

# Jeremy Avigad

## PERSONAL DATA

Born January 9, 1968, New York, N.Y. Citizenship: USA.

## ADDRESS

Department of Philosophy  
Carnegie Mellon University  
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## RESEARCH INTERESTS

Mathematical logic, proof theory, philosophy of mathematics, formal verification, automated reasoning, history of mathematics

## PROFESSIONAL EXPERIENCE

2008-present	Professor of Philosophy, Carnegie Mellon University
2007-present	Courtesy appointment, Department of Mathematical Sciences, Carnegie Mellon University
2009-2010	Visiting Researcher, Microsoft Research - INRIA Joint Centre, Orsay
2003-2008	Associate Professor of Philosophy with tenure, Carnegie Mellon University
2002-2003	Associate Professor of Philosophy, Carnegie Mellon University
1996-2002	Assistant Professor of Philosophy, Carnegie Mellon University
Spring 1996	Special Year in Logic and Algorithms Postdoctoral Fellow, DIMACS
1995-1996	T. H. Hildebrandt Assistant Professor of Mathematics, University of Michigan

## EDUCATION

1990-1995	University of California, Berkeley, Ph.D. (Mathematics) Dissertation: <i>Proof-Theoretic Investigations of Subsystems of Second-Order Arithmetic</i> Advisor: Jack Silver
1984-1989	Harvard University, B.A. magna cum laude (Mathematics)

## GRANTS AND FELLOWSHIPS

2011-2014	National Science Foundation Research Grant, "Proof mining and formal verification"
2010-2011	Andrew W. Mellon Foundation, follow-up to the New Directions Fellowship
2006-2008	National Science Foundation, "Carnegie Mellon summer school in logic and formal epistemology" (Co-PI with David Danks)
2008-2009	Templeton Foundation, Exploring the Infinite Grant Program, "The infinite in combinatorics and number theory"
2007-2010	National Science Foundation Research Grant, "Collaborative research: Logical support for formal verification" (co-PI with Harvey Friedman, Murali Sitaraman, and Bruce Weide)
2006-2008	National Science Foundation, "Carnegie Mellon summer school in logic and formal epistemology" (Co-PI with Teddy Seidenfeld; renewed once)
2004-2007	National Science Foundation Research Grant, "Collaborative research: Theoretical support for mechanized proof assistants" (Co-PI with Harvey Friedman)
2003-2004	Andrew W. Mellon Foundation New Directions Fellowship
2000-2003	National Science Foundation Research Grant, "Constructive aspects of classical logic"
1996-1999	National Science Foundation Research Grant, "A model-theoretic approach to proof theory"

## PUBLICATIONS

- “Algorithmic randomness, reverse mathematics, and the dominated convergence theorem,” with Edward Dean and Jason Rute, submitted.
- “Metastable convergence theorems,” with Edward Dean and Jason Rute, to appear in the *Journal of Logic and Analysis*.
- “Inverting the Furstenberg correspondence,” to appear in *Discrete and Continuous Dynamical Systems A*.
- “Uncomputably noisy ergodic limits,” to appear in the *Notre Dame Journal of Formal Logic*.
- “Proof theory,” invited chapter for Sven Ove Hansson and Vincent F. Hendricks, editors, *Handbook of Formal Epistemology*, to be published by Springer.
- “Zen and the art of formalization,” with Andrea Asperti, *Mathematical Structures in Computer Science*, special issue on interactive theorem proving and the formalization of mathematics, 21: 679-682, 2011.
- “Building a push-button RESOLVE verifier: Progress and challenges,” with Murali Sitaraman (first author) et al., *Formal Aspects of Computing*, 23:607-626, 2011.
- “Understanding, formal verification, and the philosophy of mathematics,” special issue of on “Logic and Philosophy Today,” *Journal of the Indian Council of Philosophical Research*, 27: 161-197, 2010.
- “Metastability in the Furstenberg-Zimmer tower,” with Henry Towsner, *Fundamenta Mathematicae*, 210:243-268, 2010.
- “The computational content of classical arithmetic,” in Solomon Feferman and Wilfried Sieg, eds., *Proofs, Categories, and Computations: Essays in Honor of Grigori Mints*, College Publications, 15-30, 2010.
- “Gödel and the metamathematical tradition,” in Charles Parsons et al. eds., *Kurt Gödel : Essays for his Centennial*, ASL Lecture Notes in Logic, Cambridge University Press, 45-60, 2010.
- “Local stability of ergodic averages,” with Philipp Gerhardy and Henry Towsner, *Transactions of the American Mathematical Society*, 362: 261-288, 2010.
- “Functional interpretation and inductive definitions,” with Henry Towsner, *Journal of Symbolic Logic*, 74:1100-1120, 2009.
- “A language for mathematical knowledge management,” with Steven Kieffer (first author) and Harvey Friedman, *Studies in Logic, Grammar and Rhetoric* (special issue on computer reconstruction of the body of mathematics), 18:51-66, 2009.
- “A formal system for Euclid’s *Elements*,” with Edward Dean and John Mumma, *Review of Symbolic Logic*, 2:700-768, 2009.
- “The metamathematics of ergodic theory,” *Annals of Pure and Applied Logic*, 157:64-76, 2009.
- “Understanding proofs,” in Paolo Mancosu, editor, *The Philosophy of Mathematical Practice*, Oxford University Press, 317-353, 2008.
- “Computers in mathematical inquiry,” in Paolo Mancosu, editor, *The Philosophy of Mathematical Practice*, Oxford University Press, 302-316, 2008.
- Response to questionnaire, in Vincent F. Hendricks and Hannes Leitgeb, editors, *Philosophy of Mathematics: 5 questions*, Automatic Press / VIP, 2007.
- “A formally verified proof of the prime number theorem,” with Kevin Donnelly, David Gray, and Paul Raff, *ACM Transactions on Computational Logic* 9(1:2):1-23, 2007.
- “Philosophy of mathematics,” in Constantin Boundas, editor, *The Edinburgh Companion to Twentieth-Century Philosophies*, Edinburgh University Press, 234-251, 2007; also published as *The Columbia Companion to Twentieth-Century Philosophies*, Columbia University Press, 2007.

- “A decision procedure for ‘big O’ equations,” with Kevin Donnelly, *Journal of Automated Reasoning* 38: 353-373, 2007.
- “Quantifier elimination for the reals with a predicate for the powers of two,” with Yimu Yin, *Theoretical Computer Science* 370:48-59, 2007.
- “Combining decision procedures for the reals,” with Harvey Friedman, *Logical Methods in Computer Science* 2(4:4):1-42, 2006.
- “Mathematical method and proof,” *Synthese*, 153:105-159, 2006.
- “Methodology and metaphysics in the development of Dedekind’s theory of ideals,” in José Ferreirós and Jeremy Gray, editors, *The Architecture of Modern Mathematics*, Oxford University Press, 159-286, 2006.
- “Fundamental notions of analysis in subsystems of second-order arithmetic,” with Ksenija Simic, *Annals of Pure and Applied Logic*, 139:138-184, 2006.
- “Weak theories of nonstandard arithmetic and analysis,” in Stephen Simpson, editor, *Reverse Mathematics 2001*. A K Peters, 19-46, 2005.
- “Forcing in proof theory,” *Bulletin of Symbolic Logic*, 10:305-333, 2004.
- “Formalizing O notation in Isabelle/HOL,” with Kevin Donnelly, in David Basin and Michaël Rusinowitch, editors, *Automated Reasoning: second international joint conference, IJCAR 2004*, Lecture Notes in Artificial Intelligence 3097, Springer, 357-371, 2004.
- “Number theory and elementary arithmetic,” *Philosophia Mathematica*, 11:257-284, 2003.
- “Eliminating definitions and Skolem functions in first-order logic,” *ACM Transactions on Computational Logic*, 4:402-415, 2003. (Conference version: *Proceedings of the 16th annual IEEE symposium on logic in computer science*, 139-146, 2001.)
- “The epsilon calculus,” with Richard Zach, in the *Stanford Encyclopedia of Philosophy*, 2002.
- “Saturated models of universal theories,” *Annals of Pure and Applied Logic*, 118:219-234, 2002.
- “Ordinal analysis without proofs,” in Wilfried Sieg et. al, eds., *Reflections on the Foundations of Mathematics: Essays in Honor of Solomon Feferman*, Association for Symbolic Logic, A K Peters, 1-36, 2002.
- “Transfer principles in nonstandard intuitionistic arithmetic,” with Jeffrey Helzner, *Archive for Mathematical Logic*, 41:581-602, 2002.
- “An ordinal analysis of admissible set theory using recursion on ordinal notations,” *Journal of Mathematical Logic*, 2:91-112, 2002.
- “Update procedures and the 1-consistency of arithmetic,” *Mathematical Logic Quarterly*, 48:3-13, 2002.
- “Algebraic proofs of cut elimination,” *Journal of Logic and Algebraic Programming*, 49:15-30, 2001.
- “Interpreting classical theories in constructive ones,” *Journal of Symbolic Logic*, 65:1785-1812, 2000.
- “A realizability interpretation for classical arithmetic,” in Buss, Hájek, and Pudlák eds., *Logic Colloquium '98*, Lecture Notes in Logic 13, AK Peters, 57-90, 2000.
- “The model-theoretic ordinal analysis of predicative theories,” with Richard Sommer, *Journal of Symbolic Logic*, 64:327-349, 1999.
- “Gödel’s functional (Dialectica) interpretation,” with Solomon Feferman, in the *Handbook of Proof Theory*, Samuel Buss, ed., Elsevier 337-405, 1998.
- “An effective proof that open sets are Ramsey,” *Archive for Mathematical Logic*, 37:235-240, 1998.
- “Predicative functionals and an interpretation of  $ID^{\omega}$ ,” *Annals of Pure and Applied Logic*, 92:1-34, 1998.
- “Plausibly hard combinatorial tautologies,” in Paul Beame and Samuel Buss, eds., *Proof Complexity and Feasible Arithmetics*, AMS Publications 1-12, 1997.

“A model-theoretic approach to ordinal analysis,” with Richard Sommer, *Bulletin of Symbolic Logic*, 3:17-52, 1997.

“Formalizing forcing arguments in subsystems of second-order arithmetic,” *Annals of Pure and Applied Logic*, 82:165-191, 1996.

“On the relationship between  $\text{ATR}_0$  and  $\text{ID}^{\omega}$ ,” *Journal of Symbolic Logic*, 61:768-779, 1996.

#### TECHNICAL REPORTS

“A variant of the double-negation translation,” Carnegie Mellon Technical Report CMU-PHIL-179, 2006.

“Notes on a formalization of the prime number theorem,” Carnegie Mellon Technical Report CMU-PHIL-163, 2004.

“Dedekind’s 1871 version of the theory of ideals,” Carnegie Mellon Technical Report CMU-PHIL-162, 2004.

“Notes on  $\Pi^1_1$  conservativity,  $\omega$ -submodels, and the collection schema,” Carnegie Mellon Technical Report CMU-PHIL-125, 2001.

“‘Clarifying the nature of the infinite’: the development of metamathematics and proof theory,” with Erich H. Reck, Carnegie Mellon Technical Report CMU-PHIL-120, 2001.

#### REVIEWS

Review of *Proof and Other Dilemmas: Mathematics and Philosophy*, edited by Bonnie Gold and Roger A. Simons, *Notices of the American Mathematical Society*, 58(11): 1580-1584, 2011.

Review of the *Handbook of Practical Logic and Automated Reasoning*, by John Harrison, *Theory and Practice of Logic Programming*, 10:237-241, 2010.

Review of *Plato’s Ghost: The Modernist Transformation of Mathematics*, by Jeremy Gray, *Mathematical Intelligencer*, 32(2):79-81, 2010.

Review of *Visual Thinking in Mathematics: An Epistemological Study*, by Marcus Giaquinto, *Philosophia Mathematica*, 17:95-108, 2009.

Review of *The Provenance of Pure Reason: Essays in the Philosophy of Mathematics and its History*, by William Tait, *Bulletin of Symbolic Logic*, 12:608-611, 2006.

Review of *The Birth of Model Theory: Löwenheim’s Theorem in the Frame of the Theory of Relatives*, by Calixto Badesa, *Mathematical Intelligencer*, 28(4):67-71, 2006.

Review of *Gnomes in the Fog: The Reception of Brouwer’s Intuitionism in the 1920s*, by Dennis E. Hesselning, *Mathematical Intelligencer*, 28(4):71-74, 2006.

Review of “Explicit provability and constructive semantics,” by Sergei Artemov, *Bulletin of Symbolic Logic* 8:432, 2002.

Review of *Proofs and Confirmations*, by David Bressoud, *SIGACT Newsletter*, 32:4-5, 2001.

Review of *Basic Proof Theory*, by A.S. Troelstra and Helmut Schwichtenberg, *SIGACT Newsletter*, 32, 2001.

Review of “Some results on cut-elimination, provable well-orderings, induction, and reflection,” by Toshiyasu Arai, *Bulletin of Symbolic Logic*, 7:77-78, 2001

Review of *In the Light of Logic*, by Solomon Feferman, *Journal of Philosophy*, 96:638-642, 1999.

Review of *First-Order Logic*, by Raymond Smullyan, *Journal of Symbolic Logic*, 61:351, 1996.

#### EDITORIAL WORK

Coordinating editor, *Review of Symbolic Logic*, 2010-present.

Journal manager, and member, editorial board, *Journal of Logic and Analysis*, 2008-present.  
 Member, editorial board, *Computability*, 2011-present.  
 Member, editorial board, *Journal of Automated Reasoning*, 2007-present.  
 Member, editorial board, *Journal of Formalized Reasoning*, 2007-present.  
 Member, editorial board, ASL Lecture Notes in Logic, 2006-present.  
 Member, advisory panel, *Theory and Applications of Computability* series, Springer, 2009-present.  
 Member, editorial board, *Notre Dame Journal of Formal Logic*, 2004-2011.  
 Member, advisory board, *Review of Symbolic Logic*, 2007-2010.  
 Member, editorial board, *Logic and Analysis*, 2006-2008.  
 Co-editor (with Andrea Asperti), special issue of the *Mathematical Structures in Computer Science*, “Advances and Perspectives in the Mechanization of Mathematics”  
 Co-editor (with Arnold Beckmann and Georg Moser) of a special issue of the *Annals of Pure and Applied Logic* in honor of Wolfram Pohlers’ 60<sup>th</sup> birthday, October 2005.  
 Referee for *Journal of Symbolic Logic*, *Annals of Pure and Applied Logic*, *Archive for Mathematical Logic*, *Mathematical Logic Quarterly*, *Notre Dame Journal of Formal Logic*, *Journal of Philosophical Logic*, *Bulletin of Symbolic Logic*, *Review of Symbolic Logic*, *Journal of Logic and Analysis*, *Advances in Mathematics*, *Transactions of the American Mathematical Society*, *Proceedings of the American Mathematical Society*, *Philosophical Transactions of the Royal Society*, *American Mathematical Monthly*, *Discrete Mathematics*, *Theoretical Computer Science*, *Mathematical Structures in Computer Science*, *Journal of Logic and Computation*, *Information and Computation*, *Logical Methods in Computer Science*, *History and Philosophy of Logic*, *Synthese*, *Dialectica*, *Philosophia Mathematica*, *Topics in Computer Science*; for conferences: *Logic in Computer Science*, *Computer Science Logic*, *Computability in Europe*, *Conference on Automated Deduction*, *Interactive Theorem Proving*, *Workshop on Logic, Language, Information and Computation*, *Types*; as well as for other journals and conferences, and various books and collections.

#### OTHER PROFESSIONAL SERVICE

Member, program committee, Computer Science Logic (CSL), 2012  
 Member, program committee, Mathematical Knowledge Management (MKM), 2012  
 Member, program committee, Model Theory and Proof Theory of Arithmetic, 2012  
 Member, program committee, Association for Symbolic Logic annual meeting, Spring 2012  
 Member, program committee, Proof Search in Axiomatic Theories and Type Theories workshop at CADE 2011  
 Member, program committee, Interactive Theorem Proving (ITP), 2011  
 Member, program committee, Logic Colloquium 2011  
 Member, program committee, 17<sup>th</sup> Workshop on Logic, Language, Information, and Computation (WoLLIC), 2011  
 Member, program committee, Mathematical Logic division of the International Congress of Logic, Methodology, and Philosophy of Science, 2011  
 Organizer (with Ulrich Kohlenbach and Henry Towsner). “Logic and analysis” joint AMS/ASL special session, American Mathematical Society annual meeting, New Orleans, January 2011  
 Board of jurors, Kurt Gödel Research Fellowship Prize Program, 2010-2011  
 Member, program committee, Interactive Theorem Proving (ITP), 2010.  
 Chair, Association for Symbolic Logic Committee on Logic in North America, 2008-2009.  
 Member, Association for Symbolic Logic Committee on Logic in North America, 2004-2009.  
 Member, program committee, Reverse Mathematics: Foundations and Applications, 2009.  
 Member, Association for Symbolic Logic Council, 2007-2009.  
 Member, Association for Symbolic Logic Nominating Committee, 2009.  
 Member, scientific committee, Logic and Mathematics, 2009

Member, program committee, Theorem Proving in Higher-Order Logic (TPHOLs), 2009.  
Member, scientific committee, 14th Latin-American Symposium on Mathematical Logic, 2008.  
Organizer (with Reed Solomon), “Effective aspects of measure theory and analysis” special session, Association for Symbolic Logic annual meeting, Montreal, May 2006.  
Taught (with Henry Towsner) a two week short-course in proof theory at Notre Dame, under NSF grant “Two Conferences in Logic at Notre Dame,” June 6-17, 2005.  
Member, program committee for the 13<sup>th</sup> Workshop on Logic, Language, Information, and Computation, 2006.  
Chair, local organizing committee, Association for Symbolic Logic annual meeting, Spring 2004.  
Member, program committee, joint Association for Symbolic Logic and American Philosophical Association meeting, Minneapolis, May 2001.  
Organizer (with Steve Awodey), Midwest Philosophy of Mathematics Workshop, Carnegie Mellon University, December 2000.  
Member, program committee for the Association for Symbolic Logic annual meeting, Urbana-Champaign, May 2000.  
Organizer (with Toni Pitassi), “Proof theory and complexity” special session, Association for Symbolic Logic annual meeting, Urbana-Champaign, May 2000.

#### UNIVERSITY SERVICE

Director, Graduate Studies in Philosophy, 2005-2009, and 2011-2012  
Director, Carnegie Mellon Summer School in Logic and Formal Epistemology, 2005-2010  
Chair, H&SS Promotion and Tenure Committee, 2008-2009  
Member, Posner Intern selection committee, 2004-present  
Director, Logic and Computation Major, 1998-2005  
University Education Council, 2002-2005  
University Committee on Non-tenure Appointments, 2002-2005  
Philosophy Department webmaster, 2001-2005  
Faculty Senate, 2000-2004  
Organizer, Pure and Applied Logic Colloquium and Philosophy Colloquium, 1996-1998

#### PHD STUDENTS

Rebecca Morris (Philosophy, current)  
Jason Rute (Mathematical Sciences, current)  
Ed Dean (Philosophy, current, co-advising with James Cummings)  
Sicun Gao (Philosophy, current, co-advising with Ed Clarke)  
Henry Towsner (PhD, Mathematical Sciences, 2008), *Some results in logic and ergodic theory*  
Yimu Yin (PhD, Philosophy, 2008), *Sets, models, and valued fields*  
Kerry Ojakian (PhD, Mathematical Sciences, 2004), *Combinatorics in bounded arithmetic*  
Ksenija Simic (PhD, Mathematical Sciences, 2004), *Aspects of ergodic theory in subsystems of second-order arithmetic*  
PhD committees I have served on (in Philosophy at Carnegie Mellon, unless otherwise noted): Alexander Kreuzer (Mathematics, TU Munich, current), Spencer Breiner (current), Tyke Nunez (University of Pittsburgh, current), Ashwini Aroksar (Mathematical Sciences, current), Sean McLaughlin (Computer Science, current), Shawn Standefer (University of Pittsburgh, current), Matthew Szudzik (Mathematical Sciences, 2010), Jesse Alama (Stanford, 2009), Chetan Balwe (Mathematics, University of Pittsburgh, 2008), Amine Chaieb (Computer Science, Technische Universität München, 2008), Henrik Forsell (2007),

Jeremy Heis (Philosophy, University of Pittsburgh, 2007), Kaustuv Chaudhuri (Computer Science, 2006), Jyotsna Diwadkar (Mathematics, University of Pittsburgh, 2006), John Mumma (2006), Dirk Schlimm (2005), Mark Ravaglia (2003), John Krueger (Mathematical Sciences, 2003), Jesse Hughes (2001), Barbara Kauffmann (2000), Alberto Momigliano (2000), John Byrnes (1999)

#### MS AND UNDERGRADUATE STUDENTS

Benjamin Northrop (MS, Philosophy, 2011), *Automated diagrammatic reasoning: a proof checker for the language of E*

Spencer Breiner (MS, Philosophy, 2010), *Towards a practical understanding of mathematical structuralism*

Steven Kieffer (MS, Philosophy, 2007), *A language for mathematical knowledge management*

Aaron Hertz (MS, Mathematical Sciences, 2004), *A constructive version of the Hilbert basis theorem*

Doug White (MS, Philosophy, 2004), *Axiomatics, methodology, and Dedekind's theory of ideals*

Jessi Berkelhammer (MS, Philosophy, 2003), *From reducibility to extensionality: the two editions of Principia Mathematica*

Erica Lucast (MS, Philosophy, 2002), *A new case for proof in mathematics curricula*

Erin Korber (Undergraduate senior thesis, Logic and Computation major, 2005), *Implementing decision procedures for the real numbers*

MS Committees I have served on (in Philosophy, unless otherwise noted): David Carper (2011), Hans-Christoph Kotsch (2011), Brian Leary (Mathematical Sciences, 2009), Nick Radcliffe (2008), Dave Gilbert (2008), Kohei Kishida (2007), George Schaeffer (Mathematical Sciences, 2007), Lindsay Spriggs (2007), Michael Warren (2004), Adam Kramer (2004), Keith Douglas (2003), Charlie Smart (Mathematical Sciences, 2002), John Mumma (2001), Jeffrey Helzner (2001), Johanna Franklin (Mathematical Sciences, 2001), Jay Kim (1999), Nathaniel Segerlind (Mathematical Sciences, 1998), Mark Ravaglia (1997), Chris Skalka (1997)

#### INVITED PRESENTATIONS IN CONFERENCES AND WORKSHOPS

“Computability, constructivity, and convergence in measure theory,” MAP (Mathematics, Algorithms, Proofs) Workshop, Leiden, November, 2011

“Computability, constructivity, and convergence in measure theory,” Reverse Mathematics Workshop, University of Chicago, September, 2011.

“Interactive theorem proving,” a series of three tutorial lectures, Panhellenic Logic Colloquium, Ioannina, Greece, July, 2011

“Simplicity, extensionality, and functions as objects,” Ideals of Proof workshop, Paris, June, 2011.

“Hilbert, Gödel, and the metamathematical tradition today,” Kurt Gödel research prize award conference, Vienna, April 2011

“Type inference in group theory,” special session on Formal Mathematics for Mathematicians, AMS annual meeting, New Orleans, January 2011

“Inverting the Furstenberg correspondence,” special session on Logic and Analysis, AMS annual meeting, New Orleans, January 2011

“Simplicity in mathematics,” Simplicity as an Epistemological Value in Scientific Practice, Paris, January 2010

“Proof mining in ergodic theory and additive combinatorics,” Bridging the Gaps: Workshop in Ergodic Theory, Queen Mary, University of London, October 2009

“Computability in Ergodic Theory,” Computability in Europe, Heidelberg, July 2009

“The computational content of classical arithmetic,” Mintsfest: A Conference in Celebration of Grigori Mints’ 70<sup>th</sup> Birthday, Stanford, June 2009

“Metastability in ergodic theory,” Special Session on Logic and Dynamical Systems, AMS annual meeting, Washington, DC, January 2009

“A formal system for Euclid’s *Elements*,” Asian Logic Conference, Kobe, September 2008

“Formally verified mathematics in theory and practice,” Mathematical Logic and Computers, Kobe, September 2008

“The role of the diagram in Euclid’s *Elements*,” Mathematical Understanding, Paris, June 2008

“Computability and ergodic theory,” Mathematical Logic: Proof Theory, Constructive Mathematics, Oberwolfach, April 2008

“Unwinding Furstenberg’s proof of Szemerédi’s theorem,” Very Informal Gathering, UCLA, February 2008

“Computability and ergodic theory,” International Congress of Logic, Methodology, and Philosophy of Science, Beijing, August 2007

“The metamathematics of ergodic theory,” Methods of Proof Theory in Mathematics, Max Planck Institute, Bonn, June 2007

“Mathematical understanding and formal verification,” Symposium on Explanation and Reasoning Styles in Mathematics, Philosophy of Science Association, Vancouver, November 2006

“Verifying real inequalities,” International Congress of Mathematical Software, Castro Urdiales, August 2006

“Gödel and the metamathematical tradition,” ASL Spring Meeting, May 2006

“Methodology and metaphysics in the development of Dedekind’s theory of ideals,” ASL/APA Winter Meeting, New York, January 2006

“Combining decision procedures for the reals with inequality,” DIAMANT day, Nijmegen, October 2005

“A formally verified proof of the prime number theorem,” TYPES Summer School, Göteborg, Sweden, August 2005

“Understanding proofs,” La Preuve en Mathématique: Logique, Philosophie, Histoire, Lille, May 2005

“Translating nonstandard proofs to constructive ones,” MAP (Mathematics, Algorithms, Proofs) Workshop, Dagstuhl, January 2005

Panelist, Logic in Computer Science Education, ASL Spring Meeting, Carnegie Mellon, May 2004

“Proof mining,” a series of tutorial lectures at the ASL Spring Meeting, Carnegie Mellon, May 2004

“Mathematical method and proof,” APA Central Division Meeting, Chicago, April 2004

“Mathematical method and proof,” Logic and Philosophy of Science Workshop, Laguna Beach, March 2004

“Distances, projections, and the mean ergodic theorem in subsystems of second-order arithmetic,” Workshop on Proof Theory and Algorithms, ICMS, Edinburgh, March 2003

“Measure theory in weak theories of nonstandard arithmetic,” special session on nonstandard models of arithmetic and set theory, AMS Winter Meeting, Baltimore, January 2003

“Update procedures and the 1-consistency of arithmetic,” MAMLS, Carnegie Mellon, November 2002

“Extracting syntactic proofs from model-theoretic arguments,” special session on effectiveness questions in model theory, AMS Fall Central Section Meeting, Madison, October 2002.

“Forcing in proof theory,” Logic Colloquium ’02, Münster, August 2002.

“Measure theory in weak theories of nonstandard arithmetic,” Bounded Arithmetic and Complexity Classes, Lisbon, June 2002

- “Methodological predicativity,” APA Pacific Division Meeting, Seattle, March 2002
- “Number theory and elementary arithmetic,” Center for the Philosophy of Science In-house Conference, University of Pittsburgh, October 2001
- “Weak theories of nonstandard arithmetic and analysis,” Proof Theory in Computer Science, Dagstuhl, October 2001
- “Update procedures and the 1-consistency of arithmetic,” special session on proof theory, AMS Fall Central Section Meeting, Columbus, September 2001
- “Weak theories of nonstandard arithmetic and analysis,” special session on reverse mathematics, ASL Annual Meeting, University of Pennsylvania, March 2001
- “Sheaf semantics and nonstandard intuitionistic arithmetic,” New York City Logic Conference, CUNY, November 1999
- “Ordinal analysis without proofs,” Reflections: A symposium honoring Solomon Feferman on his 70th birthday, Stanford, December 1998.
- “Semantic methods in proof theory,” Midwest Model Theory, Notre Dame, November 1998
- “Semantic methods in proof theory,” Operations, Sets, and Types, Castiglioncello, October 1998
- “A realizability interpretation for classical arithmetic,” special session on proof theory, Logic Colloquium '98, Prague, August 1998
- “Interpreting classical theories in constructive ones,” Proof Theory and Complexity, BRICS, Aarhus, August 1998.
- “Proof theory and typed computation,” Mathematical Logic, Oberwolfach, January 1998
- “Building finite approximations to models of arithmetic,” DIMACS workshop, New Brunswick, July 1997.
- “The combinatorics of propositional provability,” ASL Winter Meeting, San Diego, January 1997
- “The joy of functional interpretation,” MAMLS, Lafayette College, December 1996
- “Plausibly hard combinatorial tautologies,” DIMACS workshop on proof complexity and feasible arithmetic, New Brunswick, April 1996.