

# Mark Batty

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## Education

Ph.D. Computer Science, University of Cambridge, expected to finish early 2014.  
Diploma in Computer Science, Passed with Distinction, University of Cambridge, 2007.  
MMath Masters in Mathematics, 2:1, University of Nottingham, 2005.

## Employment

Research Associate, Fraser Research, Princeton, NJ, USA, October 2007 – October 2008.  
I took a clean-slate, global-scale network design from the concept stage to a working prototype.

## Research Vision

Computer systems are an impressive feat of human coordination. The constituent parts are complex, but are made to work together by establishing interfaces with prose specifications. Modern multi-core systems introduce additional subtlety by exposing relaxed-memory concurrency, whose careful use is essential to performance, yet fiendishly difficult to get right. I develop rigorous mathematical specifications, testing tools, and verification techniques for real-world concurrent systems, focusing on pervasive interfaces: the language specifications of C, C++ and, more recently, OpenCL. My goal is to offer an alternative to the prevailing culture in computer system engineering – replacing ambiguous, incomplete, and incorrect prose specifications with mathematics, enabling testing directly against specifications, and proving highly subtle parts of the system correct.

## Research

### *Refereed Conference Papers*

*Papers where I was the lead author are marked with ★.*

★ Library Abstraction for C/C++ Concurrency. M. Batty, M. Dodds, A. Gotsman. In Proc. 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL), 2013. *14 pages.*

Synchronising C/C++ and POWER. S. Sarkar, K. Memarian, S. Owens, M. Batty, P. Sewell, L. Marangot, J. Alglave, and D. Williams. In Proc. 33rd ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI), 2012. *10 pages.*

Clarifying and Compiling C/C++ Concurrency: from C++0x to POWER. M. Batty, K. Memarian, S. Owens, S. Sarkar, and P. Sewell. In Proc. 39th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL), 2012. *12 pages.*

★ Mathematizing C++ Concurrency. M. Batty, S. Owens, S. Sarkar, P. Sewell, and T. Weber. In Proc. 38th ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages (POPL), 2011. *12 pages.*

Nitpicking C++ Concurrency. J. C. Blanchette, T. Weber, M. Batty, S. Owens, and S. Sarkar. In Proc. 13th International ACM SIGPLAN Symposium on Principles and Practice of Declarative Programming (PPDP), 2011. *11 pages.*

## Workshop Papers

Relaxed Memory Models Must Be Rigorous. F. Zappa Nardelli, P. Sewell, J. Ševčík, S. Sarkar, S. Owens, L. Maranget, M. Batty, and J. Alglave. In Proc. Exploiting Concurrency Efficiently and Correctly – (EC)<sup>2</sup>, 2009.

## C++ Standard Committee Papers

N3196: Omnibus Memory Model and Atomics Paper. P. McKenney, M. Batty, C. Nelson, H. Boehm, A. Williams, S. Owens, S. Sarkar, P. Sewell, T. Weber, M.Wong, L. Crowl, B. Kosnik. November 11, 2010.

N3132: Mathematizing C++ Concurrency: The Post-Rapperswil Model. M. Batty, S. Owens, S. Sarkar, P. Sewell, T. Weber. August 23, 2010.

N3125: Omnibus Memory Model and Atomics Paper. P. McKenney, M. Batty, C. Nelson, H. Boehm, A. Williams, S. Owens, S. Sarkar, P. Sewell, T. Weber, M.Wong, L. Crowl. August 22, 2010.

N3136: Coherence Requirements Detailed. M.Wong, B. Kosnik, M. Batty. August 20, 2010.

N3074: Updates to C++ Memory Model Based on Formalization. P. McKenney, M. Batty, C. Nelson, N.M. Maclaren, H. Boehm, A. Williams, P. Dimov, L. Crowl. March 11, 2010.

N3045: Updates to C++ Memory Model Based on Formalization. P. McKenney, M. Batty, C. Nelson, N.M. Maclaren, H. Boehm, A. Williams, P. Dimov, L. Crowl. February 15, 2010.

N3057: Explicit Initializers for Atomics. P. McKenney, M. Batty, C. Nelson, N.M. Maclaren, H. Boehm, A. Williams, P. Dimov, L. Crowl. March 11, 2009.

N2955: Comments on the C++ Memory Model Following a Partial Formalization Attempt. M. Batty. September 28, 2009.

## C Standard Committee Papers

Defect Reports: #401, #402, #403, #404, #405, #406, #407, #408. M. Batty. February, 2012.

N1584: Some Discrepancies with the C++11 Memory Model. M. Batty. October 14, 2011.

## Grants

*Coauthor of* REMS: Rigorous Engineering for Mainstream Systems, P. Sewell et. al., *EPSRC Programme Grant*, Funded, 2012.

## Conference and Seminar Presentations

Programming Languages and Systems Group Seminar, University of Kent, Canterbury, November 2013.

Henzinger Group Seminar, IST, Vienna, October, 2013.

ISO IEC JTC1/SC22/WG5 – The Fortran Standards Committee, Delft, The Netherlands, June 2013

Workshop on Verified Concurrent Programs, Microsoft Research, Cambridge, June, 2013.

Coverity R&D Seminar, San Francisco, April 2013

40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL), Rome, January, 2013.

Programming, Logic, and Semantics group Seminar, IT University of Copenhagen, November, 2012.

Oxford Concurrency Workshop, Department of Computer Science, University of Oxford, July, 2012.

Yak, Cambridge University, December, 2011.

Departmental seminar, Technische Universität Dresden (TUD), February, 2011.

38th ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages (POPL), Austin USA, January, 2011.

Multi-Core Memory Models and Concurrency Theory, Schloss Dagstuhl - Leibniz Center for Informatics, January, 2011.

Institut National de Recherche en Informatique et en Automatique (INRIA), Paris Rocquencourt, November, 2010.

## Teaching

### *External*

Semantics and Tools for Low-level Concurrent Programming, ENS Lyon, Winter School, January 2013.

Advanced Topics in Programming, Harvard University, Guest Lecture, November 2011.

### *University of Cambridge*

Multicore Semantics and Programming (MPhil ACS), Lecturer on C/C++11, 2011, 2012, 2013.

Multicore Programming (MPhil ACS), Lecturer on C/C++11, 2010.

Semantics of Programming Languages (Undergraduate), Supervisions, 2009, 2010, 2011.

Further Java (Undergraduate), Demonstrations, 2010, 2011.

Foundations of Computer Science (Undergraduate), Demonstrations, 2010, 2011.

Programming in Java (Undergraduate), Demonstrations, 2009, 2010.

## Advising

Reinoud Elhorst (MPhil ACS) Lowering C11 Atomics for ARM in LLVM, 2013.

Simon Beaumont (Part II undergraduate) Efficient Parallel Route-Planning Methods, 2011-2012.

Danish Zeb (MPhil ACS) Relaxed Memory Models, Isabelle/HOL and SMT, 2010.

Robin Message (intern, Fraser Research) 2008.

Simon Hay (intern, Fraser Research) 2008.

## Professional Activities

*Reviewer for* ACM SIGPLAN Object-Oriented Programming, Systems, Languages & Applications (OOPSLA), 2013.

*Reviewer for* 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL), 2013.

*Reviewer for* 23rd International Conference on Computer Aided Verification (CAV), 2011.

*Invited member of the* BSI C++ Panel, joined November 2011.

*Adviser to* ISO IEC JTC1/SC22/WG14 – The C Standards Committee, attending meetings at:  
Washington DC, USA, October 2011.

*Adviser to* ISO IEC JTC1/SC22/WG21 – The C++ Standards Committee, attending meetings at:  
Madrid, Spain, March 2011.

Batavia, IL, USA, November 2010.

Rapperswil, Switzerland, August 2010.