Extended Curriculum Vitae of Nicolas Tabareau

Scientific Career

Personal data

STATUS	Male, French citizen, Born in 1982. Married, 2 children.
HOST INSTITUTION:	Inria
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Education

2006-2009	PhD in Computer Science at Université Paris VII, France Date defended: December, 12th 2008 Title: Resource Modalities and Control in Tensor Logic Advisor: Paul-André Mélliès I received 2 prizes for my PhD thesis (see Prizes and Awards).
2005	Parisian Master of Research in Computer Science (Rank 1).
2002-2006	Schooling at the École Normale Supérieure (ENS) de Cachan, one of the most prestigious French Grandes Écoles.

Employment

2009-NOW	Research Scientist at Inria (CR1 since 2011).
April 2009	Ranked 1st at both CNRS and Inria competitive selections for permanent starting research position. I got a permanent position in the continuity of my PhD grant so I did no official Post-Doc.
SUMMER 2007	12 weeks internship at Microsoft Research (Cambridge, UK) under the direction of Nick Benton. Working on certification of compilers in Coq, this work leads to a publication at TLDI'09 (with 24 citations).
2005-2008	Frequent long stays (up-to 1 month) at MIT (Boston, USA) leading to 4 high impact journal publications with Professor J.J. Slotine. Each publication has more that 30 citations.

Research Activities

During the last five years as a permanent researcher inside the Ascola Inria team, my research have been focused on two main topics:

- Studying aspect oriented languages and extending them to distributed and functional setting. This part of my work involves a strong collaboration with a team in Chile (see the Inria associate team in the funding section). This part corresponds to publications [1,2,11,13,14,16,17] in my publication list.
- Improving the Coq proof assistant by extending the theory behind it, using recent mathematical concepts such as homotopy type theory. This is a recent redirection of my research activities which has already lead to two important publications [9,15] and has been the base of the CoqHoTT project, for which I got an ERC starting grant.

Prizes and Awards

2009	Rosemont/Demassieux PhD thesis award in applied and fundamental mathematics from La Chancellerie des Universités de Paris.
2009	Second Gilles Kahn PhD thesis award from the Société des Personnels Enseignants et Chercheurs en Informatique de France (SPECIF).

Software

DEVELOPING THE SETOID MODULE OF COQ 8.2. (AND LATER)	2007-2008, 3500 lines, 20%, http://coq.inria.fr/. Working on the implementation of the Setoid module of Coq using the type class system of Coq to enhance the efficiency of the module. This work has been done with Matthieu Sozeau, which is now the leader of the Coq development team.
FORCING FOR COQ	An extension of Coq that integrates forcing. It enables in particular to use general inductive types with Coq, https://github.com/mattam82/Forcing. The theoretical counterpart of this extension has been published at LICS'12.

Supervisions

SUPERVISION OF PHD STUDENTS:

- ***Guilhem Jaber*** (at 90%, with Alexandre Miquel, ENS Lyon, France) 2010-2014. Defended at Institut Henri Poincaré, Paris, the 11th of July 2014. Now: Post-Doc at Queen Mary University, London, UK.
- ***Ismael Figueroa*** (at 50%, with Éric Tanter, DCC, University of Chile) 2011-2014. Defended at Lugano the 22nd of April 2014. Now: assistant professor at Valparaiso University, Chile.
- ***Kevin Quirin*** (at 100%), starting in 2013.
- ***Simon Boulier*** (at 100%), starting in 2015.
- ***Gabriel Lewertowski*** (at 50%), starting in 2015.
- ***Gaëtan Gilbert*** (at 100%), starting in 2016.
- ***Ambroise Lafont*** (at 60%), starting in 2016.

SUPERVISION OF MASTER STUDENTS:

- ***Guilhem Jaber*** (at 100%), 2010, Master of Computer Science in Rennes.
- ***Ismael Figueroa*** (at 100%), 2011, Inria Master Internship.
- ***Kevin Quirin*** (at 100%), 2013, Master LMFI, Paris 7. (Logique, Mathématiques et Fondements de l'Informatique).
- ***Gustavo Soto Ridd*** (at 100%), 2014, Inria Master Internship.
- ***Simon Boulier*** (at 100%) and ***Gabriel Lewertowski (at 50%)***, 2015, MPRI, Paris.

Funding

I have been involved **in a great variety of research projects in different fields**: two europeans projects (BIBA, BACS) in cognitive science and two projects funded by the French National Research Agency (Inval, Choco) in theoretical computer science during the course of my PhD, each time as a participant. As a PhD student, I did not have access to the detailed budget of those projects.

I am currently involved in the French ANR project Recré as a participant (2012-2016, 631k€, http://recre.ens-lyon.fr/) The goal of this project is to get a better understanding of the proofs-as-programs correspondence for classical logic using the recent advances of the theory of classical realizability.

I am currently involved as a participant in the Inria associate team REAL with the Department of Computer Science in the University of Chile (2010-2016, http://real.gforge.inria.fr/, 10k€ per year. This funding is for travel exchange between France and Chile).

ERC Starting Grant: CoqHoTT

I have proposed an ERC starting grant CoqHoTT as principal investigator that has been accepted for funding (2015-2020, 1.5M€). CoqHoTT stands for Coq for Homotopy Type Theory. The goal of this project is to go further in the correspondence between proofs and programs which has allowed in the last 20 years the development of useful proof assistants, such as Coq (developed by Inria). This project starts from the recent discovery by field medal Vladimir Voevosdky, of the strong link between homotopy theory (which studies the notion of continuous deformation in topology) and type theory (which is at the heart of the Coq proof assistant). The main goal of the CoqHoTT project is to provide a new generation of proof assistants based on this fascinating connection.

Scientific Collaborations

I am collaborating with:

- Matthieu Sozeau, πr^2 Team, Inria, Paris, France.
- Tom and André Hirschowitz, University of Savoie and Nice, France.
- Éric Tanter, DCC, University of Chile. Chile

I have collaborated with:

- Jean-Jacques Slotine, MIT, Boston, USA.
- Nick Benton, Microsoft Research, Cambridge, UK.
- Alain Berthoz, LPPA, Collège de France, Paris, France.
- Benoît Girard, LIP6, University Pierre et Marie Curie, Paris, France.
- Deepak D'Souza, Indian Institute of Science, Bangalore, India.

Track Record

Publication Strategies

I have published 33 papers in leading international journals and selective peer reviewed conferences. Overall, I published 23 conference papers and 10 journal papers.

In order to achieve both a great impact and a fast publication, I focused on the most selective conferences in programming languages and theoretical computer science (with an acceptance rate around 20 %), which are considered as important as journal publications:

IEEE Symposium on Logic in Computer Science (LICS)	3 papers
ACM Conference on Aspect-Oriented Software Development (AOSD)	5 papers
International Colloquium on Automata, Languages and Programming (ICALP)	1 paper
International Conference on Functional Programming (ICFP)	1 paper

Google Scholar reports over 700 citations for N. Tabareau. As another measure of publications impact, the Harzing-index (or H-index) counts the number *h* of publications which are cited at least *h* times; after eliminating spurious duplicates, Google Scholar reports an H-index of 13 for N. Tabareau.

I have published in many different area of research: Type Theory, Semantics of Programming Languages, Aspect-Oriented Programming, Category Theory, Cognitive Science, Stochastic Control Theory, Automata theory.

Complete lists of publications

Note that in every publication below, I have been one of the main author, with much of the time an equal contribution among authors.

International Journals with selection committee

1. Lawvere-Tierney sheafification in Homotopy Type Theory. Quirin, K. and Tabareau N. Journal of Formalized Reasoning, 2016, 9 (2)
2. Effect Capabilities for Haskell: Taming Effect Interference in Monadic Programming. Figueroa I., Tabareau N., Tanter E. Science of Computer Programming, 119 : 3-30 (2016).
3. Effective Aspects: A Typed Monadic Embedding of Pointcuts and Advice. Figueroa I., Tabareau N., Tanter É. Transactions on Aspect-Oriented Software Development XI. LNCS Volume 8400, 2014, pp 145-192.
4. Execution Levels for Aspect-Oriented Programming Tanter É., Figueroa I., Tabareau N. Science of Computer Programming (SCP). Volume 80, Part B, 1 February 2014, Pages 311–342.
5. An explicit formula for the free exponential modality of linear logic (journal version). Melliès P.A., Tabareau N., Tasson C. Accepted for publication at Mathematical Structure of Computer Science
6. Resource modalities in tensor logic Melliès P.A., Tabareau N. Annals of Pure and Applied Logic Volume 161, Issue 5, February 2010, Pages 632-653.
7. How synchronization protects from noise Tabareau N, Slotine J-J, Pham Q-C, 2010 PLoS Computational Biology 6(1)
8. A Contraction Theory Approach to Stochastic Incremental Stability Pham Q.-C., Slotine J.-J. and Tabareau N. IEEE Transactions on Automatic Control, vol. 54, pp. 816-820, 2009

9. Where neuroscience and dynamic system theory meet autonomous robotics: A contracting basal ganglia model for action selection. Girard B.,Tabareau N., Pham Q.-C., Berthoz A., Slotine J.-J. (2008) Neural Networks 21: 628-641
10. Geometry of the superior colliculus mapping and efficient oculomotor computation. Tabareau N., Bennequin D., Slotine J.-J., Berthoz A., Girard B. (2007) Biological Cybernetics 97(4): 279-292.

International conferences with selection committee

11. An Effectful Way to Eliminate Addiction to Dependence. Pédrot, P.-M. and Tabareau N. LICS'17, Reykjavik, Iceland.
12. The next 700 syntactical models of type theory. Boulier S., Pédrot, P.-M. and Tabareau N. CPP'17, Paris, France.
13. Partial Type Equivalences for Verified Dependent Interoperability Dagand P.-E., Tabareau N., Tanter E. ICFP'16, Nara, Japan. (rank A)
14. The Definitional Side of the Forcing. Jaber G., Lewertowski G., Pédrot P.-M., Sozeau M., Tabareau N. LICS'16, NYC, USA. (rank A)
15. Gradual Certified Programming in Coq Tanter, É., Tabareau N. DLS'15, Pittsburgh, USA.
16. Kripke Open Bisimulation : A Marriage of Game Semantics and Operational Techniques. Jaber G., Tabareau N. APLAS'15, Pohang, Korea.
17. Wild ω-Categories for the Homotopy Hypothesis in Type Theory Hirschowitz A., Hirschowitz T., Tabareau N. TLCA 2015, Warsaw, Poland.
18. Universe Polymorphism in Coq. Sozeau M., Tabareau N. Interactive Theorem Proving (ITP) 2014, Vienna , Austria. (rank A)
19. Lazier Imperative Programming Douence R., Tabareau N. Accepted at PPDP'14, Canterbury, UK. (rank B)
20. Compositional Reasoning About Aspect Interference Figuero I., Schrijvers T., Tabareau N., Tanter É. Modularity'14 (formerly AOSD), Lugano, Switzerland (rank A)
21. Effect Capabilities in Haskell. Figueroa I., Tabareau N., Tanter E. Accepted at SBLP'14, Maceio, Brazil.
22. Aspectual Session Types Tabareau N., Südholt M., Tanter É. Modularity'14 (formerly AOSD), Lugano, Switzerland (rank A)
23. A Typed Monadic Embedding of Aspects Tabareau N., Figueroa I., Tanter É. AOSD'13 , Fukuoka, Japan. (rank A)
24. Extending Type Theory with Forcing. Jaber G., Sozeau M., Tabareau N. LICS 2012, Dubrovnik, Croatia. (rank A)
25. A monadic interpretation of execution levels and exceptions for AOP Tabareau N. AOSD'12 , Postdam, Germany. (rank A)
26. A theory of distributed aspects Tabareau N. Proceedings of the 9th International Conference on Aspect-Oriented Software Development (AOSD'10). (rank A)
27. An explicit formula for the free exponential modality of linear logic. Melliès P.A., Tabareau N., Tasson C. Accepted at the 36th International Colloquium on Automata, Languages and Programming (ICALP 2009). (rank A)
28. Resource modalities in game semantics Melliès P.A., Tabareau N. Proceedings of the 22nd Annual IEEE Symposium on Logic in Computer Science, pages 389--398, 2007, IEEE Computer Society Washington, DC, USA. (rank A)

29. Compiling Functional Types to Relational Specifications for Low Level Imperative Code Benton N., Tabareau N. Proceedings of the Fourth ACM SIGPLAN Workshop on Types in Language Design and Implementation (TLDI '09). (rank C)
30. An algebraic account of references in game semantics Melliès P.A., Tabareau N. Accepted at the 25th Conference on the Mathematical Foundations of Programming Semantics University (MFPS 25) of Oxford, UK April 3 - 7, 2009. (rank C)
31. Free models of T-algebraic theories computed as Kan extensions. Melliès, P.-A. and Tabareau N. In International Category Theory Conference, Calais, 2008.
32. Implementation of a neurophysiologic model of saccadic movements on an anthropomorphic robotic head. Manfredi, L., Maini, E., Laschi, C., Dario, P., Girard, B., Tabareau, N. and Berthoz, A. (2006). In IEEE-RAS Int. Conf. on Humanoid Robots, pages 438-443.
33. On timed automata with input-determined guards D'Souza D. and Tabareau N. Proceedings FORMATS-FTRTFT 2004, LNCS 3253, 2004.

International Workshops with selection committee

34. Lost in extraction, recovered, Tanter É. and Tabareau N., ML Workshop, September 2015, Vancouver, Canada.
35. Internalization of the Groupoid Interpretation of Type Theory. Sozeau M., Tabareau N. TYPES 2014, Paris, France
36. Taming aspects with membranes Tanter É., Tabareau N. and Douence R. Short version at FOAL'12 , Potsdam.(rank C)
37. A Practical Monadic Aspect Weaver Figueroa I., Tanter É. and Tabareau N. FOAL'12 , Potsdam. (rank C)
38. The Journey of Biorthogonal Logical Relations to the Realm of Assembly Code Jaber G., Tabareau N. LOLA 2011, Toronto. A satellite workshop of LICS 2011.
39. Aspect Oriented Programming: a language for 2-categories Tabareau N. Foundations of Aspect-Oriented Languages (FOAL 2011). (rank C)
40. Free models of T-algebraic theories computed as Kan extensions. Melliès P.A., Tabareau N. International Category Theory Conference, Calais 2008.
41. Contracting model of the basal ganglia. Girard B., Tabareau N., Slotine J.-J. and Berthoz A. In Bryson, J., Prescott, T. and Seth, A. (Eds) Modelling Natural Action Selection: Proceedings of an International Workshop, pages 69-76. AISB Press, Brighton, UK.
42. Selective amplification using a contracting model of the basal ganglia. Girard, B., Tabareau, N., Berthoz, A. and Slotine, J.-J. (2006). In Alexandre, F., Boniface, Y., Bougrain, L., Girau, B. and Rougier, N. (Eds) NeuroComp 2006, pages 30-33.

Teaching

Here is the details list of my teaching (in French).

Bien que je sois chargé de recherche depuis la fin de ma thèse, j'ai toujours prêté une grande attention à l'enseignement. J'ai donc fait en sorte de donner des cours chaque année au sein du département informatique de l'école des mines de Nantes depuis mon arrivée fin 2009. Cela me permet de garder contact avec des étudiants plus jeunes que les étudiants de M2 que j'accueille en stage et ainsi de suivre l'évolution du corps étudiant. Cela me permet aussi d'avoir un meilleur recul sur mon activité de recherche en abordant autrement la pédagogie qu'à travers des publications et des présentations scientifiques ou l'encadrement de thésards.

- **Oraux concours ENS en informatique** (2014 et 2015)

J'ai été examinateur pour l'oral du concours d'entrée aux Écoles Normales Supérieures (ENS) pour l'épreuve d'informatique théorique en 2014 et coordinateur en 2015 pour aider les trois nouveaux examinateurs.

- **Initiation à la programmation fonctionnelle avec Haskell** (TD, 2012-2016: 60h éq TD, Ing 2)

Responsable: Rémi Douence, Mines Nantes.
Présenter un langage en train de basculer de la recherche vers industries en offrant des concepts qui se retrouvent en position d'ingénieur ou de décideur. Base de la programmation fonctionnel et notion d'évaluation paresseuse.

- **Introduction aux bases de données** (TD, 2010-2012: 70h éq TD,Ing 1)

Responsable: Xavier Lorca, Mines Nantes.
Présentation de SQL et des algèbres relationnelles basé sur le libre "Modern Database Management". La pédagogie du cours est basée sur l'approche APP (Apprentissage Par Projet), dans les deux principes sont :

1. Apprendre à apprendre, ce qui correspond à apprendre en contexte professionnel
2. Apprendre en groupe mais acquérir une compétence individuelle

- **Projet de programmation en Java** (TP, 2008-2009, 52h éq. TD, L2)

Responsable du cours : Mihaela Sighireanu, Paris 7.
Réalisation d'un projet de programmation mettant en application les concepts acquis au cours des en- seignements précédents et s'appuyant sur l'approche objets en particulier en ce qui concerne l'interface graphique.
Sujet du projet : Résolution d'un problème de type Picross (ou nonogram) sur des grilles de taille variable
Objectifs :
– Appliquer les connaissances acquises durant la première année en programmation Java, structures de données et algorithmique.
– Maîtriser le backtracking (explicite ou en récursion).
– Apprendre et utiliser l'héritage, le paquetage, les exceptions en Java.
– Apprendre à développer et debugger des applications Java sous Eclipse.

- **Développement en C** (TP, 2007-2008, 52h éq. TD, L2)

Responsable du cours : Wiesław Zielonka, Paris 7.
C'est le premier cours de C dans la scolarité des étudiants. L'objectif globale est de leur apprendre les rudiments du C (surtout le concept de pointeurs) et de finaliser cette apprentissage avec un projet d'envergure moyenne.

Sujet du projet : Réalisation d'un démineur (sans interface graphique).
Objectifs :
– Apprentissage du langage C, du développement modulaire (fichiers objets,compilations séparées, construction de bibliothèques) et d'un certain nombre d'outils de développement de base (configurateur make et débogueur gdb).
– S'agissant d'un premier cours sur le langage C, l'accent est tout particulièrement mis sur les pointeurs.
– D'un point de vue algorithmique, on réalise ici des implémentations de types de données classiques (pile, file, arbre) et on présentera quelques algorithmes numériques.
Contenu de l'enseignement :
– Notion d'expression en langage C.
– Structures de contrôle.
– Tableaux.
– Types : énumérations, structures et unions, définition de nouveaux types.
– Fonctions et passage des paramètres.
– Pointeurs et arithmétique sur les pointeurs ; tableaux et pointeurs.
– Bibliothèques standard : entrées-sorties, allocation mémoire, ...
– Programmation modulaire : compilations séparées, fichiers objets, édition de liens. – Outils de développement : mise au point (gdb), configuration (make).

• **Initiation à l'informatique** (TP, 2006-2009, 80h éq TD, L1)
Responsable du cours : Jean-Marie Rifflet, Paris 7.
Ce cours est le premier cours d'informatique des étudiants. Le but est de leur faire appréhender des concepts fondamentaux en informatique (conditionnelles, boucles, fonctions, . . .) à travers des TPs en Java.
Objectifs :
– introduction des concepts généraux des ordinateurs et de la programmation ;
– sur un plan pratique, chaque étudiant codera effectivement en Java, compilera et exécutera dans un environnement de type Unix un maximum d'algorithmes simples.
Contenu de l'enseignement :
– Notion d'algorithmes et leur expression en langue naturelle
– Variables et identificateurs, la disjonction nom/valeur, les expressions, le concept de type
– L'affectation : opération à effet de bord sur la mémoire, brique de base de la programmation impérative
– Le cas particulier des variables et expressions booléennes : les opérateurs booléens unaires et binaires, table de vérité d'une expression booléenne
– La sélection simple (if .... then .... else) et les aiguillages (switch)
– Les itérations simples : l'itération bornée (boucle for ...) et l'itération non bornée (while ... et do ... while)
– Les tableaux : définition de variables de type tableau et introduction du concept de référence et de l'opérateur new
– Tableaux à plusieurs dimensions et imbrication de boucles
– Le concept de fonctions : le mécanisme d'appel (transmission de valeurs pour les valeurs de type primitifs ou de références pour les paramètres d'un autre type) et de retour

• **Informatique** (PC*, TD/TP)
Il s'agissait de préparer des élèves de physique-chimie (PC*) à l'épreuve d'informatique des concours d'entrée aux grandes écoles. Le programme était constitué essentiellement de l'étude du langage Maple et de rudiments de programmation.

Collective Duties

SELECTION COMMITTEE	- member of the Selection Committee 2014 for an assistant professor position at IUT of Nantes (MCF 0832) - member of the Selection Committee 2012 for an assistant professor position at university of Nantes (MCF 1452) - member of the Selection Committee 2011 for an assistant professor position at university of Nantes (MCF 0487) - member of the Selection Committee 2011 for an assistant professor position at ENS Cachan Antenne de Bretagne (MCF 0298)
EXTERNAL REVIEWER	I served as an external reviewer for over 20 international journals and international conferences including: - ACM Symposium on Principles Of Programming Languages (POPL) - IEEE Symposium on Logic in Computer Science (LICS) - International Colloquium on Automata, Languages and Programming (ICALP) - ACM International Conference on Functional Programming (ICFP) - ACM International Conference on Modularity (formerly AOSD) - Logical Methods in Computer Science (LMCS) - Annals of Pure and Applied Logic (APAL)
ORGANISING THE FÊTE DE LA SCIENCE IN 2006 AND 2007	I have organised the French science day in 2006 and 2007 for the computer science department of University Paris-Diderot.
INVITED SPEAKER	Recent developments in Type Theory, Mathematical Structures of Computation - Lyon 2014 (event related to IHP thematic semester on Semantics of Proofs and Certified Mathematics)
WORKSHOP ORGANIZATION	I have co-organized the HoTT/UF workshop (satellite to the FSCD conference) with Peter Lefanu Lumsdaine in 2015 and 2016. http://hott-uf.gforge.inria.fr/
PC MEMBER	I have been a member of program committees of - Games for Logic and Programming Languages, GALOP'09, part of ETAPS 2009 - Low Level Languages, LOLA'11, satellite workshop of LICS - Journées Francophones des Langages applicatifs, JFLA'13 - Foundations of Aspect Languages, FOAL'13 - Foundations of Aspect Languages, FOAL'14 - TYPES'16 - External PC Member POPL'17 - FSCD'18
PHD DEFENSES	- Jury member of Regis Spadotti's PhD: "*A Mechanized Theory of Regular Trees in Dependent Type Theory*", Toulouse, Mai 2016. - Jury member of Bassel Mannaa's PhD to be held in Göteborg,