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**Citizenship:** U.S.A.

**Education**

**University of Mons-Hainaut, Mons, Belgium** Postdoctoral Research with Maurice Boffa, 1990-91.

**Cornell University, Ithaca, N.Y.** Postdoctoral Research with Anil Nerode, 1989-90

**State University of New York at Binghamton** Ph.D. in Mathematics (1990)

**Advisor:** Louis F. McAuley

**Dissertation:** Systems of Combinatory Logic Related to Quine's "New Foundations"

**State University of New York at Binghamton** M. A. in Mathematics (1985)

**Advisor:** Prabir Roy

**Thesis:** The Universal Separable Metric Space of Urysohn

**Employment History**

**Boise State University, Boise, Idaho** Associate Professor of Mathematics, 1997-

**Hughes Hall, Cambridge, UK** Visiting Scholar, fall 1998 (sabbatical appointment).

**Boise State University, Boise, Idaho** Assistant Professor of Mathematics, 1991-7

**Cornell University, Ithaca, N.Y.** Teaching Associate, Department of Mathematics 1989-90

**State University of New York at Binghamton** Adjunct Lecturer, Teaching Assistant, Department of Mathematics 1983-89

**Research Grants**

1. "EFTTP: an interactive equational theorem prover and programming language", Army Research Office proposal no. P-33580-MA-DPS (funded by grant no. DAAH04-93-G-0247, starting date July 1, 1994)
2. An REU (Research Experience for Undergraduates) award through NSF EPSCoR during summer 1995, supporting a BSU computer science undergraduate who implemented an important subset of the prover in C++.
3. (with Jim Alves-Foss of the University of Idaho): "Automated Reasoning using the Mark2 Theorem Prover", Army Research Office proposal no. P-36291-MA-DPS (funded by grant no. DAAH04-96-1-0397, starting date August 1, 1996)
4. "The Mark2 Theorem Prover", Army Research Office proposal number P-37735-MA-DPS (funded by grant no. DAAG55-98-1-0263, starting date May 15, 1998).

**List of Publications**

1. "There is a Continuum which is Connected by Uniformly Short Paths but not Uniformly Path Connected". *Topology and Its Applications*, 42 (1991) pp. 17-23.
2. "The Universal Separable Metric Space of Urysohn and Isometric Embeddings Thereof in Banach Spaces", *Fundamenta Mathematicae* 140 (1992), pp. 199-223.
3. "Systems of Combinatory Logic Related to Quine's 'New Foundations'", *Annals of Pure and Applied Logic*, 53 (1991), pp. 103-33.
4. "The Axiom of Anti-Foundation in Jensen's 'New Foundations with Ur-Elements'", *Bulletin de la Societe Mathematique de la Belgique*, series B, 43 (1991), no. 2, pp. 167-79.
5. "Modelling Fragments of Quine's 'New Foundations'", *Cahiers du Centre de Logique*, no. 7, Institut Supérieur de Philosophie, Université Catholique de Louvain, Louvain-la-Neuve, 1992, pp. 97-112.
6. "Systems of combinatory logic related to predicative and 'mildly impredicative' fragments of Quine's 'New Foundations'". *Annals of Pure and Applied Logic* 59 (1993), 45-53.
7. The set theoretical program of Quine succeeded (but nobody noticed), *Modern Logic*, vol. 4 (1994), pp. 1-47.
8. The equivalence of *NF*-style set theories with "tangled" type theories; the construction of $\omega$-models of predicative *NF* (and more), *Journal of Symbolic Logic*, vol. 60, no. 1 (1995), pp. 178-190.
9. "Untyped $\lambda$-calculus with relative typing", in Dezani and Plotkin, eds., *Typed Lambda-Calculi and Applications*, the proceedings of TLCA '95, Springer, 1995.

**10.** "Disguising recursively chained rewrite rules as equational theorems", in Hsiang, ed., *Rewriting Techniques and Applications*, the proceedings of RTA '95, Springer, 1995.

**11.** "Brief observations on software architecture and an examination of the type system of Spec", in the proceedings of the Monterey Workshop on software architecture at the Naval Postgraduate School, 1995.

**12.** *Elementary Set Theory with a Universal Set*, volume 10 of the Cahiers du Centre de logique, Academia, Louvain-la-Neuve (Belgium), 1998. 241 pages. ISBN 2-87209-488-1. This book is an elementary set theory text at the advanced undergraduate or graduate level using *NFU*.

**13.** "Subsystems of Quine's "New Foundations" with Predicativity Restrictions", *Notre Dame Journal of Formal Logic*, vol. 40, no. 2 (spring 1999), pp. 183-196.

**14.** "A strong and mechanizable grand logic", in *Theorem Proving in Higher Order Logics: 13th International Conference, TPHOLs 2000", Lecture Notes in Computer Science*, vol. 1869, Springer-Verlag, 2000, pp. 283-300. (refereed conference proceedings).

**15.** "Strong axioms of infinity in *NFU*", *Journal of Symbolic Logic*, vol. 66, no. 1 (March 2001), pp. 87-116. ("Errata in 'Strong Axioms of Infinity in *NFU*' ", *JSL*, vol. 66, no. 4 (December 2001), p. 1974, reports some errata and provides corrections).

**16.** (with Jim Alves-Foss) "The Watson theorem prover", *Journal of Automated Reasoning*, vol. 26 (2001), no. 4, pp. 357-408.

**17.** "Foundations of mathematics in polymorphic type theory", *Topoi*, vol. 20 (2001), pp. 29-52.

**18.** "Tarski's Theorem and *NFU*", in C. Anthony Anderson and M Zeleny (eds.), *Logic, Meaning and Computation*, Kluwer, 2001, pp. 469–478.

**19.** "Forcing in *NFU* and *NF*", in M. Crabbé, C. Michaux and F. Point, eds., *A tribute to Maurice Boffa*, Belgian Mathematical Society, 2002. (refereed proceedings of a conference in honor of the 60th birthday of Maurice Boffa).

**20.** "Polymorphic type-checking for the ramified theory of types of *Principia Mathematica*", in Fairouz Kamareddine, ed., *Thirty-five Years of Automating Mathematics*, Kluwer, 2003, pp. 173-215.

**21.** "Paradoxes in double extension set theories", *Studia Logica*, vol. 77 (2004), pp. 41-57.

**22.** "The structure of the ordinals and the interpretation of *ZF* in double extension set theory", *Studia Logica*, vol. 79 (2005), pp. 357-372.

**23.** "Alternative Axiomatic Set Theories", article in the Stanford Encyclopedia of Philosophy (online) at the URL `http://plato.stanford.edu`. The exact URL for the article is `http://plato.stanford.edu/entries/settheory-alternative/`. This article was refereed and accepted by the editors for inclusion in 2006. It was reviewed and slightly revised in 2010.

**24.** "Symmetry as a criterion for comprehension motivating Quine's "New Foundations", *Studia Logica*, vol. 88, no. 2 (March 2008).

**25.** "The Urysohn Space Embeds in Banach Spaces in Just One Way", *Topology and its Applications* Volume 155, Issue 14, 15 August 2008, Pages 1479-1482 Special Issue: Workshop on the Urysohn space. I was invited to give a talk on my work on the Urysohn space at this workshop, which was held in May 2006 at the University of the Negev in Beersheba. This is not a new research paper, but an exposition of my older results in this area.

**26.** "Permutation methods in *NF* and *NFU*", with Thomas Forster, in *Proceedings of the 70th anniversary NF meeting in Cambridge*, *Cahiers du Centre de Logique* no. 16, Academia-Bruylant, Louvain-la-Neuve, 2009.

**27.** "There is a Forster model of simple type theory" in *Proceedings of the 70th anniversary NF meeting in Cambridge*, *Cahiers du Centre de Logique* no. 16, Academia-Bruylant, Louvain-la-Neuve, 2009.

**28.** A chapter entitled "Alternative Set Theories" (in collaboration with Thomas Forster and Thierry Libert) for volume 6 (*Sets in the Twentieth Century*) of the Handbook of the History of Logic, to be published in 11 volumes by Elsevier/North-Holland. It is edited by Dov Gabbay and John Woods. Akihiro Kanamori is co-editor of volume 6. To appear.

**29.** "The usual model construction for *NFU* preserves information", submitted to the Notre Dame Journal of Formal Logic and accepted subject to revisions (submitted and under review).

**Work in Progress**

1. "The Axiom Scheme of Acyclic Comprehension", with Zuhair Al-Johar and Nathan Bowler, submitted. This paper describes a rather unexpected reformulation of the stratification criterion for sethood.

2. "Symmetry motivates and new consistent fragment of *NF* and an extension of *NF* with semantic motivation", to be submitted shortly. This paper describes a symmetric theory of sets and classes which entails *NF* and is much simpler than the one in my earlier published paper on symmetric comprehension and *NF* (which also needed superclasses). What is described is actually a sequence of theories indexed by a natural number parameter $k$. The theory with parameter 0 is easily shown to be consistent. The theory with parameter 1 is a new fragment of *NF*, slightly extending $NF_3$ + Infinity and also extending the new consistent fragment NFSI discovered recently by Sergei Tupailo (which is also entailed by the theory with parameter 0). A model of this theory is constructed and shown to be a model in the paper. The theories with parameters 2 or higher entail *NF*,

though for a truly satisfactory treatment one wants the parameter to be 4 or greater. This gives a reasonably simple formulation of a theory extending New Foundations whose motivation is not a syntactical trick. I presented this paper at a workshop at the University of Cambridge in June 2010.

3. I am planning to write a paper on the implementation of the function concept in three types (where an ordered pair is not available), extending old work of the Belgian mathematician Henrard, possibly in collaboration with a Belgian, Laurent Fourny. I gave a talk in Cambridge on this work in 2005, and again at the BEST conference in Boise (correcting some errors in the 2005 presentation) in 2009. The current projected title is "Almost defining functions (and defining cardinality) in monadic third order logic".

4. I am planning to write a paper and have been writing testing software on an efficient algorithm for bracket abstraction (implementation of lambda calculus using combinators) which I developed in 2005. I have already communicated with Henk Barendregt, an expert in this field, who seems to think that my approach has some interest.

5. I have developed a sequent calculus prover implementing *NFU* (following a formal presentation by Marcel Crabbé). I used this prover extensively (the logical rather than the set theoretical aspects) in teaching Math 502, the graduate Logic and Set Theory course, and in our second logic and discrete math course. I used it to a lesser extent to reinforce the initial review of formal proof in our introductory real analysis course, and introduced it briefly in our first logic and discrete math course. I directed a graduate student who wrote a Master's thesis about proof development in elementary real analysis using the prover. During winter break 2006-7, completely reimplemented this system. I submitted an unsuccessful grant proposal to support research into the use of this system to teach logic. I may repeat this exercise but in any case I continue to use this software as a tool in a range of courses. My experience suggests that the prover does help students to understand formal proof, both in propositional logic and in the logic of quantifiers. The built in set theory has had some applications for some students, but the fact that it is *NFU* has never actually been important to a student user. I have a project in mind to develop a formal proof of Specker's theorem that Choice is false in *NF* under the prover.

6. I am planning to write a paper and have been writing testing software on an efficient algorithm for bracket abstraction (implementation of lambda calculus using combinators) which I developed in 2005. I have already communicated with Henk Barendregt, an expert in this field, who seems to think that my approach has some interest.

7. An expanded version of "Forcing in *NFU* and *NF*", listed above as appearing in a Festschrift in honor of Maurice Boffa, should at some point be submitted to a refereed journal.

8. I project a revision of my book *Elementary set theory with a universal set*: currently it is out of print but I have permission from the publishers to post it on the web. The web version contains various revisions and I am soliciting advice from others about needed corrections. I do not intend to extend this book, but write a second monograph on a higher level; see the next item.

9. A book on the consistent subsystems of *NF*: my current plan is to write this as an extension of the existing notes I used to teach foundations of mathematics to Boise State graduate students starting with type theory rather than set theory.

10. The paper on the ramified theory of types of *Principia* is accompanied by software implementing a complete polymorphic type checker for the ramified theory of types. I have considered writing a proposal to implement some significant part of *Principia* using this system. I was invited in November 2010 to speak at a workshop commemorating the 100th anniversary of the publication of *Principia Mathematica*, due to my work in this area, and gave a presentation whose slides should soon appear on my web page.