

Wesley Crain Calvert

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Education

Ph.D. in mathematics, May 2005, University of Notre Dame
Thesis title: Algebraic Structure and Computable Structure
Thesis adviser: Julia F. Knight
M.S. in mathematics, May 2002, University of Notre Dame
B.A. *summa cum laude* in mathematics and history, May 2000, Augustana College (Illinois)
– Phi Beta Kappa

Positions Held

Director of Undergraduate Studies, Department of Mathematics, Southern Illinois University,
Carbondale, 2016–Present
Associate Professor, Southern Illinois University, Carbondale, 2016–Present
Assistant Professor, Southern Illinois University, Carbondale, 2010 – 2016
Fulbright-Nehru Senior Research Scholar, Institute of Mathematical Sciences, Chennai, India,
2011
Assistant Professor, Murray State University, 2005 – 2010
Teaching Assistant / Graduate Student Instructor, University of Notre Dame, 2001-2004

Research Area

Primary interest: Mathematical logic and its applications (MSC 03), especially computability
theory and model theory
Secondary interests: Algebraic Geometry (MSC 14) and number theory (MSC 11), especially
computational aspects; theoretical computer science (MSC 68)

External Research Funding

Fulbright-Nehru Senior Research Scholarship, *Effective Structures and Computation*, US-India
Educational Foundation
Senior Personnel, *Collaboration in Computability*, National Science Foundation award DMS
1101123, \$82,500 to fund travel for research collaboration among US, Russian, and Kazakh
mathematicians
Senior Personnel, *Collaboration in Computability*, National Science Foundation award DMS
0554841, \$75,000 to fund travel for research collaboration among US, Russian, and Kazakh
mathematicians

Refereed Publications

“The isomorphism problem for classes of computable fields,” *Archive for Mathematical Logic*
43 (2004), 327–336.
“Comparing classes of finite structures,” with D. Cummins, J. F. Knight, and S. Miller,
Algebra and Logic 43 (2004) 374–392.
“The isomorphism problem for computable Abelian p -groups of bounded length,” *Journal of
Symbolic Logic* 70 (2005), 331–345.

- “Trees of Scott rank ω_1^{CK} and computable approximability,” with J. F. Knight and J. Millar, *Journal of Symbolic Logic* 71 (2006), 283–298.
- “Classification from a computable viewpoint,” with J. F. Knight, *Bulletin of Symbolic Logic* 12 (2006), 191–218.
- “Effective categoricity of equivalence structures,” with D. Cenzer, V. S. Harizanov, and A. Morozov, *Annals of Pure and Applied Logic* 141 (2006), 61–78.
- “Index sets of computable structures,” with V. S. Harizanov, J. F. Knight, and S. Miller, *Algebra and Logic* 45 (2006), 306–325.
- “Computable structures of Scott rank ω_1^{CK} in familiar classes,” with S. S. Goncharov and J. F. Knight, *Advances in Logic* (Proceedings of the North Texas Logic Conference, October 8–10, 2004), Contemporary Mathematics 425 (2007), American Mathematical Society, 49–66.
- “Turing degrees of isomorphism types of algebraic objects,” with V. S. Harizanov and A. Shlapentokh, *Journal of the London Mathematical Society*, 75 (2007), 273–286.
- “Index sets for classes of high rank structures,” with E. Fokina, S. S. Goncharov, J. F. Knight, O. Kudinov, A. S. Morozov, and V. Puzarenko, *Journal of Symbolic Logic* 72 (2007), 1418–1446.
- “Categoricity of computable infinitary theories,” with S. S. Goncharov, J. F. Knight, and J. Millar, *Archive for Mathematical Logic* 48 (2009), 25–38 (special issue for papers on Model Theory and Computable Model Theory from the Special Year in Logic, University of Florida, 2007).
- “Effective categoricity of Abelian p -groups,” with D. Cenzer, V. S. Harizanov, and A. Morozov, *Annals of Pure and Applied Logic* 159 (2009), 187–197.
- “Real computable manifolds and homotopy groups,” with R. Miller, *Unconventional Computation 2009*, Lecture Notes in Computer Science 5715 (2009), 98–109.
- “The cardinality of an oracle in Blum-Shub-Smale Computation,” with K. Kramer and R. Miller, *Electronic Proceedings in Theoretical Computer Science*, special issue for Computability and Complexity in Analysis 2010, 24 (2010) 56–66.
- “Metric structures and probabilistic computation,” *Theoretical Computer Science* 412 (2011), 2766–2775.
- “Noncomputable Functions in the Blum-Shub-Smale Model,” with K. Kramer and R. Miller, *Logical Methods in Computer Science* 7 (2011), 1–20.
- “Formalization of generalized constraint language: A crucial prelude to computing with words,” with E. Khorasani and S. Rahimi, *IEEE Transactions on Cybernetics* 43 (2013) 246–258.
- “Degeneration and orbits of tuples and subgroups in an Abelian group,” with K. Dutta and A. Prasad, *Journal of Group Theory* 16 (2013), 221–233.
- “Approximating functions and measuring distance on a graph,” with R. Miller and J. Chubb Reimann, *Proceedings of the 12th Asian Logic Conference*, 2013, World Scientific Publishing, 24–52.
- “Some results on \mathbb{R} -computable structures,” with J. E. Porter, *Effective Mathematics and the Uncountable* (Lecture Notes in Logic, volume 41), 2013, Cambridge University Press, 14–32.
- “Degrees of isomorphism types of geometric objects,” with V. Harizanov and A. Shlapentokh, *Computability* 3 (2014), 105–134.
- “PAC Learning, VC Dimension, and the Arithmetic Hierarchy,” *Archive for Mathematical Logic* 54 (2015) 871–883.
- “Genericity and UD-random reals,” with J. N. Y. Franklin, *Journal of Logic and Analysis*,

7:4 (2015) 1–10.

Conference and Seminar Lectures

Invited Talks at Conferences:

- *The isomorphism problem for computable structures*, AMS Special Session on Computability and Models, Joint Mathematics Meetings, Baltimore, Maryland, January 15, 2003
- *Description and comparison of computable structures*, Special session on Computability Theory and Applications, AMS Central Section Meeting, Northwestern University, October 23–24, 2004
- *Classification from a computable viewpoint*, Classification of Countable Models: Workshop on Work Growing Out of Vaught’s Conjecture, University of Notre Dame, May 18, 2005
- *Some results in \mathbb{R} -computable model theory*, Special Session on Advances in Algorithmic Methods for Algebraic Structures, AMS Southeastern Section Meeting, Middle Tennessee State University, November 4, 2007
- *\mathbb{R} -computable structures*, Invited address, Workshop on Computability and Uncountable Structures, City University of New York Graduate Center, August 18, 2008
- *Randomized Computation and Continuous First-Order Logic*, Special Session on Computability Theory and Effective Algebra, AMS Eastern Section Fall Meeting, Middletown, Connecticut, October 12, 2008
- *Specifying Computation for a Complicated World*, invited lecture, Workshop in Computability Theory, University of San Francisco, California, March 22–23, 2011
- *Continuous First Order Logic*, Invited lecture, Annual Meeting of the Calcutta Logic Circle, Kolkata, India, September 4, 2011
- *The Distance Function on a Computable Graph*, Invited lecture, Mal’tsev Meeting, Novosibirsk, Russia, October 11–14, 2011.
- *The Most Annoying Restriction* Invited lecture, MidAtlantic Mathematical Logic Seminar (Alan Turing Centenary), Boca Raton, Florida, January 12–16, 2012.
- *Degeneration and orbits of tuples and subgroups*, Invited lecture in special session on Computable Mathematics (in honor of Alan Turing), AMS Eastern Section Meeting, March 18, 2012.
- *Algorithmic Unsolvability in Geometry*, Special Session on Computational Advances on Special Functions and Tropical Geometry, AMS Central Section Meeting, Iowa State University, April 28, 2013.
- *What Does a Random Number Look Like?*, Invited keynote address in IL-MO Regional Undergraduate Mathematics Conference, Southeast Missouri State University, November 2, 2013.
- *The Power of Uniform Distribution Randomness*, Invited talk in AMS Special Session on Computability in Geometry and Topology, Joint Mathematics Meetings, Baltimore, Maryland, January 15–18, 2014.
- *PAC learning, VC dimension, and the arithmetic hierarchy*, Invited lecture in Special Session on Computable Structure Theory, AMS Eastern Section Meeting, Georgetown University, March 8, 2015.
- *What could we be, if not rational?*, Invited lecture in Special Session on Computability Theory and Applications, AMS Central Section Meeting, Loyola University Chicago, October 4, 2015.
- *Asymptotically Computable Structures: Model Existence and Categoricity*, Invited lecture, Southeastern Logic Symposium, Gainesville, Florida, March 4, 2017.

- *Generically and Coarsely Computable Structures*, Invited lecture in special session on Computability in Algebra and Number Theory, AMS Southeastern Section Meeting, Charleston, South Carolina, March 12, 2017.

Invited Seminar and Colloquium Lectures

- *Structure and non-structure via the isomorphism problem*, Mathematics Department Colloquium, Western Illinois University, March 18, 2004
- *Description and comparison of computable structures*, Southern Wisconsin Logic Colloquium, University of Wisconsin at Madison, November 2, 2004
- *Description and comparison of computable structures*, Logic Seminar, Massachusetts Institute of Technology, December 1, 2004
- *A course in mathematical logic for non-mathematical students*, Westminster College, Fulton, Missouri, December 8, 2004
- *Internal and external complexity among computable structures*, Logic Seminar, Ohio State University, January 14, 2005
- *Internal and external complexity among computable structures*, Department of Mathematics and Statistics Colloquium, Murray State University, January 31, 2005
- *Classification and computation*, Department of Mathematics, Morehouse College, March 1, 2005
- *Comparing classes of structures*, Department of Mathematics Colloquium, George Washington University, April 8, 2005
- *Internal and external complexity among computable structures*, Logic Seminar, George Washington University, April 8, 2005
- *Computation, algebra, and the uncountable*, Mathematics Department Colloquium, East Carolina University, April 11, 2008
- *Effectiveness and Computation in Algebra and Geometry*, Mathematics Department Colloquium, University of Connecticut, October 9, 2008
- *Continuity, Logic, and Computation*, Mathematical and Philosophical Logic Seminar, University of Connecticut, October 10, 2008
- *Effectiveness and Computation in Algebra and Geometry*, Mini-Symposium on Logic and Universal Algebra, University of Bern, Switzerland, November 24, 2008
- *Effectiveness and Computation in Algebra and Geometry*, Mathematics Department Colloquium, University of Louisville, February 9, 2009
- *Continuous Logic and Randomized Computation*, Logic Seminar, Indiana University, Bloomington, February 25, 2009
- *Effectiveness and Computation in Algebra and Geometry*, Mathematics Department Colloquium, University of Toledo, March 20, 2009
- *Effectiveness and Computation in Algebra and Geometry*, Mathematics Department Colloquium, University of Alaska Fairbanks, April 7, 2009
- *Computation, Decision, and Mathematical Problems*, Mathematics Department Colloquium, Southern Illinois University Carbondale, November 10, 2010
- *Randomized Computation and Continuous First-Order Logic*, Computable Structures Seminar, Novosibirsk State University, Russia, June 7, 2010
- *How is a Proof Like a Function?*, Mathematics Department Colloquium, Eastern Illinois University, April 1, 2011.
- *Degrees coded in geometry*, Logic Seminar, George Washington University, April 28, 2011
- *Diophantine Geometry of Undecidability*, Mathematics Departments, Alpha Arts and

Science College and Alpha College of Engineering, Chennai, India, September 14, 2011

- *The distance function on a computable graph* Computer Science Seminar, Indian Statistical Institute, Chennai Centre, Chennai, India, October 24, 2011.
- *Strong Jump Inversion*, Logic Seminar, George Washington University, December 6, 2016

Contributed Talks (selected):

- *The isomorphism problem for familiar classes of computable structures*, ASL annual meeting, Las Vegas, Nevada, June 1, 2002
- *The isomorphism problem for classes of computable groups and fields*, Logic Colloquium 2003, Helsinki, Finland, August 19, 2003
- *The isomorphism problem for classes of computable structures*, ASL Winter Meeting, Joint Mathematics Meetings, Phoenix, Arizona, January 10, 2004
- *Comparing classes of finite structures*, MAA Trisection Meeting (Illinois, Indiana, and Kentucky), Evansville, Indiana, November 2004
- *Description and comparison of computable structures*, ASL Winter Meeting, Joint Mathematics Meetings, Atlanta, Georgia, January 7, 2005
- *Turing degrees of isomorphism types of algebraic objects*, ASL Winter Meeting, Joint Mathematics Meetings, San Antonio, Texas, January 15, 2006
- *Coding Turing Degrees in Geometric Objects*, Contributed talk in ASL Meeting, Joint Mathematics Meetings, Washington, DC, January 7, 2009
- *Probabilistic Computation and Stochastic Processes*, Contributed talk in ASL Meeting, Joint Mathematics Meetings, San Francisco, CA, January 15, 2010
- *Computation and logic on dynamic random graphs*, ASL Annual Meeting, Berkeley, California, March 26, 2011.
- *Geometry of Undecidability*, Knots in Washington XXXII, May 1, 2011.
- *The Distance Function on a Computable Graph*, Contributed talk in ASL Meeting, Joint Mathematics Meetings, Boston, MA, January 2012.
- *Algebra and Logic of Random Variables*, Illinois Section Meeting of the MAA, March 31, 2012.
- *Who Can See the Isomorphism?*, Contributed talk in Illinois Section Meeting of the MAA, April 6, 2013.
- *PAC Learning, VC Dimension, and the Arithmetic Hierarchy*, Association of Symbolic Logic North American Meeting, Urbana, Illinois, March 25, 2015.
- *Locating Boundaries of Machine Learning*, Knots in Washington XLIII, December 10, 2016.
- Numerous talks in local seminars at the University of Notre Dame, Murray State University, and Southern Illinois University

Upcoming Talks

- *Computability and Continuous Logic*, Invited lecture in special session on Computability Theory: Pushing the Boundaries, AMS Eastern Section Meeting, Hunter College, New York City, May 7, 2017.

Internal Research Funding

Undergraduate Assistantship, SIUC Center for Undergraduate Research and Creative Activities, 2016–2017

Graduate Research Students

Elizabeth Spector, M.S., 2013; presently Assistant Vice-President, Special Assets Group, Byline Bank

Vina Pedigo-Young, M.S., 2015; presently Lecturer, Mathematics, Southern Illinois University at Carbondale

Mehmet Ergan, Ph.D. in progress.

Undergraduate Research Students

Ryan Walls, 2007–2009; preliminary results presented at MAA Kentucky Section Meeting, March 2008; Senior thesis defended May 2009

Robert Amundson, 2007–2008; preliminary results presented at MAA Kentucky Section Meeting, March 2008

Aron Huckaba, 2009–2010

Sophia Lozano, 2012

Alexandra Melton, 2012

David Foutch, 2012, currently continuing subject work as a graduate student at University of Tennessee, Knoxville and Oak Ridge National Laboratory.

Ashley Ziegler, 2016; preliminary results presented at MAA Illinois Section Meeting, April 2016

Brianna Martin, 2016–present; preliminary results presented at MAA Illinois Section Meeting, March 2017

Courses Taught

At Southern Illinois University, Carbondale:

- Service courses: College Algebra, Finite Mathematics (for business), Calculus I–III, Mathematics Content and Methods for the Elementary School; University Honors Seminar in Uncertainty
- Graduate / Advanced Courses: Introduction to proofs, Upper-level Linear Algebra, Abstract Algebra II (ring and field theory for undergraduate and masters' students), Algebraic Structures I (group and ring theory for Ph.D. students), Mathematics of Uncertainty, Machine Learning

At Institute of Mathematical Sciences, Chennai: Computable Model Theory

At Murray State University:

- Service courses: Liberal Arts Mathematics, Introductory Statistics, College Algebra, Precalculus, Business Calculus, Calculus I
- Other undergraduate courses: Introduction to Algebraic Structures
- Graduate courses: Abstract Algebra I, Linear Algebra (graduate), Computability Theory

At University of Notre Dame: (As primary instructor) Liberal Arts Mathematics, Basic Logic; (As teaching assistant) Basic Logic, Calculus II for Life Sciences, Linear Algebra and Differential Equations

At Augustana College: help session tutor for basic physics

Conferences Organized

Co-Organizer, 5th Annual Graduate Student Conference in Logic, University of Notre Dame, May 1–2, 2004

Local organizing committee, 27th Southeastern Atlantic Regional Conference on Differential Equations, Murray State University, October 19–20, 2007 (SEARCDE 2007)

Co-Organizer, Special Session on Computability Across Mathematics, AMS Central Section Meeting, St. Louis, Missouri, October 18–20, 2013

- Co-Organizer, AMS-ASL Joint Special Session on Logic and Probability, Joint Mathematics Meetings, Baltimore, Maryland, January 15–18, 2014
- Program Committee, ASL Winter Meeting (with Joint Mathematics Meetings), January 2015
- Program Committee and Organizing Committee, Langenhop Lecture and SIU Mathematics Conference, May 16–17, 2016
- Co-Organizer, Special Session on Effective Mathematics in Discrete and Continuous Worlds, AMS Central Section Meeting, Minneapolis, Minnesota, October 28–30, 2016

Externally Funded Involvement in Education Reform

- Content specialist and workshop leader, *West Kentucky Partners in Math and Science Education* (Funded by US Department of Education), provided training in content knowledge and pedagogy for K-8 teachers, 2006–2007
- Content specialist and workshop leader, *West Kentucky Mathematics Partnership* (Funded by Kentucky Council on Postsecondary Education), providing training in content knowledge and pedagogy for middle school teachers, 2008–2010
- Mathematics Instructor, Monroe-Randolph-Intel Math Connections (Funded by US Department of Education via Illinois State Board of Education MSP program), 2010–present
- Guest speaker (Lecture title: *Bayes' Rule in Artificial Intelligence*), PSBB Secondary School, Chennai, India, August 29, 2011
- Guest speaker (Lecture title: *Inquiry in Maths Education and Teacher Education*), Faculty Development Program, Alpha Arts and Science College and Alpha College of Engineering
- Internal Co-PI, *A Community of Problem Solvers: Teachers Leading Problem-Based Learning in Southern Illinois*, NSF DUE 1136414; \$1,640,821, October 1, 2011–September 30, 2017
- Organizer, high school teachers' workshop on affective content knowledge in mathematics, Chennai, India, funded by United States-India Educational Foundation.
- Co-PI, *SIUC Race to the Top (Common Core Standards Intro Secondary Mathematics Teacher Education Program)*, Illinois State Board of Education, \$4,000, October 31, 2013–June 30, 2014
- Co-PI, *SIUC Race to the Top (Common Core Standards Intro English Language Arts Teacher Education Programs)*, Illinois State Board of Education, \$4,166, October 31, 2013–June 30, 2014
- PI, *SIUC Race to the Top (Common Core Standards Intro Secondary Mathematics and English Teacher Education Program)*, Illinois State Board of Education, \$38,842, August 1, 2014–December 22, 2015
- PI, *ISTEM Network Local Area Partnerships*, US Department of Education, via Illinois State Board of Education and Regional Office of Education #30; \$23,850, July 1, 2015–September 30, 2015.
- Co-PI and Fiscal Officer, *ISTEM Network Local Area Partnerships*, US Department of Education, via Illinois State Board of Education and Regional Office of Education #30; \$23,850, July 1, 2016–August 31, 2016.

Popular Writing and Speaking

- Keynote speaker at a luncheon hosted by Reppert Publications (local newspaper publisher) to honor top graduates of local high schools, May 2011.
- Weekly columnist, *The Carterville Courier*, documenting my experiences in India, July–December 2011.
- “Paradox, Truth, and Computing,” 15th Popular Lecture of the Association for Mathematics Teachers in India, December 21, 2011, published under same title in *The Mathematics Teacher* 47 (2011), 189–198.

Guest Opinion, “Not Vouching for School Choice,” *The Southern Illinoisan*, January 31, 2012
 The Saylor Foundation, free online course in mathematical logic and theory of computing, 2014

Guest Opinion, “Snake Oil School Choice,” *The Carterville Courier*, April 16, 2014

Radio Interview, “Morning Conversations,” WSIU radio, May 16, 2016.

Service

To Southern Illinois University (University-level appointments)

- Internal program review team for the SIUC English Department (representing Graduate Council), 2010–2011.
- Intercollegiate Athletics Advisory Committee, 2012–2014.
- Outstanding Dissertation Award Committee, 2016.
- Chair, Library Affairs Advisory Committee, 2015–2016.
- Teacher Education Program Unit Accreditation Coordinating Council, 2012–present.
- Community of Practice on First Generation Students, 2016–present.
- Graduate Council, 2016–present.
 - Research Subcommittee
- Search Committee, Dean of Library Affairs, 2016.
- Review Panel, PROMPT (Proactive Recruitment of Multicultural Professionals for Tomorrow) Fellowship, 2016–present.

To Southern Illinois University (College-level appointments)

- Chair, Search Committee for Assistant Professor, Science Education (joint appointment in two colleges), 2015.
- Health Preprofessional Committee, 2016–present.
- College of Science Curriculum Committee, 2016–present.

To Southern Illinois University (Department-level appointments)

- Math Field Day / Little Egypt Mathematics Week Committee, 2010–2014.
- Mathematics Department Colloquium Organizer, 2012–2016.
- Mathematics Department Graduate Program Committee, 2015–2016.
- Mathematics Department Undergraduate Program Committee, 2010–present; Chair, 2016–present.
- Department Representative to institutional team for Illinois Board of Higher Education / Illinois Community College Board Complete College America Co-requisite Remediation Pilot Program, 2016–present.
- Promotion and Tenure Committee, 2016–present.
- Moderator, Formation Committee for Calculus I Enhanced (Calculus I with coremediation), Fall 2016.

To Murray State University

- Mathematics Department Scholarship Committee, 2005–2006.
- Roads Scholars Outreach Team to Massac County, Illinois, 2005–2008.
- Mathematics Department Graduate Program Committee, 2006–2009.
- Mathematics Department Curriculum and Assessment Committee, 2009–2010.
- Faculty Adviser, Lee Clark Residential College Debate Team, 2005–2010.
- Faculty Adviser, University Academic Team (Quick Recall), 2006–2010.
- Search committee for chair of Mathematics Department, 2008–2009.
- Mathematics Department Study Abroad Ambassador, 2008–2010.
- Mathematics Department Library Contact, 2009–2010.

To the scientific community

- Co-Organizer, Graduate Student Workshop at Indiana section MAA meeting, Indiana State University, April 2–3, 2004; supported by an MAA grant for Pilot Programs to Support Graduate Student Participation
- MAA Liaison to Murray State University, 2008–2010.
- MAA Committee on Articulation and Placement, 2009–2015.

- Member, India National Screening Committee, Fulbright-Nehru Doctoral and Professional Research Fellowships, 2011.
- AMS Library Committee, 2013–2016.
- MAA Illinois Section Board of Directors, 2013–2016, 2017–present.
- MAA Illinois Section Two-Year College Committee, 2012–2015.
- MAA Illinois Section Finance Committee, 2013–present.
- MAA Illinois Section Program Committee, 2017–present.
- MAA Committee on Mathematical Education of Teachers (term begins January 2017).
- Referee for journals, conference proceedings, and Mathematical Reviews.

To the University of Notre Dame

- Mathematics Department Graduate Student Seminar Organizer, 2001–2004
- University Committee on Libraries, 2002–2005
- Teaching, Learning, and Technology Roundtable Subcommittee on Student Computer Ownership, January – October 2002
- University Traffic Appeals Committee and Parking Committee, 2001–2002
- Department Graduate Student Recruiting committee, Spring 2002 – Spring 2004

Honors

Outstanding Graduate Student Teacher Award for Excellence in Teaching, 2004, awarded by the Kaneb Center for Teaching and Learning.
Project NEXt Fellow 2006–2007

Memberships

American Mathematical Society, Mathematical Association of America, National Council of Teachers of Mathematics, Association for Symbolic Logic, Association for Computing Machinery, Sigma Xi