000€. See page 27.

- CNRS-CONICET cooperation project *Langages avec motifs: syntaxe et sémantique*. Partners: Department of Computer Science of University of Buenos Aires, Department of Computer Science of National University of Quilmes. Local leader: Kesner. Started in 2007, ended in 2009. Local funding: 4 500€. See page 7.

- ANR *Blanc international II* project Locali (*Approche logique de nouveaux paradigmes de calcul*). Partners: Deducteam team of INRIA Rocquencourt, Institute of Software Chinese Academy of Sciences. Local leader: Ehrhard. Number of local researchers (men months): 24. Started in 2012, ending in 2015. Local funding: 172 295€. See page 26 and 30.

- INRIA associate team Semacode (*Stratégies d'évaluation, machines abstraites et contrôle délimité*). Partners: team of Zena Ariola of University of Oregon, team Focus (located in Bologna, Italy) of INRIA Sophia Antipolis, team of Silvia Ghilezan of University of Novi Sad. Leader: Saurin.

[77] Italian ministry of universities and research

Local funding: about 45 000€. Started in 2011, ending in 2013. See page 24.
http://www.pps.univ-paris-diderot.fr/~saurin/EA-SEMACODE/

- CNRS-GNSF project Structural and Computational Properties of Logics (with Georgia). Partner: Ilia Vekua Institute of Applied Mathematics of Tbilissi State University. Local leader: Parigot. Started in 2009, ending in 2012. Local funding: 7 040€. See page 27.

- STIC-Amsud project Types for Robust Program Development. Partners: Department of Computer Science of National University of Quilmes (Argentina), Department of Computer Science of Universidad ORT (Uruguay). Local leader: Kesner. Started in 2008, ended in 2011. Local funding: 2 500€. See page 17.

- *Programme franco-chinois de recherche avancée*[78] project *Types, processus et leurs applications en sécurité et systèmes biologiques*. Parteners: Team DCS of Verimag lab (Université Joseph Fourier), Institute of Software Chinese Academy of Sciences, Department of Computer Science of Shanghai Jiao Tong University. Local leader: Curien. Started in 2006, ended in 2008. See page 35.

- National Natural Science Foundation of China project Unranked tree-structured data and semantically defined polymorphic type systems. Partner: Institute of Software Chinese Academy of Sciences. Local leader: Castagna. Started in 2011, ending in 2013. Local funding: accommodation and travel expenses of Xu Zhiwu. See page 19.

### 6.6 Long term collaborations

We provide here a list of long term cooperations involving members of the PPS lab. Some of these collaborations take place in projects listed above.

- Balat is collaborating with Emmanuel Chailloux (LIP6) on several projects: ANR PWD, *domaine d'intérêt majeur (DIM) Région Île de France* Logiciels et Systèmes Complexes (LSC), PhD advising, workshop organisation.

- Berline collaborates regularly with Antonino Salibra (Ca'Foscari University, Venice) and Klaus Grue (University of Copenhague).

- Bucciarelli has a regular collaboration with Antonino Salibra (Ca'Foscari University) and with Simona Ronchi della Rocca (University of Torino).

- Castagna collaborates regularly with Imperial College London (Nobuko Yoshida in particular), University of Torino (Mariangiola Dezani and her group), Université Paris Sud, INRIA Grenoble.

- Curien has a continuing collaboration with Glynn Winskel and Marcelo Fiore (Cambridge University), mainly on game semantics and categorical semantics.

- Di Cosmo has been regularly collaborating with various partners from different laboratories, and has published with colleagues from University of Bologna, University of Pisa, University of Torino and Université de Nice Sophia Antipolis.

[78] A research program of the French ministry of foreign affairs.

- Ehrhard has a continuing collaboration with Lorenzo Tortora de Falco (Department of Philosophy, University of Roma 3), Michele Pagani (LIPN, Université Paris Nord – Villetaneuse), Thomas Streicher (Department of Mathematics, Technische Universität Darmstadt) and Antonino Salibra (Department of Computer Science, Ca'Foscari University). He has also regular scientific interactions with Martin Hyland (Department of Pure and Applied Mathematics, Cambridge University).
- Faggian has regular collaborations, leading to a number of visits and exchanges, with team Focus of INRIA Sophia-Antipolis and University of Bologna (Ugo dal Lago), and with RIMS lab of University of Kyoto (Michele Basaldella and Kazushige Terui).
- Harmer and Jean Krivine are engaged in an active collaboration with Walter Fontana of the Department of Systems Biology at Harvard Medical School on the application of rule-based modeling to cellular signaling networks. They are also engaged in a collaboration with Glynn Winskel (Cambridge University) and Danos (University of Edinburgh) on the graph-theoretic and categorical foundations of the rule-based approach.
- Herbelin has regular collaborations with the University of Oregon (Zena Ariola), University of Novi Sad in Serbia (Silvia Ghilezan), University of Anseong in Korea (Gyesik Lee).
- Kesner has regular collaborations with University of Torino (Simona Ronchi della Rocca), National University of Quilmes (Eduardo Bonelli) and University of Buenos Aires (Alejandro Ríos) in Argentina, University of Sydney (Barry Jay), LIX lab of École Polytechnique (Beniamino Accattoli and Stéphane Lengrand).
- Apart from the above mentioned collaboration with Harvard Medical School, University of Edinburgh and Cambridge University, Jean Krivine has a constant collaboration with LIENS lab of INRIA-ENS Ulm (Jérôme Féret), mainly on the development of KaSim.
- Melliès has a regular collaboration with Martin Hyland (Cambridge University) on game semantics and higher dimensional algebra, with Hasegawa Masahito (RIMS, Kyoto, Japan) on categorical semantics of programming languages, and with Andrew Appel (Princeton), Nick Benton (Microsoft Research) and Zhong Shao (Yale) on the semantics of low level languages.
- Métayer collaborates regularly with Dimitri Ara (IMJ, Université Paris Diderot and Université Pierre et Marie Curie), Yves Guiraud[79] and Philippe Malbos (ICJ, Université Lyon 1), Yves Lafont (IML, Université d'Aix-Marseille 2) and Krzysztof Worytkiewicz (LAMA, Université de Chambéry).
- Parigot collaborates regularly with Matthias Baaz (Technische Universität Wien), Alessio Guglielmi (University of Bath), Georg Moser (University of Innsbruck), Revaz Grigolia (Tbilissi State University).
- Régis-Gianas is close to the teams ProVal and Gallium of INRIA.
- Ruet has been affiliated with the IML (Université d'Aix-Marseille 2) until August 2011. He is still collaborating with members of the IML.

[79] Member of the PPS lab since January 2012

- Saurin has regular collaborations with members of LIX (École Polytechnique), IML (Université d'Aix-Marseille 2), LIP (ENS Lyon), LIPN (Université Paris Nord – Villetaneuse) in France and with members of RIMS (University of Kyoto), University of Oregon, University of Novi Sad (Serbia), University of Torino.
- Tasson collaborates regularly with Michele Pagani of LIPN (Université Paris Nord – Villetaneuse), Lionel Vaux of IML (Université d'Aix-Marseille 2) and Richard Blute (Department of Mathematics of University of Ottawa).
- Treinen continued, after his move from ENS Cachan to PPS, to collaborate with Florent Jacquemard, Steve Kremer, Étienne Lozes and Jules Villard from the LSV lab in Cachan. He also has a continuing cooperation with Hitoshi Ohsaki, and since more recently with Cyrille Artho, from AIST Kansai in Amagasaki, Japan.
- Varacca has an ongoing continuous collaboration with Silvia Crafa of the Department of Mathematics of University of Padova.
- Zacchiroli collaborates regularly with Yacine Boufkhad of the LIAFA. He collaborates regularly with Gabriele D'Angelo, Angelo Di Iorio, Davide Rossi, Fabio Vitali, and Gianluigi Zavattaro, members of the Department of Computer Science of University of Bologna. He has collaborated regularly with Antonio Cicchetti, Davide Di Ruscio, Patrizio Pelliccione, and Alfonso Pierantonio members of the Department of Computer Science of University of L'Aquila.

# 7 Organization of national and international conferences and meetings

## 7.1 Organization of two major international conferences

► **RDP'2007**, *June 25th – June 29th, 2007.* In 2007, the PPS lab (Bucciarelli and Padovani), LSV (Treinen, who was not yet a member of PPS) — ENS Cachan — and CÉDRIC (X. Urban) — ENSIIE — organized the ***Federated Conference on Rewriting, Deduction and Programming*** (***RDP'2007***), which included this year ***RTA*** (***Rewriting Techniques and Applications***), ***TLCA*** (***Typed Lambda-Calculus Applications***), a colloquium in honor of Giuseppe Longo and 8 workshops. Each of these events had its own program committtee. The conference took place in the buildings of the Conservatoire National des Arts et Métiers in the third district of Paris and gathered more than 280 attendees. The event has been sponsored by CNRS, INRIA, *Région Île de France*, ENSIIE and Conservatoire National des Arts et Métiers.

► **LC'2010**, *July 24th – July 31st, 2010.* In 2010, the PPS lab and the Équipe de Logique Mathématique (Université Paris Diderot and CNRS), together with the LIAFA, organized the ***Logic Colloquium***[80], which is the main international conference on Logic in general, with an emphasis on Mathematical Logic and Logic for Computer Science. It is the official yearly conference of the Association for Symbolic Logic (ASL). Curien (PPS) was a member of the program committee, and the organizing committee was co-chaired by Ehrhard and included Abbes, Ainardi, Balat, Legrandgérard, Manoury, Manuset[81] and Rozière. The PPS administrative staff (consisting of

[80] See http://www.pps.univ-paris-diderot.fr/logic2010/.
[81] Former member of the administrative staff of the PPS lab.

Ainardi and Mansuet) dealt with most of the administrative aspects of the organization. The colloquium gathered about 300 attendees and had an important grant programme for students and young researchers. It took place at the *Halle aux Farines*, one of the buildings of Université Paris Diderot. The conference was sponsored by many institutions: CNRS, INRIA, *Région Île de France*, *Ville de Paris*, ASL and of course University Paris Diderot.

## 7.2 Other conferences and events

- Amadio and Castagna organized (with A. Asperti) the Symposium ***From Type Theory to Morphologic Complexity: A Colloquium in Honor of Giuseppe Longo***, *Conservatoire des Arts et Métiers*, Paris, 2007.

- Curien was president of the Organisation Committee for ***Jean-Yves Girard's Days*** (aniversary meeting for his 60th birthday), *Institut Henry Poincaré*, Paris, September 2007.

- Curien and Melliès organised the workshop ***GGJJ2011***[82], in honour of Gérard Berry and Jean-Jacques Lévy, in Gérardmer (February 2011).

- Curien has created (together with Jean-Eric Pin of LIAFA) a permanent Committee for the organisation of the annual ***Spring School in Theoretical Computer Science***, in 2002, and has been a member of this committee until 2012.

- Faggian has been co-organizer (with K. Terui of RIMS, University of Kyoto) of the meeting ***Geometry of Interaction*** Kyoto, 7-11 November 2011; she has been co-organizer (with O. Laurent and M. Quatrini) of the week 2 of ***Logic and Interaction 2012***[83] CIRM, Marseille 6-10 February 2012.

- Harmer co-organized, with D. Ghica (University of Birmingham, UK), the 3rd International Workshop on ***Games for Logic and Programming Languages*** (***GaLoP 2008***), a satellite workshop of ***ETAPS 2008***[84], in Budapest and co-organized, with J. Lynch (Clarkson University, USA), the 3rd ***LICS*** Workshop on ***Logic for Systems Biology*** (***LSB***), a satellite workshop of ***FLoC 2010***, in Edinburgh[85].

- Herbelin initiated the ***Coq workshop*** in 2009. The first venue held as a satellite event of ***TPHOLs 2009*** in Munich, Germany[86]. With V. Kuncak and K. Heljanko, he organized the workshop ***AIPA*** as a satellite event of ***ETAPS 2012***, Tallinn, Estonia[87]. Herbelin, Saurin and Zeilberger organized the ***TPDC*** workshop in 2011 as a satellite event of ***RDP 2011*** in Novi Sad, Serbia[88].

- Kesner organized two workshops of the working group *Logique, Algèbre et Calcul* (LAC) of

[82] See `http://www.lri.fr/~conchon/gerardmer/`.
[83] See `http://li2012.univ-mrs.fr/`.
[84] See `http://www.cs.bham.ac.uk/~drg/galop08.html`
[85] See `http://www.floc-conference.org/LSB-home.html`.
[86] See `http://coq.inria.fr/coq-workshop/2009/`.
[87] See `http://pauillac.inria.fr/~herbelin/aipa2012/`.
[88] See `http://www.pps.jussieu.fr/~saurin/tpdc2011/`.

the CNRS GDR[89] *Informatique Mathématique* (GDR-IM): one in February 2007 (Chambéry, 44 attendees) and one in November 2010 (Paris, 53 attendees)[90]. She also organized the ***PPS lab yearly September meeting*** in Trouville, in 2011 (first venue) and 2012.

- Jean Krivine organized the ***Bertinoro Summer School on Natural Computing*** in June 2008, a lecture series on Modeling bio molecular systems and the ***Santa Fe Institute Complex System Summer School*** in 2008 a lecture series on Rule based modeling.

- Melliès initiated with Nick Benton (Microsoft Research) in 2010 the ***LOLA*** workshop devoted to the syntax and semantics of low level languages. The workshop has been organized since then (***LOLA 2010***, ***LOLA 2011***, ***LOLA 2012***) as a satellite workshop of the ***LICS*** conference. He has also organized a series of thematic meetings in the PPS lab, devoted to operad theory (2009, 2010), synthetic geometry (2010), categorification (2011), homotopy type theory (2012)

- Parigot organized the following events. ***International Summer School in Logic and Language***, September 24-28, 2007, Tbilisi, Georgia. Workshop ***Computational interpretations of proofs***, November 29-30, 2007, Paris, France. ***International Summer School in Logic and Language***, September 22-26, 2008, Tbilisi, Georgia. International Workshop ***Structural Proof Theory***, November 19-21, 2008, Paris, France. International Workshop ***Structure and Deduction, SD09*** (associated to ***ESSLI'2009***), July 20 -24, 2009, Bordeaux, France. ***Workshop Paris-Innsbruck***, September 15-16, 2009, Paris, France. ***International Summer School in Logic and Language***, August 28 – September 02, 2009, Tbilisi, Georgia. ***Workshop Paris-Innsbruck-Tbilisi***, May 20-21 2010, Paris, France. ***International Summer School in Logic and Language***, August 30 - September 4, 2010, Zesko, Georgia. Collegium Logicum 2010, ***Proofs and Structures***, November 2010, Paris, France. Workshop ***Structural***, June 15-17 2011, Paris, France. ***International Summer School in Logic and Language***, September 19-23, 2011, Tbilisi, Georgia.

- Régis-Gianas organized a joint workshop between the Eternal INRIA ARC project and the CerCo European project (around 25 participants).

- Saurin organized an ***RDP*** workshop in 2011: the first ***Workshop on the Theory and Practice of Delimited Control*** took place in Novi Sad during the ***RDP 2011*** week. Taking the occasion of the physical PC meeting of ***ICFP 2011***, Saurin organized an informal workshop involving PC members, opened to all members of the PPS lab.

- Sozeau organised a one-day workshop on ***Reification and generic tactics*** at INRIA, Paris in March 2011, with 20 participants[91]. He was a coorganiser of the ***DTP'11*** workshop, August 2011, Nijmegen, Netherlands[92].

[89] A GDR (*Groupement de recherche*) is a CNRS research structure which gathers members of various laboratories on specific research topics. They have a low CNRS specific funding but are extremely successful and efficient for federating research communities.

[90] See http://www.lama.univ-savoie.fr/~david/gdr/journees.html and http://www.pps.jussieu.fr/~saurin/GT-LAC/.

[91] See http://coq.inria.fr/cocorico/GTReification/.

[92] See http://www.cs.ru.nl/dtp11/.

- Di Cosmo and Treinen organised a two day workshop on Software Reliability at IRILL, Paris, in June 2011, with over 60 participants from academia and industry[93].
- Varacca was one of the creators and organizers of the regular ***CHOCO Seminar***, a one-day meeting taking place on an (almost) monthly basis at LIP, ENS Lyon and organized by the CHOCO ANR *Blanc* project (lead by Ehrhard). Started in 2007, these meetings gathered members from the project – IML (Université d'Aix-Marseille 2), LIF (Université d'Aix-Marseille 1), LIP (ENS Lyon), LAMA (Université de Chambéry), LIPN (Université Paris Nord – Villetaneuse) and PPS – and had actually a wider audience[94]. After the end of the CHOCO project, these successful events have been followed on by the ***CHoCoLa***[95] series, still coorganized by Varacca.

## References


[AARGS10] Roberto M. Amadio, Nicolas Ayache, Yann Régis-Gianas, and Ronan Saillard. Certifying cost annotations in compilers. Technical report, Preuves, Programmes et Systèmes, 2010. 22

[AB08] Samy Abbes and Albert Benveniste. Probabilistic true-concurrency models: Markov nets and a Law of large numbers. *Theoretical Computer Science*, 390:129–170, 2008. 38, 39

[AB09] Samy Abbes and Albert Benveniste. Concurrency, sigma-algebras and probabilistic fairness. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 380–394. Springer-Verlag, 2009. 38, 39

[Abb07] Samy Abbes. A projective formalism applied to topological and probabilistic event structures. *Mathematical Structures in Computer Science*, 17(4):819–837, 2007. 38

[Abb08] Samy Abbes. On Countable Completions of Quotient Ordered Semigroups. *Semigroup Forum*, 77(3):482–499, 2008. 38

[Abb10] Samy Abbes. Markov concurrent processes. Technical report, Preuves, Programmes et Systèmes, 2010. 38, 39

[Abb11] Samy Abbes. Distributed Markov Processes. Technical report, Preuves, Programmes et Systèmes, 2011. 38, 39

[ABDCZ09] Pietro Abate, Jaap Boender, Roberto Di Cosmo, and Stefano Zacchiroli. Strong Dependencies between Software Components. In *Proceedings of the Third International Symposium on Empirical Software Engineering and Measurement, ESEM 2009, October 15-16, 2009, Lake Buena Vista, Florida, USA*, pages 89–99, 2009. 40


[93] See http://www.irill.org/events/journees-irill-gtll-sur-la-fiabilite-du-logiciel/.
[94] See http://choco.pps.jussieu.fr/events/.
[95] See http://chocola.ens-lyon.fr/.

[Abe10] Andreas Abel. Towards normalization by evaluation for the *betaeta*-calculus of constructions. In *Functional and Logic Programming, 10th International Symposium, FLOPS 2010, Sendai, Japan, April 19-21, 2010. Proceedings*, volume 6009 of *Lecture Notes in Computer Science*, pages 224–239. Springer-Verlag, 2010. 22, 23

[Abe11] Andreas Abel. Irrelevance in type theory with a heterogeneous equality judgement. In *Foundations of Software Science and Computational Structures - 14th International Conference, FOSSACS 2011, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2011, Saarbrücken, Germany, March 26-April 3, 2011. Proceedings*, volume 6604 of *Lecture Notes in Computer Science*, pages 57–71. Springer-Verlag, 2011. 23

[ABM10] Roberto M. Amadio, Patrick Baillot, and Antoine Madet. An affine-intuitionistic system of types and effects: confluence and termination. In *Workshop LOLA "Syntax and Semantics of Low Level Languages"*, 2010. 25, 36, 26, 37

[Acc11] Beniamino Accattoli. *Jumping around the box: graphical and operational studies on Lambda Calculus and Linear Logic.* Ph.D. Thesis, Università di Roma La Sapienza, 2011. 18

[ACCL91] Martín Abadi, Luca Cardelli, Pierre Louis Curien, and Jean-Jacques Lévy. Explicit substitutions. *Journal of Functional Programming*, 4(1):375–416, 1991. 18

[ACP09] Andreas Abel, Thierry Coquand, and Miguel Pagano. A modular type-checking algorithm for type theory with singleton types and proof irrelevance. In Pierre-Louis Curien, editor, *TLCA*, volume 5608 of *Lecture Notes in Computer Science*, pages 5–19. Springer-Verlag, 2009. 22, 23

[ACTZ12] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. Dependency solving: a separate concern in component evolution management. *Journal of Systems and Software*, October 2012. To appear. 39, 40

[AD08] Roberto M. Amadio and Mehdi Dogguy. On affine usages in signal-based communication. In *Programming Languages and Systems, 6th Asian Symposium, APLAS 2008, Bangalore, India, December 9-11, 2008. Proceedings*, volume 5356 of *Lecture Notes in Computer Science*, pages 221–236. Springer-Verlag, 2008. 36, 37

[AD09] Roberto M. Amadio and Mehdi Dogguy. Determinacy in a synchronous pi-calculus. In *From semantics to computer science: essays in honour of Gilles Kahn*, pages 1–27. Cambridge University Presse, 2009. 36, 37

[ADC11] Pietro Abate and Roberto Di Cosmo. Predicting upgrade failures using dependency analysis. In *Workshops Proceedings of the 27th International Conference on Data Engineering, ICDE 2011, April 11-16, 2011, Hannover, Germany*, pages 145–150. IEEE Computer Society, 2011. 40

[ADCTZ11] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. MPM : a modular package manager. In *Proceedings of the 14th International ACM Sigsoft*

*Symposium on Component Based Software Engineering, CBSE 2011, part of Comparch '11 Federated Events on Component-Based Software Engineering and Software Architecture, Boulder, CO, USA, June 20-24, 2011*, pages 179–188. Association for Computing Machinery, 2011. 39, 40

[ADCTZ12] Pietro Abate, Roberto Di Cosmo, Ralf Treinen, and Stefano Zacchiroli. Learning from the Future of Component Repositories. In *The 15th International ACM SIGSOFT Symposium on Component Based Software Engineering (CBSE-2012), Bertinoro, Italy, June 26-28, 2012*. Association for Computing Machinery, 2012. To appear. 40

[AG09] Beniamino Accattoli and Stefano Guerrini. Jumping boxes. In *Computer Science Logic, CSL 2009, 18th Annual Conference of the EACSL, Coimbra, Portugal, September 7-11, 2009. Proceedings*, volume 5771 of *Lecture Notes in Computer Science*, pages 55–70. Springer-Verlag, 2009. 18

[AGL+10] Pietro Abate, André Guerreiro, Stéphane Laurière, Ralf Treinen, and Stefano Zacchiroli. Manccosi Deliverable D5.2: Extension of an existing package manager to produce traces of ugradeability problems in CUDF format. Technical report, Preuves, Programmes et Systèmes, 2010. 39, 40

[Ahm06] Amal J. Ahmed. Step-indexed syntactic logical relations for recursive and quantified types. In *Programming Languages and Systems, 15th European Symposium on Programming, ESOP 2006, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2006, Vienna, Austria, March 27-28, 2006, Proceedings*, volume 3924 of *Lecture Notes in Computer Science*, pages 69–83. Springer-Verlag, 2006. 33

[AHS11] Zena Ariola, Hugo Herbelin, and Alexis Saurin. Classical Call-by-need and duality. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 27–44. Springer-Verlag, 2011. 23

[AK10] Beniamino Accattoli and Delia Kesner. The structural lambda-calculus. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 381–395. Springer-Verlag, 2010. 18

[AK12a] Beniamino Accattoli and Delia Kesner. Preservation of strong normalisation modulo permutations for the structural lambda-calculus. *Logical Methods in Computer Science*, 8(1:28):1–44, 2012. 18

[AK12b] Beniamino Accattoli and Delia Kesner. The permutative lambda-calculus. In *Logic for Programming, Artificial Intelligence, and Reasoning - 18th International Conference, LPAR-18, Mérida, Venezuela, March 11-15, 2012. Proceedings*, volume 7180 of *Lecture Notes in Computer Science*, pages 23–36. Springer-Verlag, 2012. 18

[AM99] Samson Abramsky and Paul-André Melliès. Concurrent games and full completeness. In *Proceedings of the 14th IEEE Symposium on Logic in Computer Science, LICS 1999, July 2-5, 1999, Trento, Italy*, pages 431–442, 1999. 28, 29

[AM01] Andrew W. Appel and David A. McAllester. An indexed model of recursive types for foundational proof-carrying code. *ACM Transactions on Programming Languages and Systems*, 23(5):657–683, 2001. 33

[AM11] Dimitri Ara and François Métayer. The Brown-Golasinski model structure on strict $\infty$-groupoids revisited. *Homology, homotopy and Applications*, 13(1):121–142, 2011. 35

[Ama07a] Roberto M. Amadio. A synchronous pi-calculus. *Information and Computation*, 205(9):1470–1490, 2007. 36, 37

[Ama07b] Roberto M. Amadio. The SL synchronous language, revisited. *Journal of Logic and Algebraic Programming*, 70:121–150, 2007. 36, 37

[Ama09a] Roberto M. Amadio. On convergence-sensitive bisimulation and the embedding of CCS in timed CCS. In *Proceedings of the 15th Workshop on Expressiveness in Concurrency (EXPRESS 2008)*, volume 242 of *Electronic Notes in Theoretical Computer Science*, pages 3–17. Elsevier, 2009. 36, 37

[Ama09b] Roberto M. Amadio. On stratified regions. In *Proceedings of the 7th Asian Symposium on Programming Languages and Systems*, Springer Lecture Notes in Computer Science 5904, pages 210–225, 2009. 25, 26

[Ama11] Roberto Amadio. A decompilation of the pi-calculus and its application to termination. Technical report, Preuves, Programmes et Systèmes, 2011. 25, 26

[ARG12] Roberto M. Amadio and Yann Regis-Gianas. Certifying and reasoning on cost annotations of functional programs. In *Foundational and Practical Aspects of Resource Analysis (FOPARA'12)*, volume 7177 of *Lecture Notes in Computer Science*, pages 72–88. Springer-Verlag, 2012. 22

[Asc12] Federico Aschieri. Interactive Realizability for Second-Order Heyting Arithmetic with EM1 and SK1. Technical report, Preuves, Programmes et Systèmes, 2012. 32

[AT11a] Pietro Abate and Ralf Treinen. Mancoosi Deliverable D5.3: UPDB infrastructure to collect traces of upgradeability problems in CUDF format. Technical report, Preuves, Programmes et Systèmes, 2011. 39, 40

[AT11b] Pietro Abate and Ralf Treinen. Mancoosi Deliverable D5.4: Report on the international competition. Technical report, Preuves, Programmes et Systèmes, 2011. 39, 40

[Bal09a] Vincent Balat. Ocsigen : approche fonctionnelle typée de la programmation Web. In *Journées Françaises des Langages Applicatifs*, 2009. Saint-Quentin sur Isère. 40, 41

[Bal09b] Vincent Balat. Rethinking Web interaction. Technical report, Preuves, Programmes et Systèmes, 2009. 40, 41

[Bal10a] Thibaut Balabonski. On the Implementation of Dynamic Patterns. In *Proceedings 5th International Workshop on Higher-Order Rewriting*, pages 29–33. Electronic Proceedings in Theoretical Computer Science, 2010. 18

[Bal10b] Thibaut Balabonski. Optimality for Dynamic Patterns. In *Proceedings of the 12th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, July 26-28, 2010, Hagenberg, Austria*, pages 231–242. Association for Computing Machinery, 2010. 18

[Bal12a] Thibaut Balabonski. A Unified Approach to Fully Lazy Sharing. In *Proceedings of the 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2012, Philadelphia, Pennsylvania, USA, January 22-28, 2012*, pages 469–480. Association for Computing Machinery, 2012. 18

[Bal12b] Thibaut Balabonski. Axiomatic Sharing-via-Labelling. In *23rd International Conference on Rewriting Techniques and Applications (RTA'12), May 28 - June 2, 2012, Nagoya, Japan*, volume 15 of *LIPIcs*, pages 85–100. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. 18

[BCCM07] Véronique Benzaken, Giuseppe Castagna, Dario Colazzo, and Cédric Miachon. Pattern by Example: type-driven visual programming of XML queries. In *Actes des vingt troisièmes Journées de Bases de Données Avancées*, 2007. 19

[BCCM08] Véronique Benzaken, Giuseppe Castagna, Dario Colazzo, and Cédric Miachon. Pattern by example: type-driven visual programming of XML queries. In *Proceedings of the 10th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, July 15-17, 2008, Valencia, Spain*, pages 131–142. Association for Computing Machinery, 2008. 19

[BCD+11] Véronique Benzaken, Giuseppe Castagna, Julien Demouth, Alain Frisch, Cédric Miachon, Kim Nguyen, and Stefano Zacchiroli. ℂDuce User's Manual. Technical report, Preuves, Programmes et Systèmes, 2011. 18, 19

[BCDL07] Patrick Baillot, Paolo Coppola, and Ugo Dal Lago. Light Logics and Optimal Reduction: Completeness and Complexity. In *Proceedings of the 22nd IEEE Symposium on Logic in Computer Science, LICS 2007, 10-12 July 2007, Wroclaw, Poland*, pages 421–430, 2007. 25

[BCF07] Véronique Benzaken, Giuseppe Castagna, and Alain Frisch. ℂDuce Tutorial. Technical report, Preuves, Programmes et Systèmes, 2007. 18, 19

[BCH12] Vincent Balat, Pierre Chambart, and Grégoire Henry. Client-server Web applications with Ocsigen. In *Proceedings of the 21st international conference on World Wide Web, Lyon, France, April 16 - 20, 2012*. Association for Computing Machinery, 2012. 41

[BdS96] Frédéric Boussinot and Robert de Simone. The sl synchronous language. *IEEE Trans. Software Eng.*, 22(4):256–266, 1996. 36

[BEM07] Antonio Bucciarelli, Thomas Ehrhard, and Giulio Manzonetto. Not enough points is enough. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 298–312. Springer-Verlag, 2007. 30, 31

[BEM09] Antonio Bucciarelli, Thomas Ehrhard, and Giulio Manzonetto. A relational model of a parallel and non-deterministic lambda-calculus. In *Logical Foundations of Computer Science, International Symposium, LFCS 2009, Deerfield Beach, FL, USA, January 3-6, 2009. Proceedings*, volume 5407 of *Lecture Notes in Computer Science*, pages 107–121. Springer-Verlag, 2009. 31, 32

[BEM10] Antonio Bucciarelli, Thomas Ehrhard, and Giulio Manzonetto. Categorical Models for Simply Typed Resource Calculi. In *Proceedings of the Twenty-Sixth Conference on the Mathematical Foundations of Programming Semantics - MFPS XXVI*, volume 265 of *Electronic Notes in Theoretical Computer Science*, pages 213–230. Elsevier, 2010. 29, 30

[BET10] Richard Blute, Thomas Ehrhard, and Christine Tasson. A convenient differential category. Technical report, Preuves, Programmes et Systèmes, 2010. 29

[BG89] Ronald Brown and Marek Golasinski. A model structure for the homotopy theory of crossed complexes. *Cahiers de Topologie et Géométrie Différentielle Catégoriques*, 30(1):61–82, 1989. 35

[BG97] Chantal Berline and Klaus Grue. A kappa-denotational semantics for map theory in zfc + si. *Theor. Comput. Sci.*, 179(1-2):137–202, 1997. 33

[BG09] Guillaume Bonfante and Yves Guiraud. Polygraphic programs and polynomial-time functions. *Logical Methods in Computer Science*, 5(2):1–37, 2009. 34, 35

[BG12] Chantal Berline and Klaus Grue. A synthetic axiomatization of Map Theory. Technical report, Preuves, Programmes et Systèmes, 2012. 78 p. incluant TOC détaillée, index et appendices. 33

[BGGP10] Paola Bruscoli, Alessio Guglielmi, Tom Gundersen, and Michel Parigot. A Quasipolynomial Cut-Elimination Procedure in Deep Inference via Atomic Flows and Threshold Formulae. In *Logic for Programming, Artificial Intelligence, and Reasoning - 16th International Conference, LPAR-16, Dakar, Senegal, April 25-May 1, 2010, Revised Selected Papers*, volume 6355 of *Lecture Notes in Computer Science*, pages 136–153. Springer-Verlag, 2010. 27

[BKLR12] Eduardo Bonelli, Delia Kesner, Carlos Lombardi, and Alejandro Ríos. Normalisation for Dynamic Pattern Calculi. In *23rd International Conference on Rewriting Techniques and Applications (RTA'12), May 28 - June 2, 2012, Nagoya, Japan*, volume 15 of *LIPIcs*, pages 117–132. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. 17, 18

[BKS12] Ana Bove, Alexander Krauss, and Matthieu Sozeau. Partiality and Recursion in Interactive Theorem Provers - An Overview. *Mathematical Structures in Computer Science*, 2012. 21, 22

[BL96] Gérard Boudol and Carolina Lavatelli. Full abstraction for lambda calculus with resources and convergence testing. In Hélène Kirchner, editor, *CAAP*, volume 1059 of *Lecture Notes in Computer Science*, pages 302–316. Springer-Verlag, 1996. 26

[BMS07] Chantal Berline, Giulio Manzonetto, and Antonino Salibra. Lambda theories of effective lambda models. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 268–282. Springer-Verlag, 2007. 31

[BMSS11] Lars Birkedal, Rasmus Ejlers Møgelberg, Jan Schwinghammer, and Kristian Støvring. First steps in synthetic guarded domain theory: Step-indexing in the topos of trees. In *Proceedings of the 26th Annual IEEE Symposium on Logic in Computer Science, LICS 2011, June 21-24, 2011, Toronto, Ontario, Canada*, pages 55–64. IEEE Computer Society, 2011. 33

[BMW12] Clemens Berger, Paul-André Melliès, and Mark Weber. Monads with arities and their associated theories. *Journal of Pure and Applied Algebra*, 216(8-9):2029–2048, 2012. 33

[Boe11] Jaap Boender. *Etude formelle des distributions de logiciel libre*. PhD thesis, Université Paris Diderot - Paris 7, 2011. 40

[Bou12] Pierre Boutillier. A relaxation of Coq's guard condition. In *Actes des vingt troisièmes Journées Françaises des Langages Applicatifs (JFLA 2012), 4-7 février 2012, Carnac*, pages 1–14, 2012. 22

[Bre12] Flavien Breuvart. On the discriminating power of tests in resource lambda-calculus. Technical report, Preuves, Programmes et Systèmes, 2012. 31

[BS08] Antonio Bucciarelli and Antonino Salibra. Graph Lambda Theories. *Mathematical Structures in Computer Science*, 18(5):975–1004, 2008. 31

[Bur93] Albert Burroni. Higher-dimensional word problems with applications to equational logic. *Theoretical Computer Science*, 115(1):43–62, jul 1993. 34, 35

[BVY09] Vincent Balat, Jérôme Vouillon, and Boris Yakobowski. Experience report : Ocsigen, a web programming framework. In *Proceeding of the 14th ACM SIGPLAN international conference on Functional programming, ICFP 2009, Edinburgh, Scotland, UK, August 31 - September 2, 2009*, pages 311–316. Association for Computing Machinery, 2009. 40, 41

[Can11] Benjamin Canou. *Programmation Web Typée*. These, Université Pierre et Marie Curie - Paris VI, October 2011. 41

[CB10] Roberto Di Cosmo and Jaap Boender. Using strong conflicts to detect quality issues in component-based complex systems. In *Proceeding of the 3rd Annual India Software Engineering Conference, ISEC 2010, Mysore, India, February 25-27, 2010*, pages 163–172. Association for Computing Machinery, 2010. 40

[CBC08] Benjamin Canou, Vincent Balat, and Emmanuel Chailloux. O'Browser : Objective Caml on browsers. In *Proceedings of the ACM Workshop on ML, 2008, Victoria, BC, Canada, September 21, 2008*, pages 69–78. Association for Computing Machinery, 2008. 41

[CCV12] Benjamin Canou, Emmanuel Chailloux, and Jérôme Vouillon. How to Run your Favorite Language in Web Browsers. In *Proceedings of the 21st international conference on World Wide Web, Lyon, France, April 16 - 20, 2012*, 2012. 41

[CDCGP09] Giuseppe Castagna, Mariangiola Dezani-Ciancaglini, Elena Giachino, and Luca Padovani. Foundation of Session Types. In *Proceedings of the 11th International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming, September 7-9, 2009, Coimbra, Portugal*, pages 219–230. Association for Computing Machinery, 2009. 37, 38

[CDCP11] Giuseppe Castagna, Mariangiola Dezani-Ciancaglini, and Luca Padovani. On global types and multi-party sessions. In Roberto Bruni and Jürgen Dingel, editors, *Formal Techniques for Distributed Systems - Joint 13th IFIP WG 6.1 International Conference, FMOODS 2011, and 31st IFIP WG 6.1 International Conference, FORTE 2011, Reykjavik, Iceland, June 6-9, 2011. Proceedings*, volume 6722 of *Lecture Notes in Computer Science*, pages 1–28. Springer-Verlag, 2011. 37, 38

[CDCP12] Giuseppe Castagna, Mariangiola Dezani-Ciancaglini, and Luca Padovani. On global types and multi-party sessions. *Logical Methods in Computer Science*, 8(1):1–45, 2012. 37, 38

[CDKZ08] Pierre-Louis Curien, Vincent Danos, Jean Krivine, and Min Zhang. Computational self-assembly. *Theoretical Computer Science*, 404((1-2)):61–75, 2008. 35, 36

[CDNV08] Giuseppe Castagna, Rocco De Nicola, and Daniele Varacca. Semantic subtyping for the pi-calculus. *Theoretical Computer Science*, 398(1-3):217–242, 2008. 37

[CDRP+09] Antonio Cicchetti, Davide Di Ruscio, Patrizio Pelliccione, Alfonso Pierantonio, and Stefano Zacchiroli. A Model Driven Approach to Upgrade Package-Based Software Systems. In *ENASE 2009 - Proceedings of the 4th International Conference on Evaluation of Novel Approaches to Software Engineering, Milan, Italy, May 2009*, volume 69 of *CCIS*, pages 262–276. INSTICC Press, 2009. 39, 40

[CES10] Alberto Carraro, Thomas Ehrhard, and Antonino Salibra. Resource Combinatory Algebras. In *Mathematical Foundations of Computer Science 2010, 35th International Symposium, MFCS 2010, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6281 of *Lecture Notes in Computer Science*, pages 233–245. Springer-Verlag, 2010. 26, 27

[CF12] Pierre-Louis Curien and Claudia Faggian. An approach to innocent strategies as graphs. *Information and Computation*, 214:119–155, 2012. 25, 28, 29

[CGP08] Giuseppe Castagna, Nils Gesbert, and Luca Padovani. A Theory of Contracts for Web Services. In *Proceedings of the 35th ACM SIGPLAN-SIGACT Symposium on*

*Principles of Programming Languages, POPL 2008, San Francisco, California, USA, January 7-12, 2008*, pages 261–272. Association for Computing Machinery, 2008. 37

[CGP09] Giuseppe Castagna, Nils Gesbert, and Luca Padovani. A theory of contracts for Web services. *ACM Transactions on Programming Languages and Systems*, 31(5):1–61, 2009. 37

[CH00] Pierre-Louis Curien and Hugo Herbelin. The duality of computation. In *Proceedings of the Fifth ACM SIGPLAN International Conference on Functional Programming (ICFP '00), Montreal, Canada, September 18-21, 2000*, SIGPLAN Notices 35(9), pages 233–243. ACM, 2000. 23

[CH09a] Pierre Clairambault and Russ Harmer. Totality in arena games. *Annals of Pure and Applied Logic*, 161(5):673–689, 2009. 28

[CH09b] Pierre-Louis Curien and Hugo Herbelin. Abstract machines for dialogue games. In *Interactive models of computation and program behavior*, Panoramas et Synthèses, pages 231–275. Société Mathématique de France, 2009. 28

[Chr09] Juliusz Chroboczek. BitTorrent DHT Extensions for IPv6. Technical report, Preuves, Programmes et Systèmes, 2009. 42

[Chr12] Juliusz Chroboczek. Sequentialising a concurrent program using continuation-passing style. In *Proceedings of the 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2012, Philadelphia, Pennsylvania, USA, January 22-28, 2012*. Association for Computing Machinery, 2012. Tutorial lecture. 42

[CK01] Horatiu Cirstea and Claude Kirchner. The rewriting calculus — Part I *and* II. *Logic Journal of the IGPL*, 9(3):427–498, May 2001. 17, 18

[Cla09] Pierre Clairambault. Least and greatest fixpoints in game semantics. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 16–31. Springer-Verlag, 2009. 28

[Cla11] Pierre Clairambault. Estimation of the length of interactions in arena game semantics. In *Foundations of Software Science and Computational Structures - 14th International Conference, FOSSACS 2011, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2011, Saarbrücken, Germany, March 26-April 3, 2011. Proceedings*, volume 6604 of *Lecture Notes in Computer Science*, pages 335–349. Springer-Verlag, 2011. 28

[CMM10] Pierre-Louis Curien and Guillaume Munch-Maccagnoni. The duality of computation under focus. In *Theoretical Computer Science - 6th IFIP TC 1/WG 2.2 International Conference, TCS 2010, Held as Part of WCC 2010, Brisbane, Australia, September 20-23, 2010. Proceedings*, volume 323 of *Lecture Notes in Computer Science*, pages 165–181. Springer-Verlag, 2010. 23

[CN08] Giuseppe Castagna and Kim Nguyen. Typed iterators for XML. In *Proceeding of the 13th ACM SIGPLAN international conference on Functional programming, ICFP 2008, Victoria, BC, Canada, September 20-28, 2008*, pages 15–26. Association for Computing Machinery, 2008. 18, 19

[Coq93] Thierry Coquand. Infinite objects in type theory. In Henk Barendregt and Tobias Nipkow, editors, *TYPES*, volume 806 of *Lecture Notes in Computer Science*, pages 62–78. Springer-Verlag, 1993. 22

[CP09a] Giuseppe Castagna and Luca Padovani. A preliminary proposal of decidable testing relations for infinitary asynchronous CCS (position paper). In *INFINITY 2009: 11th International Workshop on Verification of Infinite-State Systems*, 2009. 37

[CP09b] Giuseppe Castagna and Luca Padovani. Contracts for Mobile Processes. In *Concurrency Theory, 20th International Conference, CONCUR 2009, Bologna, Italy, September 1-4, 2009. Proceedings*, volume 5710 of *Lecture Notes in Computer Science*, pages 211–228. Springer-Verlag, 2009. 37, 38

[CPM90] T. Coquand and C. Paulin-Mohring. Inductively defined types. In P. Martin-Löf and G. Mints, editors, *Proceedings of Colog'88*, volume 417 of *Lecture Notes in Computer Science*. Springer-Verlag, 1990. 19, 20

[CSB12] Alberto Carraro, Antonino Salibra, and Antonio Bucciarelli. Minimal lambda-theories by ultraproducts. Technical report, Preuves, Programmes et Systèmes, 2012. 31

[Cur93] Pierre-Louis Curien. Substitution up to isomorphism. *Fundamenta Informaticae*, 19(1-2):51–86, 1993. 34

[Cur12] Pierre-Louis Curien. Operads, clones, and distributive laws. In *Proceedings of the International Conference on Operads and Universal Algebra*, volume 9 of *Nankai Series in Pure, Applied Mathematics and Theoretical Physics*, pages 25–50. World Scientific, 2012. 34

[CVY07] Silvia Crafa, Daniele Varacca, and Nobuko Yoshida. Compositional Event Structure Semantics of the Internal pi-Calculus. In *Concurrency Theory, 18th International Conference, CONCUR 2007, Lisbon, Portugal, September 3-8, 2007, Proceedings*, volume 4703 of *Lecture Notes in Computer Science*, pages 317–332. Springer-Verlag, 2007. 38

[CVY12] Silvia Crafa, Daniele Varacca, and Nobuko Yoshida. Event structure semantics of the parallel extrusion in the pi-calculus. In *Foundations of Software Science and Computational Structures - 15th International Conference, FOSSACS 2012, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS 2012, Tallinn, Estonia, March 24 - April 1, 2012. Proceedings*, Lecture Notes in Computer Science, pages 225–239. Springer-Verlag, 2012. 38

[DAB09] Derek Dreyer, Amal Ahmed, and Lars Birkedal. Logical step-indexed logical relations. In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer*

*Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 71–80. IEEE Computer Society, 2009. 33

[DCDB+08] Roberto Di Cosmo, Berke Durak, Jaap Boender, Fabio Mancinelli, and Jérôme Vouillon. Improving the Quality of GNU/Linux Distributions. In *Proceedings of the 32nd Annual IEEE International Computer Software and Applications Conference, COMPSAC 2008, 28 July - 1 August 2008, Turku, Finland*, pages 1240–1246. IEEE Computer Society, 2008. 40

[DCDRP+11] Roberto Di Cosmo, Davide Di Ruscio, Patrizio Pelliccione, Alfonso Pierantonio, and Stefano Zacchiroli. Supporting software evolution in component-based FOSS systems. *Science of Computer Programming*, 76(12):1144–1160, 2011. 39, 40

[DCPTDF08] Daniel De Carvalho, Michele Pagani, and Lorenzo Tortora De Falco. A semantic measure of the execution time in Linear Logic. Technical report, Preuves, Programmes et Systèmes, 2008. 25

[DCZ10] Roberto Di Cosmo and Stefano Zacchiroli. Feature Diagrams as Package Dependencies. In *Software Product Lines: Going Beyond - 14th International Conference, SPLC 2010, Jeju Island, South Korea, September 13-17, 2010. Proceedings*, volume 6287 of *Lecture Notes in Computer Science*, pages 476–480. Springer-Verlag, 2010. 39, 40

[DCZT08] Roberto Di Cosmo, Stefano Zacchiroli, and Paulo Trezentos. Package upgrades in FOSS distributions: details and challenges. In *Proceedings of the 1st ACM Workshop on Hot Topics in Software Upgrades, HotSWUp 2008, Nashville, TN, USA, October 20, 2008*. Association for Computing Machinery, 2008. 39

[DFF+07] Vincent Danos, Jérôme Feret, Walter Fontana, Russell Harmer, and Jean Krivine. Rule-based modelling of cellular signalling. In *International Conference on Concurrency Theory (CONCUR'07)*, volume 4703 of *Lecture Notes in Computer Science*, pages 17–41. Springer-Verlag, 2007. 35, 36

[DFF+08] Vincent Danos, Jérôme Feret, Walter Fontana, Russell Harmer, and Jean Krivine. Rule-based modelling, symmetries, refinements. In *Formal Methods in Systems Biology, First International Workshop, FMSB 2008, Cambridge, UK, June 4-5, 2008. Proceedings*, volume 5054 of *Lecture Notes in Computer Science*, pages 103–122. Springer-Verlag, 2008. 35, 36

[DFF+09a] Vincent Danos, Jérôme Feret, Walter Fontana, Russ Harmer, and Jean Krivine. Rule-Based Modelling and Model Perturbation. *Transactions on Computational Systems Biology*, 5750:116–137, 2009. 35, 36

[DFF+09b] Vincent Danos, Jérôme Feret, Walter Fontana, Russell Harmer, and Jean Krivine. Investigation of a biological repair scheme. In *Membrane Computing - 9th International Workshop, WMC 2008, Edinburgh, UK, July 28-31, 2008, Revised Selected and Invited Papers*, volume 5391 of *Lecture Notes in Computer Science*, pages 1–12. Springer-Verlag, 2009. 35, 36

[DFF+10] Vincent Danos, Jérôme Feret, Walter Fontana, Russell Harmer, and Jean Krivine. Abstracting the differential semantics of rule-based models: exact and automated model reduction. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 362–381. IEEE Computer Society, 2010. 35, 36

[DFFK07] Vincent Danos, Jérôme Feret, Walter Fontana, and Jean Krivine. Scalable Simulation of Cellular Signaling Networks. In *Programming Languages and Systems, 5th Asian Symposium, APLAS 2007, Singapore, November 29-December 1, 2007, Proceedings*, volume 4807 of *Lecture Notes in Computer Science*, pages 139–157. Springer-Verlag, 2007. 36

[DFFK08] Vincent Danos, Jérôme Feret, Walter Fontana, and Jean Krivine. Abstract Interpretation of Cellular Signalling Networks. In *Verification, Model Checking, and Abstract Interpretation*, volume 4905 of *Lecture Notes in Computer Science*, pages 83–97, 2008. 35, 36

[DGF08] Paolo Di Giamberardino and Claudia Faggian. Proof nets sequentialisation in multiplicative linear logic. *Annals of Pure and Applied Logic*, 155(3):173–182, 2008. 25

[DHK12] Troels Damgaard, Espen Hojsgaard, and Jean Krivine. Formal Cellular Machinery. In *Proceedings of the Second International Workshop on Static Analysis and Systems Biology*, volume 18228 of *Electronic Notes in Theoretical Computer Science*, pages 55–74. Elsevier, 2012. 37

[DHW11] Vincent Danos, Russ Harmer, and Glynn Winskel. Constraining rule-based dynamics with types. Technical report, Preuves, Programmes et Systèmes, 2011. 36

[Dog12] Mehdi Dogguy. *Déterminisme et Confluence dans des systèmes concurrents et synchrones*. PhD thesis, Université Paris Diderot - Paris 7, 2012. 36, 37

[DRPPZ09] Davide Di Ruscio, Patrizio Pelliccione, Alfonso Pierantonio, and Stefano Zacchiroli. Towards maintainer script modernization in FOSS distributions. In *Proceedings of the 1st International Workshop on Open Component Ecosystems*, pages 11–20. Association for Computing Machinery, 2009. 39, 40

[EBCM11] Thomas Ehrhard, Antonio Bucciarelli, Alberto Carraro, and Giulio Manzonetto. Full Abstraction for Resource Calculus with Tests. In *Computer Science Logic, 20th Annual Conference of the EACSL, CSL 2011, September 12-15, 2011, Bergen, Norway, Proceedings*, volume 12 of *LIPIcs*, pages 97–111. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2011. 30, 31

[ECS10] Thomas Ehrhard, Alberto Carraro, and Antonino Salibra. Exponentials with Infinite Multiplicities. In *Computer Science Logic, CSL 2010, 19th Annual Conference of the EACSL, Brno, Czech Republic, August 23-27, 2010. Proceedings*, volume 6247 of *Lecture Notes in Computer Science*, pages 170–184. Springer-Verlag, 2010. 30

[ED11] Thomas Ehrhard and Vincent Danos. Probabilistic coherence spaces as a model of higher- order probabilistic computation. *Information and Computation*, 152(1):111–137, 2011. 31

[Ehr05] Thomas Ehrhard. Finiteness spaces. *Mathematical Structures in Computer Science*, 15(4):615–646, 2005. 26, 29, 27

[Ehr10] Thomas Ehrhard. A finiteness structure on resource terms. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 402–410. IEEE Computer Society, 2010. 26, 27

[Ehr12a] Thomas Ehrhard. Collapsing non-idempotent intersection types. In *Computer Science Logic, 21nd Annual Conference of the EACSL, CSL 2012, September, 2012, Fontaineblau, France, Proceedings*, LIPIcs. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2012. To appear. 30

[Ehr12b] Thomas Ehrhard. The Scott model of Linear Logic is the extensional collapse of its relational model. *Theoretical Computer Science*, 424:20–45, 2012. 30

[EL10a] Thomas Ehrhard and Olivier Laurent. Acyclic Solos and Differential Interaction Nets. *Logical Methods in Computer Science*, 6(3), 2010. 26

[EL10b] Thomas Ehrhard and Olivier Laurent. Interpreting a finitary pi-calculus in differential interaction nets. *Information and Computation*, 208(6):606–633, 2010. 26

[EPT11] Thomas Ehrhard, Michele Pagani, and Christine Tasson. The computational meaning of probabilistic coherent spaces. In *Proceedings of the 26th Annual IEEE Symposium on Logic in Computer Science, LICS 2011, June 21-24, 2011, Toronto, Ontario, Canada*, pages 87–96. IEEE Computer Society, 2011. 31

[ER06] Thomas Ehrhard and Laurent Regnier. Differential interaction nets. *Theor. Comput. Sci.*, 364(2):166–195, 2006. 26, 29, 30

[ES09] Elie Soubiran. A unified framework and a transparent name-space for the Coq module system. In *Proceedings of the First International Workshop on Modules and Libraries for Proof Assistants (MLPA'09)*, pages 28–42, Montreal, Canada, August 2009. Electronic Notes in Theoretical Computer Science. 20

[FB09] Claudia Faggian and Michele Basaldella. Ludics with Repetitions (Exponentials, Interactive Types and Completeness). In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 375–384. IEEE Computer Society, 2009. 29, 31, 32

[FB11] Claudia Faggian and Michele Basaldella. Ludics with repetitions (Exponentials, Interactive types and Completeness). *Logical Methods in Computer Science*, 7(2):1–85, 2011. 29, 31, 32

[FCB08] Alain Frisch, Giuseppe Castagna, and Véronique Benzaken. Semantic subtyping: Dealing set-theoretically with function, union, intersection, and negation types. *Journal of the ACM*, 55(4):1–64, 2008. 19

[FDK$^+$09] Jérôme Feret, Vincent Danos, Jean Krivine, Russ Harmer, and Walter Fontana. Internal coarse-graining of molecular systems. *Proceedings of the National Academy of Sciences of the United States of America*, 106(16), 2009. 36

[Fil94] Andrzej Filinski. Representing monads. In *Conf. Record 21st ACM SIGPLAN-SIGACT Symp. on Principles of Programming Languages, POPL'94, Portland, OR, USA, 17-21 Jan. 1994*, pages 446–457. Association for Computing Machinery, 1994. 24

[Fio07] Marcelo P. Fiore. Differential structure in models of multiplicative biadditive intuitionistic linear logic. In Simona Ronchi Della Rocca, editor, *TLCA*, volume 4583 of *Lecture Notes in Computer Science*, pages 163–177. Springer-Verlag, 2007. 29, 30

[FK07] Julien Forest and Delia Kesner. Expression Reduction Systems with Patterns. *Journal of Automated Reasoning*, 39(4):513–541, 2007. 17, 18

[Fos07] Luca Fossati. Handshake Games. In *Proceedings of the Second International Workshop on Developments in Computational Models (DCM 2006)*, volume 171 of *Electronic Notes in Theoretical Computer Science*, pages 21–41. Elsevier, 2007. 37

[FP07a] Claudia Faggian and Mauro Piccolo. A Graph Abstract Machine Describing Event Structure Composition. In *Proceedings of the Workshop on Graph Transformation for Concurrency and Verification (GT-VC 2006)*, volume 175 of *Electronic Notes in Theoretical Computer Science*, pages 21–36. Elsevier, 2007. 28, 29

[FP07b] Claudia Faggian and Mauro Piccolo. Ludics is a model for the finitary linear Pi-calculus. In *Typed Lambda Calculi and Applications, 8th International Conference, TLCA 2007, Paris, France, June 26-28, 2007, Proceedings*, volume 4538 of *Lecture Notes in Computer Science*, pages 148–162. Springer-Verlag, 2007. 28, 29

[FP09] Claudia Faggian and Mauro Piccolo. Partial Orders, Event Structures and Linear Strategies. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 95–111. Springer-Verlag, 2009. 28, 29

[FV09a] Luca Fossati and Daniele Varacca. A Petri Net Model of HandShake Protocols. In *Proceedings of the First Interaction and Concurrency Experiences Workshop (ICE 2008)*, volume 229 of *Electronic Notes in Theoretical Computer Science*, pages 59–76. Elsevier, 2009. 37

[FV09b] Luca Fossati and Daniele Varacca. The calculus of HandShake Configurations. In *Foundations of Software Science and Computational Structures, 12th International Conference, FOSSACS 2009, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2009, York, UK, March 22-29, 2009. Proceedings*, volume 5504 of *Lecture Notes in Computer Science*, pages 227–241. Springer-Verlag, 2009. 37

[Gau08] Philippe Gaucher. Towards a homotopy theory of process algebra. *Homology, homotopy and Applications*, 10(1):353–388, 2008. 34

[Gau09] Philippe Gaucher. Homotopical interpretation of globular complex by multipointed d-space. *Theory and Applications of Categories*, 22(22):588–621, 2009. 34

[Gau10a] Philippe Gaucher. Combinatorics of labelling in higher dimensional automata. *Theoretical Computer Science*, 411(11-13):1452–1483, 2010. 34

[Gau10b] Philippe Gaucher. Directed algebraic topology and higher dimensional transition system. *New York Journal of Mathematics*, 16:409–461, 2010. 34

[Gau11] Philippe Gaucher. Towards a homotopy theory of higher dimensional transition systems. *Theory and Applications of Categories*, 25(12):295–341, 2011. 34

[GGP10] Alessio Guglielmi, Tom Gundersen, and Michel Parigot. A Proof Calculus Which Reduces Syntactic Bureaucracy. In *Proceedings of the 21st International Conference on Rewriting Techniques and Applications, RTA 2010, July 11-13, 2010, Edinburgh, Scottland, UK*, volume 6 of *LIPIcs*, pages 135–150. Schloss Dagstuhl - Leibniz Zentrum fuer Informatik, 2010. 27

[Gia09] Elena Giachino. *Session Types: Semantic Foundations and Object-Oriented Applications*. PhD thesis, Università degli Studi di Torino – Université Paris 7, December 2009. 37, 38

[Gim09] Stéphane Gimenez. *Programmer, calculer et raisonner avec les réseaux de la Logique Linéaire*. PhD thesis, Université Paris Diderot - Paris 7, 2009. 26

[Gim11] Stéphane Gimenez. Realizability proof for normalization of full differential linear logic. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 107–122. Springer-Verlag, 2011. 27

[Gir91] Jean-Yves Girard. A new constructive logic: Classical logic. *Math. Struct. Comp. Sci.*, (1), 1991. 23

[Gir04] Jean-Yves Girard. Between logic and quantic: a tract. In Thomas Ehrhard, Jean-Yves Girard, Paul Ruet, and Philip Scott, editors, *Linear Logic in Computer Science*, volume 316 of *London Mathematical Society Lecture Notes Series*, pages 346–381. Cambridge University Press, 2004. 31

[Glo12] Stéphane Glondu. *Vers une certification de l'extraction de Coq*. PhD thesis, Université Paris Diderot, June 2012. 21

[GLV11] Jean Goubault-Larrecq and Daniele Varacca. Continuous Random Variables. In *Proceedings of the 26th Annual IEEE Symposium on Logic in Computer Science, LICS 2011, June 21-24, 2011, Toronto, Ontario, Canada*, pages 97–106. IEEE Computer Society, 2011. 31

[GM09] Yves Guiraud and Philippe Malbos. Higher dimensional categories with finite derivation type. *Theory and Applications of Categories*, 22(18):420–478, 2009. 34, 35

[GM10a] Yves Guiraud and Philippe Malbos. Coherence in monoidal track categories. *Mathematical Structures in Computer Science*, 2010. 32 pages, to appear. 34, 35

[GM10b] Yves Guiraud and Philippe Malbos. Higher-dimensional normalisation strategies for acyclicity. *Advances in Mathematics*, 2010. 46 pages, accepted. 34, 35

[GM11] Yves Guiraud and Philippe Malbos. Identities among relations for higher-dimensional rewriting systems. *Séminaires et Congrès, Société Mathématique de France*, 26:145–161, 2011. 34, 35

[Gui04] Yves Guiraud. *Présentations d'opérades et systèmes de réécriture*. PhD thesis, Université Montpellier 2, 2004. 34, 35

[Gui06a] Yves Guiraud. Termination orders for 3-dimensional rewriting. *Journal of Pure and Applied Algebra*, 207(2):341–371, 2006. 34, 35

[Gui06b] Yves Guiraud. The three dimensions of proofs. *Annals of Pure and Applied Logic*, 141(1–2):266–295, 2006. 34, 35

[Gui06c] Yves Guiraud. Two polygraphic presentations of Petri nets. *Theoretical Computer Science*, 360(1–3):124–146, 2006. 34, 35

[Har09] Russ Harmer. Rule-based modelling and tunable resolution. In *Proceedings Fifth Workshop on Developments in Computational Models–Computational Models From Nature*, volume 9 of *Electronic Proceedings in Theoretical Computer Science*, pages 65–72, 2009. 36

[HDF+10] Russ Harmer, Vincent Danos, Jérôme Feret, Jean Krivine, and Walter Fontana. Intrinsic Information carriers in combinatorial dynamical systems. *Chaos*, 20(3), 2010. 36

[Her94] Hugo Herbelin. A lambda-calculus structure isomorphic to gentzen-style sequent calculus structure. In Leszek Pacholski and Jerzy Tiuryn, editors, *CSL*, volume 933 of *Lecture Notes in Computer Science*, pages 61–75. Springer-Verlag, 1994. 22, 23

[Her10] Hugo Herbelin. An intuitionistic logic that proves Markov's principle. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 50–56. IEEE Computer Society, 2010. 23

[Her12] Hugo Herbelin. A Constructive Proof of Dependent Choice, Compatible with Classical Logic. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*, pages 365–374. IEEE Computer Society, 2012. 32

[HFC09] Haruo Hosoya, Alain Frisch, and Giuseppe Castagna. Parametric polymorphism for XML. *ACM Transactions on Programming Languages and Systems*, 32(1):1–56, 2009. 19

[HG08] Hugo Herbelin and Silvia Ghilezan. An Approach to Call-by-Name Delimited Continuations. In *Proceedings of the 35th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, POPL 2008, San Francisco, California, USA, January 7-12, 2008*, pages 383–394. Association for Computing Machinery, 2008. 24

[HHM07] Russ Harmer, Martin Hyland, and Paul-André Melliès. Categorical Combinatorics for Innocent Strategies. In *Proceedings of the 22nd IEEE Symposium on Logic in Computer Science, LICS 2007, 10-12 July 2007, Wroclaw, Poland*, pages 379–388. IEEE Computer Society, 2007. 27, 28

[HL09] Hugo Herbelin and Gyesik Lee. Forcing-based cut-elimination for Gentzen-style intuitionistic sequent calculus. In *Logic, Language, Information and Computation, 16th International Workshop, WoLLIC 2009, Tokyo, Japan, June 21-24, 2009. Proceedings*, volume 5514 of *Lecture Notes in Computer Science*, pages 209–217. Springer-Verlag, 2009. 24

[HL12] Hugo Herbelin and Gyesik Lee. Formalising logical meta-theory - semantical normalisation using kripke models for first-order predicate logic. submitted, 2012. 24

[Hof94] Martin Hofmann. On the interpretation of type theory in locally cartesian closed categories. In *Computer Science Logic, 8th International Workshop, CSL 1994, Kazimierz, Poland, September 25-30, 1994, Selected Papers*, volume 933 of *Lecture Notes in Computer Science*, pages 427–441. Springer-Verlag, 1994. 34

[HS09] Hugo Herbelin and Alexis Saurin. $\lambda\mu$-calculus and $\Lambda\mu$-calculus: a Capital Difference. Technical report, Preuves, Programmes et Systèmes, 2009. 24

[HZ09] Hugo Herbelin and Stéphane Zimmermann. An Operational Account of Call-By-Value Minimal and Classical $\lambda$-calculus in "Natural Deduction" Form. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 142–156. Springer-Verlag, 2009. 23

[ILH10] Danko Ilik, Gyesik Lee, and Hugo Herbelin. Kripke Models for Classical Logic. *Annals of Pure and Applied Logic*, 161(11):1367–1378, 2010. 24

[Ili10a] Danko Ilik. Delimited control operators prove Double-negation Shift. Technical report, Preuves, Programmes et Systèmes, 2010. 23, 24

[Ili10b] Danko Ilik. *Preuves constructives de complétude et contrôle délimité.* PhD thesis, École Polytechnique, 2010. 21, 24, 22

[Jay04] C. Barry Jay. The pattern calculus. *TOPLAS*, 26(6):911–937, 2004. 17, 18

[Jer08] Emil Jerábek. Independent bases of admissible rules. *Logic Journal of the IGPL*, 16(3):249–267, 2008. 27

[JK09] Barry Jay and Delia Kesner. First-class patterns. *Journal of Functional Programming*, 19(2):191–225, 2009. 17, 18

[JLTV11] Florent Jacquemard, Etienne Lozes, Ralf Treinen, and Jules Villard. Multiple Congruence Relations, First-Order Theories on Terms, and the Frames of the Applied Pi-Calculus. In *Theory of Security and Applications - Joint Workshop, TOSCA 2011, Saarbrücken, Germany, March 31 - April 1, 2011, Revised Selected Papers*, volume 6993 of *Lecture Notes in Computer Science*, pages 166–185. Springer-Verlag, 2011. 19

[JTS12] Guilhem Jaber, Nicolas Tabareau, and Matthieu Sozeau. Extending Type Theory with Forcing. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*. IEEE Computer Society, 2012. To appear. 21, 33

[KC11] Gabriel Kerneis and Juliusz Chroboczek. CPC: programming with a massive number of lightweight threads. In *Proceedings of the Fourth Workshop on Programming Language Approaches to Concurrency and Communication-Centric Software (PLACES'11)*, pages 30–34, 2011. 42

[KC12a] Gabriel Kerneis and Juliusz Chroboczek. Continuation-Passing C: compiling threads to events through continuations. *Higher-Order and Symbolic Computation*, 2012. 42

[KC12b] Gabriel Kerneis and Juliusz Chroboczek. Lambda-lifting and CPS conversion in an imperative language. Technical report, Preuves, Programmes et Systèmes, 2012. 42

[KDB09] Jean Krivine, Vincent Danos, and Arndt Benecke. Modelling epigenetic information maintenance a Kappa tutorial. In *Proceedings of the 21st International Conference on Computer Aided Verification*, volume 5643 of *Lecture Notes in Computer Science*, pages 17–32. Springer-Verlag, 2009. 36

[Kes07] Delia Kesner. The theory of calculi with explicit substitutions revisited. In *Computer Science Logic, CSL 2007, 16th Annual Conference of the EACSL, Lausanne, Switzerland, September 11-15, 2007, Proceedings*, volume 4646 of *Lecture Notes in Computer Science*, pages 238–252. Springer-Verlag, 2007. 18

[Kes08] Delia Kesner. Perpetuality for full and safe composition (in a constructive setting). In *Automata, Languages and Programming, 35th International Colloquium, ICALP 2008, Reykjavik, Iceland, July 7-11, 2008, Proceedings, Part II - Track B: Logic, Semantics, and Theory of Programming & Track C: Security and Cryptography Foundations*, volume 5126 of *Lecture Notes in Computer Science*, pages 311–322. Springer-Verlag, 2008. 18

[Kes09] Delia Kesner. A Theory of Explicit Substitutions with Safe and Full Composition. *Logical Methods in Computer Science*, 5(3:1):1–29, 2009. 18

[KL07a] Delia Kesner and Stéphane Lengrand. Resource Operators for lambda-calculus. *Information and Computation*, 205(4):419–473, 2007. 18

[KL07b] Jean-Louis Krivine and Yves Legrandgérard. Valid formulas, games and network protocols. Technical report, 2007. 12 pages. 32, 33

[KMT08a] Steve Kremer, Antoine Mercier, and Ralf Treinen. Proving Group Protocols Secure Against Eavesdroppers. In *Automated Reasoning, 4th International Joint Conference, IJCAR 2008, Sydney, Australia, August 12-15, 2008, Proceedings*, volume 5195 of *Lecture Notes in Computer Science*, pages 116–131. Springer-Verlag, 2008. 19

[KMT08b] Jean Krivine, Robin Milner, and Angelo Troina. Stochastic Bigraphs. In *Proceedings of Mathematical Foundation of Programming Semantics (MFPS 2008)*, volume 218

of *Electronic Notes in Theoretical Computer Science*, pages 73–96. Springer-Verlag, 2008. 37

[KMT09] Steve Kremer, Antoine Mercier, and Ralf Treinen. Reducing Equational Theories for the Decision of Static Equivalence. In *Advances in Computer Science - ASIAN 2009. Information Security and Privacy, 13th Asian Computing Science Conference, Seoul, Korea, December 14-16, 2009. Proceedings*, volume 5913 of *Lecture Notes in Computer Science*, pages 94–108. Springer-Verlag, 2009. 19

[KMT12] Steve Kremer, Antoine Mercier, and Ralf Treinen. Reducing Equational Theories for the Decision of Static Equivalence. *Journal of Automated Reasoning*, 48(2):197–217, 2012. 19

[Kri03] Jean-Louis Krivine. Dependent choice, 'quote' and the clock. *Theor. Comput. Sci.*, 308(1-3):259–276, 2003. 32

[Kri08] Jean-Louis Krivine. Structures de réalisabilité, RAM et ultrafiltre sur N. *CoRR*, abs/0809.2394, 2008. 23, 32, 24

[Kri11] Jean-Louis Krivine. Realizability algebras: a program to well order R. *Logical Methods in Computer Science*, 7(3):1–47, 2011. 32

[Kri12a] Jean Krivine. A verification technique for reversible process algebra. In *Reversible Computation - Third International Workshop, RC 2012, Copenhagen, Denmark, July 2-3, 2011. Proceedings*, Lecture Notes in Computer Science. Springer-Verlag, 2012. To appear. 38

[Kri12b] Jean-Louis Krivine. Realizability algebras II : new models of ZF + DC. *Logical Methods in Computer Science*, 8(1), 2012. 32

[Laf07] Yves Lafont. Algebra and geometry of rewriting. *Applied Categorical Structures*, 15(4):415–437, 2007. 34, 35

[Len06] Stéphane Lengrand. *Normalisation and Equivalence in Proof Theory and Type Theory*. PhD thesis, Université Paris Diderot - Paris 7, December 2006. 22, 23

[Ler09] Xavier Leroy. Formal verification of a realistic compiler. *Commun. ACM*, 52(7):107–115, 2009. 22

[Lev99] Paul Blain Levy. Call-by-push-value: A subsuming paradigm. In *TLCA*, pages 228–242, 1999. 24

[LG88] John M. Lucassen and David K. Gifford. Polymorphic effect systems. In *POPL*, pages 47–57, 1988. 25

[LM08] Ugo Dal Lago and Simone Martini. The weak lambda calculus as a reasonable machine. *Theoretical Computer Science*, 398(1-3):32–50, 2008. 25

[LM09] Yves Lafont and François Métayer. Polygraphic resolutions and homology of monoids. *Journal of Pure and Applied Algebra*, 213:947–968, 2009. 35

[LMW10] Yves Lafont, François Métayer, and Krzysztof Worytkiewicz. A folk model structure on omega-cat. *Advances in Mathematics*, 224(3):1183–1231, 2010. 35

[LR08] Yves Lafont and Pierre Rannou. Diagram rewriting for orthogonal matrices: A study of critical peaks. In *Proceedings of the 19st International Conference on Rewriting Techniques and Applications, RTA 2008, July 15-17, 2008, Hagenberg, Austria*, volume 5117 of *Lecture Notes in Computer Science*, pages 232–245. Springer-Verlag, 2008. 34, 35

[MA11] Antoine Madet and Roberto M. Amadio. An Elementary Affine λ-Calculus with Multithreading and Side Effects. In *Typed Lambda Calculi and Applications - 10th International Conference, TLCA 2011, Novi Sad, Serbia, June 1-3, 2011. Proceedings*, volume 6690 of *Lecture Notes in Computer Science*, pages 138–152. Springer-Verlag, 2011. 26

[Man10] Pascal Manoury. De l'interprétation algorithmique du blason. In *Actes des vingt et unièmes Journées Françaises des Langages Applicatifs (JFLA 2010), 30 janvier - 2 février 2010, La Ciotat*, Studia Informatica Universalis, pages 217–244. Hermann, 2010. 39

[MDF+10] Elaine Murphy, Vincent Danos, Jérôme Feret, Jean Krivine, and Russell Harmer. Rule Based Modeling and Model Refinement. In *Elements of Computational Systems Biology*, Wiley Book Series on Bioinformatics, pages 83–114. John Wiley & Sons, 2010. 35, 36

[Mel12] Paul-André Melliès. Game semantics in string diagrams. In *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, LICS 2012, Dubrovnik, Croatia*, pages 481–490. IEEE Computer Society, 2012. 33

[Mét03] François Métayer. Resolutions by polygraphs. *Theory and Applications of Categories*, 11(7):148–184, 2003. http://www.tac.mta.ca/tac/. 34, 35

[Mim10] Samuel Mimram. Computing Critical Pairs in 2-Dimensional Rewriting Systems. In Christopher Lynch, editor, *Proceedings of the 21st International Conference on Rewriting Techniques and Applications, RTA 2010, July 11-13, 2010, Edinburgh, Scottland, UK*, volume 6 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 227–242, Edinburgh Royaume-Uni, 2010. 34, 35

[Miq01] Alexandre Miquel. The implicit calculus of constructions. In *TLCA*, pages 344–359, 2001. 23

[MM09] Guillaume Munch-Maccagnoni. Focalisation and Classical Realisability (version with appendices). In *Computer Science Logic, CSL 2009, 18th Annual Conference of the EACSL, Coimbra, Portugal, September 7-11, 2009. Proceedings*, volume 5771 of *Lecture Notes in Computer Science*, pages 409–423. Springer-Verlag, 2009. 23

[MM11] Guillaume Munch-Maccagnoni. From delimited CPS to polarisation. Technical report, Preuves, Programmes et Systèmes, 2011. 24

[MRG10] Puech Matthias and Yann Regis-Gianas. Towards typed repositories of proofs. In *Mathematically Intelligent Proof Search - MIPS 2010*, 2010. 21

[MT08] Paul-André Melliès and Nicolas Tabareau. Free models of T-algebraic theories computed as Kan extensions. Technical report, Preuves, Programmes et Systèmes, 2008. 30, 33, 34

[MT10] Paul-André Melliès and Nicolas Tabareau. Resource modalities in tensor logic. *Annals of Pure and Applied Logic*, 161(5):632–653, 2010. 25

[MTT09] Paul-André Melliès, Nicolas Tabareau, and Christine Tasson. An explicit formula for the free exponential modality of linear logic. In *Automata, Languages and Programming, 36th International Collogquium, ICALP 2009, Rhodes, greece, July 5-12, 2009, Proceedings, Part II*, volume 5556 of *Lecture Notes in Computer Science*, pages 247–260. Springer-Verlag, 2009. 30, 34

[MTT10] Paul-André Melliès, Nicolas Tabareau, and Christine Tasson. An explicit formula for the free exponential modality of linear logic (journal version). *Theoretical Computer Science*, 2010. To appear. 30, 34

[Mé08] François Métayer. Cofibrant objects among higher-dimensional categories. *Homology, homotopy and Applications*, 10(1):181–203, 2008. 34, 35

[Pad10] Vincent Padovani. Ticket Entailment is decidable. *Mathematical Structures in Computer Science*, 2010. To appear. Submitted on 06/09/2010. Accepted for publication on 12/19/2011. Last revision on 03/06/2012. 25

[Pag09] Michele Pagani. The Cut-Elimination Theorem for Differential Nets with Boxes. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 219–233. Springer-Verlag, 2009. 27

[Pag11] Michele Pagani. Visible acyclic differential nets, Part I: Semantics. *Annals of Pure and Applied Logic*, 163(3):238–265, 2011. 26, 27

[PAM+09] Bruno Pagano, Olivier Andrieu, Thomas Moniot, Benjamin Canou, Emmanuel Chailloux, Philippe Wang, Pascal Manoury, and Jean-Louis Colaço. Experience Report: Using Objective Caml to develop safety-critical embedded tool in a certification framework. In *Proceeding of the 14th ACM SIGPLAN international conference on Functional programming, ICFP 2009, Edinburgh, Scotland, UK, August 31 - September 2, 2009*, pages 215–220. Association for Computing Machinery, 2009. 42, 43

[Par92] Michel Parigot. Lambda-mu-calculus: An algorithmic interpretation of classical natural deduction. In *Logic Programming and Automated Reasoning: International Conference LPAR '92 Proceedings, St. Petersburg, Russia*, pages 190–201. Springer-Verlag, 1992. 24

[PP02] Gordon Plotkin and John Power. Computational effects determine monads. In *Proceedings of FOSSACS 2002*, volume 2303 of *LNCS*. Springer-Verlag, 2002. 33, 34

[PT09a] Michele Pagani and Christine Tasson. The inverse Taylor expansion problem in linear logic. In *Proceedings of the 24th Annual IEEE Symposium on Logic in Computer Science, LICS 2009, 11-14 August 2009, Los Angeles, CA, USA*, pages 222–231. IEEE Computer Society, 2009. 26, 27

[PT09b] Michele Pagani and Paolo Tranquilli. Parallel Reduction in Resource Lambda-Calculus. In *Programming Languages and Systems, 7th Asian Symposium, APLAS 2009, Seoul, Korea, December 14-16, 2009. Proceedings*, volume 5904 of *Lecture Notes in Computer Science*, pages 226–242. Springer-Verlag, 2009. 27

[Rey72] John C. Reynolds. Definitional interpreters for higher-order programming languages. In *ACM '72: Proceedings of the ACM annual conference*, pages 717–740, New York, NY, USA, 1972. ACM Press. 21

[RGP08] Yann Regis-Gianas and François Pottier. A Hoare Logic for Call-by-Value Functional Programs. In *Mathematics of Program Construction, 9th International Conference, MPC 2008, Marseille, France, July 15-18, 2008. Proceedings*, volume 5133 of *Lecture Notes in Computer Science*, pages 305–335. Springer-Verlag, 2008. 21

[Sau05] Alexis Saurin. Separation with streams in the $\lambda\mu$-calculus. In *Symposium on Logic in Computer Science (LICS 2005), 26-29 June 2005, Chicago, IL, USA, Proceedings*, pages 356–365. IEEE Computer Society, 2005. 24

[Sau08] Alexis Saurin. On the Relations between the Syntactic Theories of $\lambda\mu$-Calculi. In *Computer Science Logic, CSL 2008, 17th Annual Conference of the EACSL, Bertinoro, Italy, September 16-19, 2008. Proceedings*, volume 5213 of *Lecture Notes in Computer Science*, pages 154–168, 2008. 24

[Sau10a] Alexis Saurin. A Hierarchy for Delimited Continuations in Call-by-Name. In *Foundations of Software Science and Computational Structures, 13th International Conference, FOSSACS 2010, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2010, Paphos, Cyprus, March 20-28, 2010. Proceedings*, volume 6014 of *Lecture Notes in Computer Science*, pages 374–388. Springer-Verlag, 2010. 24

[Sau10b] Alexis Saurin. Typing streams in the $\Lambda\mu$-calculus. *ACM Transactions on Computational Logic*, 11(4):28–61, 2010. 24

[SG09] Stéphane Glondu. Extraction certifiée dans Coq-en-Coq. In *JFLA 2009, Vingtièmes Journées Francophones des Langages Applicatifs, Saint Quentin sur Isère, France, January 31 - February 3, 2009. Proceedings*, 2009. 21

[SH10] Vincent Siles and Hugo Herbelin. Equality is typable in Semi-Full Pure Type Systems. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 21–30. IEEE Computer Society, 2010. 22

[SH12] Vincent Siles and Hugo Herbelin. Pure Type System conversion is always typable. *Journal of Functional Programming*, 22(2):153–180, 2012. 22

[Sil10] Vincent Siles. *Etude sur le typage de l'égalité dans les systèmes de types*. PhD thesis, École Polytechnique, 2010. 22

[SN08] Matthieu Sozeau and Oury Nicolas. First-Class Type Classes. *Lecture Notes in Computer Science*, 2008. 20

[Soz09] Matthieu Sozeau. A New Look at Generalized Rewriting in Type Theory. *Journal of Formalized Reasoning*, 2(1):41–62, 2009. 20

[Soz10a] Matthieu Sozeau. Elaborations in Type Theory. In *Dependently Typed Programming 2010 (DTP'10)*, 2010. Workshop affiliated to FLoC 2010, Edinburgh. 22

[Soz10b] Matthieu Sozeau. Equations: A Dependent Pattern-Matching Compiler. *Lecture Notes in Computer Science*, 6172, 2010. 22

[Soz12] Matthieu Sozeau. Coq avec Classes. In *Journées Françaises des Langages Applicatifs*, 2012. Carnac. 20, 21

[Spi11] Arnaud Spiwak. *Calculs vérifiés en algèbre homologique*. Ph.D. Thesis, École Polytechnique, 2011. 23

[Squ87] Craig Squier. Word problems and a homological finiteness condition for monoids. *Journal of Pure and Applied Algebra*, 49:201–217, 1987. 34, 35

[Tas09a] Christine Tasson. Algebraic totality, towards completeness. In *Typed Lambda Calculi and Applications, 9th International Conference, TLCA 2009, Brasilia, Brazil, July 1-3, 2009. Proceedings*, volume 5608 of *Lecture Notes in Computer Science*, pages 325–340. Springer-Verlag, 2009. 31, 32

[Tas09b] Christine Tasson. *Sémantiques et syntaxes vectorielles de la logique linéaire*. PhD thesis, Université Paris Diderot - Paris 7, 2009. 29

[Tre09] Ralf Treinen. Debianopolis. *Linux Magazin*, 2009. 40

[TV10] Christine Tasson and Lionel Vaux. Transport of finiteness structures and applications. Technical report, Preuves, Programmes et Systèmes, 2010. 29

[TZ08] Ralf Treinen and Stefano Zacchiroli. Solving package dependencies: from EDOS to Mancoosi. In *Proceedings of the 9th Annual Debian Conference, Mar del Plata, Argentina, August 3-18, 2008*, pages 18–43, 2008. 40

[TZ09] Ralf Treinen and Stefano Zacchiroli. Expressing advanced user preferences in component installation. In *Proceedings of the 1st International Workshop on Open Component Ecosystems*, pages 31–40. Association for Computing Machinery, 2009. 39, 40

[Vau] L. Vaux. A Non-Uniform Finitary Relational Semantics of System T. *Theoretical Informatics and Applications., FICS 2009, to appear*, page 116. 29

[Vau09] Lionel Vaux. The algebraic lambda calculus. *Mathematical Structures in Computer Science*, 19(5):1029–1059, 2009. 31

[VB93] K. Van Berkel. *Handshake Circuits: an Asynchronous Architecture for VLSI Design*, volume 5 of *Cambridge International Series on Parallel Computation*. Cambridge University Press, 1993. 37

[VDC11] Jérôme Vouillon and Roberto Di Cosmo. On software component co-installability. In *SIGSOFT/FSE'11 19th ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE-19) and ESEC'11: 13rd European Software Engineering Conference (ESEC-13), Szeged, Hungary, September 5-9, 2011*, pages 256–266. Association for Computing Machinery, 2011. 40

[VM04] Jerome Vouillon and Paul-André Melliès. Semantic types: a fresh look at the ideal model for types. In Neil D. Jones and Xavier Leroy, editors, *POPL*, pages 52–63. ACM, 2004. 21

[vO90] Vincent van Oostrom. Lambda calculus with patterns. Technical Report IR-228, Vrije Universiteit, Amsterdam, 1990. 17, 18

[VY10] Daniele Varacca and Nobuko Yoshida. Typed Event Structures and the linear pi-calculus. *Theoretical Computer Science*, 411(19):1949–1973, 2010. 38

[Zei10] Noam Zeilberger. Polarity and the Logic of Delimited Continuations. In *Proceedings of the 25th Annual IEEE Symposium on Logic in Computer Science, LICS 2010, 11-14 July 2010, Edinburgh, United Kingdom*, pages 219–227. IEEE Computer Society, 2010. 24