Paul Shafer

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Bonifantenstraat 19
B-9000 Ghent
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Nationality
USA

Current position
FWO Pegasus Marie Curie post-doctoral researcher in the Ghent University Department of Mathematics in Ghent, Belgium.

Education
Cornell University – Ithaca, NY
PhD in mathematics. August 2011. Advisor: Richard A. Shore. Thesis title: *On the complexity of mathematical problems: Medvedev degrees and reverse mathematics.*

Cornell University – Ithaca, NY
MS in computer science. August 2010.

Cornell University – Ithaca, NY
BS in computer science with honors plus minor in applied mathematics. May 2005. *summa cum laude*. Recipient of Cornell University Computer Science Prize for Academic Excellence and Leadership.

Research interests
Mathematical logic: computability theory, degrees of unsolvability, reverse mathematics.

Papers

17. Paul Shafer. *Honest elementary degrees and degrees of relative provability without the cupping property.* preprint.

16. Paul Shafer. *The reverse mathematics of the Tietze extension theorem.* to appear in Proceedings of the American Mathematical Society.

15. Emanuele Frittaion, Matthew Hendtlass, Alberto Marcone, Paul Shafer, and Jeroen Van der Meeren. *Reverse mathematics, well-quasi-orders, and Noetherian spaces.* Archive for Mathematical Logic (2016). 1–29.

14. Laurent Bienvenu, Ludovic Patey, and Paul Shafer. *On the logical strengths of partial solutions to mathematical problems.* preprint.

13. Rupert Hölzl and Paul Shafer. *Universality, optimality, and randomness deficiency.* Annals of Pure and Applied Logic **166** (2015). 1049–1069.

12. François G. Dorais, Jeffry L. Hirst, and Paul Shafer. *Comparing the strength of diagonally non-recursive functions in the absence of Σ^0_2 induction.* Journal of Symbolic Logic **80** (2015). 1211–1235.

11. Laurent Bienvenu, Rupert Hölzl, Christopher P. Porter, and Paul Shafer. *Randomness and semi-measures.* to appear in Notre Dame Journal of Formal Logic.

10. François G. Dorais, Damir D. Dzhafarov, Jeffry L. Hirst, Joseph R. Mileti, and Paul Shafer. *On uniform relationships between combinatorial problems.* Transactions of the American Mathematical Society **368** (2016). 1321–1359

9. François G. Dorais, Jeffry L. Hirst, and Paul Shafer. *Reverse mathematics and algebraic field extensions.* Computability **4** (2013). no. 2, 75–92.

8. François G. Dorias, Jeffry L. Hirst, and Paul Shafer. *Reverse mathematics, trichotomy, and dichotomy.* Journal of Logic and Analysis **4** (2012). 1–14.

7. Paul Shafer. *Menger's theorem in Π^0_1-CA_0.* Archive for Mathematical Logic **51** (2012). no. 3-4. 407–423.

6. Paul Shafer. *Coding true arithmetic in the Medvedev degrees of Π^0_1 classes.* Annals of Pure and Applied Logic **163** (2012). 321–337.

5. Paul Shafer. *Coding true arithmetic in the Medvedev and Muchnik degrees.* Journal of Symbolic Logic **76** (2011). 267–288.

4. Paul Shafer. *Characterizing the join-irreducible Medvedev degrees.* Notre Dame Journal of Formal Logic **52** (2011). 21–38.

3. Eric O. Williams, Yuanyuan Xiao, Heather M. Sickles, Paul Shafer, Golan Yona, Jean YH Yang, and David M. Lin. *Novel subdomains of the mouse olfactory bulb defined by molecular heterogeneity in the nascent external plexiform and glomerular layers.* BMC Developmental Biology **7**:48 (2007).

2. Paul Shafer, David M. Lin, and Golan Yona. *EST2Prot: Mapping EST sequences to proteins.* BMC Genomics **7**:41 (2006).

1. Paul Shafer, Timothy Isganitis, and Golan Yona. *Hubs of knowledge: using the functional link structure of Biozon to mine for biologically significant entities.* BMC Bioinformatics **7**:71 (2006).

Service
Member of the program committee of Computability in Europe 2016
Organizer of Workshop on Computability Theory 2016
Referee for Annals of Pure and Applied Logic
Referee for Archive for Mathematical Logic
Referee for Bulletin of Symbolic Logic
Referee for Journal of Symbolic Logic
Referee for Lecture Notes in Computer Science
Referee for Logical Methods in Computer Science
Referee for Transactions of the American Mathematical Society
Referee for STACS
Referee for Theory of Computing Systems

Awards
Fonds Wetenschappelijk Onderzoek travel grant to attend the New Challenges in Reverse Mathematics workshop in January 2016 in Singapore.

Fonds Wetenschappelijk Onderzoek travel grant to attend the Association for Symbolic Logic North American Annual Meeting 2014 in Boulder, CO.

Fonds Wetenschappelijk Onderzoek Pegasus Marie Curie Long Fellowship October 2013 – present.

Foundation Sciences Mathématiques de Paris post-doctoral fellowship October 2012 – October 2013.

Leonardo Melandri Fellowship to attend Ramsey Theory in Logic, Combinatorics and Complexity 2011 in Bertinoro, Italy.

Cornell University Computer Science Prize for Academic Excellence and Leadership 2005.

Invited talks
Logic Colloquium 2016 – Leeds, England – upcoming
New Challenges in Reverse Mathematics Workshop – Singapore – 1.11.2016
Reverse mathematics and the strong Tietze extension theorem.

The Foundational Impact of Recursion Theory – Storrs, CT – upcoming
A tour of the mass problems.

Sets and Computations Workshop – Singapore – 4.20.2015
Computability in Europe 2015 – Bucharest, Romania – 7.2.2015
Reverse mathematics, well-quasi-orders, and Noetherian spaces.

ASL North American Annual Meeting 2014 – Boulder, CO – 5.21.2014
Proof Theory, Modal Logic and Reflection Principles – Mexico City, Mexico – 9.30.2014
Exploring randomness, diagonally non-recursiveness, and Ramsey-type combinatorial principles in reverse mathematics.

Sendai Logic School – Tokyo, Japan – 2.21.2014
Studying the role of induction axioms in reverse mathematics.

Computability Theory and Foundations of Mathematics 2014 – Tokyo, Japan – 2.17.2014.
Separating the uniformly computably true from the computably true via strong Weihrauch reducibility.

University of Udine Mathematics and Computer Science Seminar – Udine, Italy – 9.17.2013
Sendai Logic Seminar – Sendai, Japan – 2.14.2014
Examples of problems that cannot be solved by randomness and examples of problems that can be solved by randomness.

Bundeswehr University Munich Seminar for Theoretical Computer Science and Mathematical Logic – Munich, Germany – 8.21.2013
Reverse mathematics and Birkhoffs problem 111.

Logic Colloquium 2013 – Évora, Portugal – 7.22.2013
Comparing the strength of $DNR(k)$ functions and $DNR(2)$ functions.

Workshop on Reverse Mathematics and Type Theory – Seoul, South Korea – 3.26.2013
Journées Calculabilités 2013 – Nancy, France - 4.11.2013
A low $DNR(k)$ function that computes no $DNR(2)$ function.

ENS Lyon Semaine Sport-Etudes 2012-2013 – Les 7 Laux, France – 1.26.2013
Randomness from an algorithmic perspective.

Ghent University Logic and Analysis Seminar – Ghent, Belgium – 10.24.2012
Logics and complexity in a calculus of problems.

ASL North American Annual Meeting 2012 – Madison, WI – 3.31.2012
Presenting the effectively closed Medvedev degrees requires $0'''$.

AMS Spring Eastern Sectional Meeting 2012 – Washington, DC – 3.18.2012

The Medvedev degrees as semantics for propositional logic.

Penn State Logic Seminar – State College, PA – 10.14.2011
Complexity in the Medvedev and Muchnik degrees.

Appalachian State University Mathematical Sciences Colloquium Series – Boone, NC – 10.7.2011
Describing the complexity of the "problem $\mathcal{B}$ is harder than problem $\mathcal{A}$" relation.

Workshop on Computability Theory 2011, part 2 – Barcelona, Spain – 7.17.2011
Complexity in the Medvedev degrees of Π^0_1 classes.

AMS Fall Central Sectional Meeting 2010 – Notre Dame, IN – 11.7.2010
Birkhoff's theorem and reverse mathematics.

Notre Dame Logic Seminar – Notre Dame, IN – 11.4.2010
Medvedev degrees: characterizing the first-order theory and the join-irreducibles.

MIT Logic Seminar – Cambridge, MA – 4.2.2008
Menger's theorem and reverse mathematics.

Selected contributed talks
Varieties of Algorithmic Information – Heidelberg, Germany – 6.18.2015
Logic Colloquium 2015 – Helsinki, Finland – 8.4.2015
Universality, optimality, and randomness deficiency.

ASL Winter Meeting (with JMM) – Boston, MA – 1.6.2012
Complexity in the degrees of unsolvability of mass problems.

Logic Colloquium 2010 – Paris, France – 7.27.2010
Menger's theorem in Π^0_1-CA_0.

ASL North American Annual Meeting 2010 – Washington, DC – 3.17.2010
Coding second-order arithmetic into the closed Medvedev degrees.

Logic Colloquium 2009 – Sofia, Bulgaria – 8.4.2009
The first-order theory of the Medvedev lattice is third-order arithmetic.

Computability in Europe 2009 – Heidelberg, Germany – 7.22.2009
A characterization of the join-irreducible Medvedev degrees.

Ithaca High School (Math Awareness Month 2006) – Ithaca, NY – 5.23.2006
Ranking the Web: behind the mathematics of search engine results.

Teaching experience at Ghent University
Spring 2016
Wiskundige Logica II (*Mathematical Logic II*) – instructor

Spring 2015
Wiskundige Logica II (*Mathematical Logic II*) – co-instructor

Spring 2014
Wiskundige Logica II (*Mathematical Logic II*) – co-instructor

Teaching experience at Appalachian State University
Spring 2012
MAT 1110: *Calculus with Analytic Geometry I* – instructor

Fall 2011
MAT 1025: *Algebra and Elementary Functions* – instructor
MAT 1110: *Calculus with Analytic Geometry I* – instructor

Teaching experience at Cornell University
Summer 2011
Math 1920: *Multivariable Calculus for Engineers* – instructor

Spring 2011
Math 3040: *Prove It!* – teaching assistant

Fall 2010
Math 4810/Phil 4310: *Mathematical Logic* – teaching assistant

Spring 2010
Math 6810: *Logic* – teaching assistant

Fall 2009
Math 1120: *Calculus II* – instructor and czar's assistant

Spring 2009
Math 6810: *Logic* – teaching assistant

Fall 2008
Math 1910: *Calculus for Engineers* – instructor and czar's assistant

Summer 2008
REU: *Games, Logic, and Linear Orders* – graduate student mentor

Spring 2008
Phil 331/Math 281: *Deductive Logic* – teaching assistant
Math 486/CS 486: *Applied Logic* – teaching assistant
Math 681: *Logic* – teaching assistant

Fall 2007
Math 191: *Calculus for Engineers* – head teaching assistant

Spring 2007
Math 481/Phil 431: *Mathematical Logic* – teaching assistant

Fall 2006
Math 191: *Calculus for Engineers* – head teaching assistant

Summer 2006
Math 191: *Calculus for Engineers* – teaching assistant

Spring 2006
Math 304: *Prove It!* – teaching assistant

Fall 2005
Math 192: *Multivariable Calculus for Engineers* – teaching assistant

Spring 2003
Com S 312: *Data Structures and Functional Programming* – academic assistant

Fall 2002
Com S 211: *Computers and Programming* – academic assistant

Employment history
Fall 2013 to present
Ghent University – Ghent, Belgium
Post-doctoral researcher

Fall 2012 to Fall 2013
Laboratoire d'Informatique Algorithmique: Fondements et Applications
Université Paris Diderot - Paris 7 – Paris, France
Post-doctoral researcher

Fall 2011 through Spring 2012
Appalachian State University – Boone, NC
Lecturer
Instructor for courses in pre-calculus and calculus.

Fall 2005 through Summer 2011
Cornell University – Ithaca, NY
Teaching assistant
Instructor for freshman calculus courses. Recitation leader for freshman calculus courses.
Teaching assistant for various courses in mathematical logic at undergraduate and graduate levels in the mathematics, computer science, and philosophy departments.

Summer 2004 through Fall 2004
Cornell University – Ithaca, NY
Undergraduate student researcher in computational biology
Developed and implemented a Google-like ranking system for queries to the Biozon database.
Developed and implemented software to map EST sequences to their corresponding proteins through the Biozon database.

Summer 2003
Microsoft Corporation – Redmond, WA
Intern in software development
Developed an implemented a bug-tracking system for the Visual Studio team.

Fall 2002 through Spring 2003
Cornell University – Ithaca, NY
Undergraduate academic assistant
Held office hours and graded assignments and exams for courses in computer programming.

Professional organizations
Member – Association for Symbolic Logic
Member – American Mathematical Society
Member – Association Computability in Europe
Member – Tau Beta Pi

Programming experience
ASP, C, C++, C#, Forth, HTML, Java, JavaScript, LaTeX 2_ε, MATLAB, MIPS Assembly, OCaml, perl, SML, SQL, VBScript