

# Carl Mummert

## Curriculum Vitae

July 13, 2021

Department of Computer  
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### Education

**PhD Mathematics** Eberly College of Science, Pennsylvania State University, 2005.  
Thesis Advisor: Stephen G. Simpson

**Bachelor of Science** Honors College, Western Carolina University, 2000, *summa cum laude*.  
Majors: Mathematics and Computer Science.

### Postgraduate Employment

**Marshall University** Professor, Dept. of Computer and Information Technology, 2021 to present.  
Associate Professor, Dept. of Mathematics, 2015–2021.  
Assistant Professor, Dept. of Mathematics, 2009 to 2015.

**University of Michigan** Assistant Professor, Dept. of Mathematics, 2006 to 2009.  
A full-time postdoctoral position.

**Appalachian State University** Adjunct Assistant Professor, Dept. of Mathematics, 2005 to 2006.  
A full-time postdoctoral position.

### Administrative Positions

**Marshall University** Interim Assistant Provost, Fall 2021 to present.  
Academic Affairs Faculty Fellow for Academic Programs, Spring 2021.  
Chair, Dept. of Computer and Information Technology, 2020–2021.  
Director, Writing Across the Curriculum, Spring 2020–Spring 2021.

### Peer-reviewed Research Papers

“Using Ramsey’s Theorem once”, Jeffrey L. Hirst and Carl Mummert. *Archive for Mathematical Logic* v. 58, 2019, pp. 857-866.

“On erasure combinatorial batch codes”, JiYoon Jung, Carl Mummert, Elizabeth Niese,  
and Michael Schroeder. *Advances in Mathematics of Communications* v. 12 n. 1, 2018, pp. 49–65.

“Reverse mathematics of matroids”, Jeffrey L. Hirst and Carl Mummert. In *Computability and Complexity: Essays Dedicated to Rodney G. Downey on the Occasion of His 60th Birthday*, Day, Fellows, Greenberg, Khossainov, Melnikov, and Rosamond (Eds.), *Theoretical Computer Science*, 2017, pp. 143–159.

“On the existence of a connected component of a graph”, Kirill Gura, Jeffrey L. Hirst,  
and Carl Mummert. *Computability* v. 4 n. 2, 2015, pp. 103–117.

**Peer-reviewed Research Papers (continued)**

- “The modal logic of Reverse Mathematics”, Carl Mummert, Alaeddine Saadaoui, and Sean Sovine. *Archive for Mathematical Logic* v. 54 n. 3, 2015, pp. 424–437.
- “On the strength of the finite intersection principle”, Damir D. Dzhafarov and Carl Mummert. *Israel Journal of Mathematics*, v. 196 n. 1, 2013, pp. 345–361.
- “On the number of mates of Latin squares of size 7 and 8”, Megan Bryant, James Figler, Roger Garcia, Carl Mummert, and Yudhisthir Singh. Proceedings of the 44th Southeastern International Conference on Combinatorics, Graph Theory, and Computing, *Congressus Numerantium* v. 217, 2013, pp. 53–64.
- “Reverse mathematics and properties of finite character”, Damir D. Dzhafarov and Carl Mummert. *Annals of Pure and Applied Logic* v. 163 n. 9, 2012, pp. 1243–1251.
- “Reverse mathematics and uniformity in proofs without excluded middle”, Jeffrey L. Hirst and Carl Mummert. *Notre Dame Journal of Formal Logic* v. 52, 2011, pp. 149–162.
- “Stationary and convergent strategies in Choquet games”, François G. Dorais and Carl Mummert. *Fundamenta Mathematicae* v. 209 n. 1, 2010, pp. 59–79.
- “Topological aspects of poset spaces”, Carl Mummert and Frank Stephan. *Michigan Mathematical Journal* v. 59, 2010, pp. 3–24.
- “Subsystems of second-order arithmetic between  $RCA_0$  and  $WKL_0$ ”, Carl Mummert. *Archive for Mathematical Logic*, v. 47 n. 3, 2008, pp. 205–210.
- “Reverse Mathematics of MF spaces”, Carl Mummert. *Journal of Mathematical Logic*, v. 6 n. 2, 2007, pp. 203–232.
- “Filters on computable posets”, Steffen Lempp and Carl Mummert. *Notre Dame Journal of Formal Logic*, v. 47 n. 4, 2006, pp. 479–485.
- “Reverse Mathematics and  $\Pi_2^1$  comprehension”, Carl Mummert and Stephen G. Simpson. *Bulletin of Symbolic Logic*, v. 11 n. 4, 2005, pp. 526–533.
- “An incompleteness theorem for  $\beta_n$ -models.” Carl Mummert and Stephen G. Simpson. *Journal of Symbolic Logic*, v. 69 n. 2, 2004, pp. 612–616.

**Invited Articles**

- Review of *Reverse Mathematics: Proofs From the Inside Out* by John Stillwell. Carl Mummert. *Notices of the American Mathematical Society* v. 65, n. 9, 2018, pp. 1098–1102.

**Books**

- Finite Fields and Applications*. Gary L. Mullen and Carl Mummert. AMS Student Mathematics Library, v. 41 (2007). 175 pages.

**Funded External Grants**

- Graduate Fellowship for Sean Sovine. WV NASA Space Grant Consortium, 2016–2017. Supervisor. REU Site: Undergraduate Research in Combinatorics at Marshall University, U.S. National Security Agency, 2016–2018, no. H98230-16-1-0028, Co-PI.

**Internal Grants**

- Hedrick Teaching Fellow, Marshall University, 2018–2019. This award gives support to conduct a project on Inquiry-Based Learning with the Marshall Center for Teaching and Learning.

## Awards

- John & Francis Rucker Graduate Advisor of the Year Award, Marshall University, 2017.  
Distinguished Artists and Scholars Award (Team), with Elizabeth Niese and Michael Schroeder, Marshall University, 2017.  
Distinguished Artists and Scholars Award (Individual), Marshall University, 2015.  
Distinguished Alumni Award, Western Carolina University College of Arts and Sciences, 2010.

## Invited research talks

- König's edge coloring theorem and related results*, Southeast Atlantic Logic Seminar (SEALS), February 2021.  
*The strength of König's edge coloring theorem*, Southern Illinois University Online Logic Seminar, September 2020.  
*Reverse mathematics and excluded middle*, Southern Illinois University Pure Mathematics Conference, May 2019.  
*Counting down from infinity*, Mathematical Association of America Ohio Section Meeting, April 2019. Invited one-hour talk for a broad audience.  
*On the existence of a connected component of a graph*. Dagstuhl Workshop, Measuring the Complexity of Computational Content, September 2015.  
*Reverse mathematics and the axiom of choice*. Reverse Mathematics Workshop, University of Chicago, September 2011.  
*Reverse mathematics and uniformization*. Reverse Mathematics: Foundations and Applications, University of Chicago, November 2009.  
*Reverse mathematics, general topology, and MF spaces*. Sendai Logic and Philosophy Seminar, Matsushima, Japan, February 2009. Two one-hour talks.  
*Reverse mathematics and one-point compactifications*. Special session on computability theory, ASL annual meeting, Gainesville FL, March 2007.  
*Maximal filter spaces*. Special session on asymmetric topology, 21st Summer Conference on Topology and its Applications, Statesboro GA, July 2006.  
*Uniformity and set existence proofs*. Special session on effective aspects of measure theory and analysis, ASL annual meeting, Montreal, May 2006.  
*Filters on computable posets*. Special session on model theory and computability, AMS sectional meeting, U. Notre Dame, April 2006.  
*Representing second countable topological spaces in second-order arithmetic*. Special session on reverse mathematics, AMS/ASL Joint Meetings, Atlanta, January 2005.

## Contributed research talks

- Weihrauch reducibility and finite-dimensional subspaces*, Carl Mummert and Sean Sovine, AMS/ASL Joint Mathematics Meetings, Atlanta, January 2017.  
*The modal logic of Reverse Mathematics*. AMS/ASL Joint Mathematics Meetings, Baltimore, January 2014.  
*Reverse Mathematics and the axiom of choice*. AMS/ASL Joint Mathematics Meetings, New Orleans, January 2011.  
*Convergent and stationary strategies in Choquet games*. ASL annual meeting, Washington D.C., March 2010.  
*Reverse mathematics and uniformity*. Special section on constructive mathematics, AMS sectional meeting, Boca Raton, November 2009.

*Topological aspects of poset spaces.* AMS/ASL Joint Meetings, San Diego, January 2008.

### **Contributed research talks (continued)**

*Reverse mathematics and  $\Pi_2^1$  comprehension.* AMS/ASL Joint Meetings, San Antonio, January 2006.

### **External colloquium and seminar talks**

*Counting down from infinity, and TREE(3).* Appalachian State University, March 2020.

*Incompleteness in mathematics.* Appalachian State University, March 2016.

*What is “reverse” mathematics?* University of Dayton, March 2015.

*Graph theory, reverse mathematics, and Weihrauch reducibility.* Dartmouth College, May 2014.

*The modal logic of Reverse Mathematics.* University of Connecticut, October 2013.

*Stationary and convergent strategies in Choquet games.* University of Dayton, November 2012.

*The axiom of choice in mathematics and computability.* Appalachian State Univ., October 2011.

*The axiom of choice in mathematics and computability.* Western Carolina Univ., September 2010.

*Reverse mathematics, topology, and Choquet games.* University of Chicago, May 2010.

*Reverse mathematics.* Western Carolina University, March 2010.

*Stationary and convergent strategies in Choquet games.* Penn State, September 2009.

*Convergent and stationary strategies in Choquet games.* UCLA Logic Colloquium, April 2009.

### **Other conferences attended**

AMS/ASL Joint Meetings, 2010, 2012, 2013, 2018, 2019, 2020.

Reverse Mathematics of Combinatorial Principles, Casa Matemática, Oaxaca, September 2019.

Measuring the Complexity of Computational Content, Dagstuhl seminar, September 2018.

Association for Symbolic Logic annual meeting. Western Illinois U., 2018; Connecticut, 2017; U. Notre Dame, 2009.

32nd Summer Conference on Topology and its Applications, University of Dayton, June 2017.

Workshop on New Challenges in Reverse Mathematics, University of Singapore, January 2016.

Seminar on New Trends in Gödelian Incompleteness, Oberwolfach Mathematical Research Institute, October 2011.

Workshop on Computability, Reverse Mathematics and Combinatorics, Banff International Research Station, December 2008.

### **Professional society memberships**

*Association for Symbolic Logic, American Mathematical Society, Mathematical Association of America, Computability in Europe*

### **Professional service**

Program Coordinator, MAA Special Interest Group (SIGMAA) on Inquiry Based Learning. 2019–2021.  
*30th Cumberland Conference on Combinatorics, Graph Theory, and Computing*, Marshall University, May 2018. Co-organizer.

*Conference on the Foundational Impact of Recursion Theory*, University of Connecticut, May 2016. Co-organizer.

*MAA Ohio Section Meeting*, Marshall University, March 2015. Organizing committee member.

*Special Session on the Life and Legacy of Alan Turing*, 2012 Joint Mathematics Meetings.

Co-organizer, representative to the Turing Centenary Advisory Committee for Alan Turing Year.

Refereeing for *Memoirs of the AMS*, *Journal of Symbolic Logic*, *Notre Dame Journal of Formal Logic*, *Mathematical Logic Quarterly*, proceedings of the annual *Logic Colloquium*, the *Computability in Europe* annual meeting, and *Rose-Hulman Undergraduate Mathematics Journal*. Reviewing for *Mathematical Reviews* (MathSciNet), 2010–present.

### **Selected University Service Activities**

Marshall University Leadership Fellows Program, 2021.

Marshall University Faculty Senate Parliamentarian, 2018–2021.

Marshall University Strategic Planning Committee, Co-Chair. 2016–2019.

Marshall University Persistence and Completion Team (PACT), 2017–2019.

Marshall University Mission Statement Committee. 2018.

Marshall University Provost Search Committee. College of Science representative, 2018.

Marshall University Digital Humanities Steering Committee, Fall 2017–present.

Marshall University Mathematics Department Assistant Chair for Graduate Studies.  
Fall 2015; 2016–2020.

Marshall University Budget Working Group. Faculty representative, 2015–2018.

Marshall University Writing Across the Curriculum Committee. Member, 2013–2020.

Marshall University Leadership Academy. Participant, August 2011–May 2012.

## Teaching

### Classes taught as primary instructor

#### Marshall University

*Concepts and Applications* (MU Math 121), Spring 2013, Fall 2017. Writing intensive.  
*Applied Calculus* (MU Math 140), Fall 2011, Fall 2013.  
*Applied Mathematical Reasoning* (MU Math 160), Spring 2014, Fall 2015, Spring 2018.  
Writing intensive.  
*Discrete Structures* (MU Math 220), Fall 2014, Fall 2017.  
*Calculus I* (MU Math 229), Fall 2009, Spring 2010, Spring 2011.  
*Calculus I Honors* (MU Math 229H), Fall 2016. Writing intensive.  
*Calculus III* (MU Math 231), Fall 2009, Spring 2010, Spring 2013.  
*Introduction to Higher Mathematics* (MU Math 300), Fall 2010, Spring 2012. Writing intensive.  
*Linear Algebra* (MU Math 331), Fall 2013, Fall 2016.  
*History of Mathematics* (MU Math 405), Spring 2015, Spring 2019. Writing intensive.  
*Numerical Linear Algebra* (MU Math 442/642), Spring 2017.  
*Abstract Algebra I* (MU Math 450/550), Fall 2009.  
*Abstract Algebra II* (MU Math 452/552), Spring 2010.  
*Senior Seminar* (MU Math 485), Fall 2017. Writing intensive.  
*Graduate Mathematics Seminar* (MU Math 589), Fall 2012–present.  
*Advanced Topology* (MU Math 632), Spring 2011.  
*Topology I* (MU Math 430/630), Fall 2011, Fall 2015.  
*Topology II* (MU Math 431/631), Spring 2016.  
*Combinatorics and Graph Theory* (MU Math 440/635), Spring 2014.  
*Real Variables I* (MU Math 650), Fall 2011.  
*Real Variables II* (MU Math 652), Spring 2012.  
  
*Exploring the World with Computing* (MU CIT 105), Spring 2021.  
*Introduction to C++* (MU CIT 163), Fall 2020.  
  
*Applied Algorithms* (MU CS 620), Spring 2015, Spring 2016, Spring 2018.  
  
*Mathematicians on Film* (MU HON 480), Honors seminar, Spring 2017. Writing intensive.

#### University of Michigan

*Calculus I* (UM Math 115), Fall 2006, Fall 2008, Spring 2009.  
*Linear Algebra* (UM Math 217), Fall 2008.  
*Principles of Analysis* (UM Math 351), Fall 2006, Spring 2007, Spring 2008.  
*Introduction to Mathematical Logic* (UM Math 481), Fall 2007.

#### Appalachian State University

*Introduction to Mathematics* (ASU Math 1010), Fall 2005, Spring 2006.  
*Business Calculus* (ASU Math 1030), Fall 2005.

### Other teaching

*Coding for the Digital Humanities*, assisted with course, Fall 2019.  
*Independent studies*. Set theory, Fall 2010. Fourier analysis, Spring 2012. Sturm–Liouville theory, Spring 2013. Mathematical logic, Spring 2014. Research in topology, Fall 2014. Multivariable Calculus, Spring 2016. Introduction to higher mathematics, Spring 2017. Mathematical logic, Spring 2018. Proof verification in Lean, Spring 2019.  
*Special topics*. Hilbert’s 10th Problem, Fall 2017. Computability theory, Fall 2012.

**Other teaching (continued)**

*Special topics: COMAP modeling contest.* Instructor, Marshall University, Spring 2011, Spring 2020.

This course prepared undergraduate students to participate in the international COMAP mathematics contest. Modeled after course at Appalachian State. Enrollment: 6 per course.

*Appalachian State U. Math 3530: COMAP modeling contest.* Co-instructor, Spring 2007. Course prepared undergraduate students to participate in the international COMAP mathematics contest. Course emphasizes problem solving, scientific writing, and oral presentation of research.

*Penn State MASS Program.* Teaching assistant, Fall 2004. Advised undergraduate research.

**Student research**

Research collaboration with James Michael Waldeck, Spring–Fall 2018.

Supervised mathematics master's thesis for Junya Kasahara, "Universal quantum computation", 2018–2019.

Supervised mathematics master's thesis for Sean Sovine, "Weihrauch reducibility and finite-dimensional subspaces", 2015–2017.

Supervised undergraduates in the Marshall Combinatorics REU. Summer 2016: Tyler Davis, Christopher DeFiglia, and Rylee Shell.

Research collaboration with Kirill Gura, Spring 2014 to Spring 2015. This project resulted in a peer-reviewed publication with Gura and Jeffry Hirst.

Supervised mathematics master's thesis for Alaeddine Saadaoui, "On the logic of Reverse Mathematics", 2011–2012. This project resulted in a peer-reviewed publication with Saadaoui and Sean Sovine.

Supervised CIT undergraduate capstone project, Emily Strickler, Fall 2020.

Supervised mathematics undergraduate capstone projects.

Skylar Mease, "PAC Learning", Fall 2020.

Mike Waldeck, "Row-cyclic Latin Squares", Fall 2019.

Toby Hartwell, "Three Digit Base Infinity Numbers", Spring 2019.

Jacquelyn Sizemore, "Batch Processing of Chromatogram Data Using GNU Octave", Spring 2019.

Samantha Colbert, "Base Infinity Numbers", Spring 2018.

Ashley Dunham, "Hall's Marriage Theorem", Fall 2017.

Sarah Willis, "The Stable Marriage Theorem", Fall 2017.

Katherine Runyon, "Nontrivial rational powers of  $e$  are irrational", Spring 2017.

Emily Ferguson, "Possible values of  $\pi$ ", Summer 2016.

Christina Carrion, "Modular Rado numbers", Fall 2015.

Abby Holleron, "The Poincaré disc model", Fall 2015.

Brian Stligenbauer, "Sphere packings", Fall 2014.

Richard Campbell, "Latin squares", Spring 2014.

Rebecca Hovermayer, "An analysis of the game LCR", Spring 2014.

Jeffrey Strachan, "The Erdős–Rado theorem", Fall 2013.

Sean Sovine, "The implicational logic of Reverse Mathematics", Summer and Fall 2011.

Sovine presented this research at the West Virginia Research Day at the Capitol, 2012.

Supervised undergraduates in the Marshall Computational Science REU. The research project, "Computational experiments on latin squares", resulted in a peer-reviewed publication.

Summer 2011: James Figler and Yudhisthir Singh.

Summer 2012: Megan Bryant and Roger Garcia.

**Student research (continued)**

Supervised master's projects for computer science students.

Ugochi Ugwunna, Fall 2015–Spring 2016. Alexandra Martynova, Fall 2015–Spring 2016.

Ngoc Truong, Fall 2016. Benjamin Dean, Fall 2016. Hai Nguyen, Fall 2016.

Supervised undergraduate computer science capstone for Luke Brumfield and Caleb Spencer,

Fall 2012–Spring 2013.

**Teaching conference presentations**

*A classroom experience with inquiry-based learning*, with Nathaniel Miller (U. Northern Colorado), MAA Workshop, Joint Mathematics Meetings, January 2020.

*What's up with inquiry-based learning*, Mathematical Association of America Ohio Section Project NeXT workshop, April 2019.

Digital Humanities Panel at HerdCon, invited panelist, March 2019. Spoke about the the study of pop culture in the Mathematics on Film course.

*Panel: Digital humanities teaching and learning*, with Janet Carleton, Joe Carver, Kristen Lillvis, and Linda J. Rice. Ohio University Spotlight on Teaching Conference, May 3, 2018.

*Using innovative grading systems to enhance learning and make your life easier*, with Michael Castellani, Kristen Lillvis, and Nicole Winston. Marshall University Inquiring Pedagogies Workshop, August 2017.

*A non-quantitative grading system for senior-level courses*, MAA Ohio Section Meeting, March 2016.

*Developing a student-centered research program*, Marshall University Inquiring Pedagogies Workshop, August 2015.

*An inquiry-based introduction to proofs course*. Project NExT Ohio workshop. October 2012.

*An inquiry-based, writing intensive introduction to proofs course*. MAA General Contributed Paper Session: Teaching Mathematics Beyond the Calculus Sequence, January 2012.

*IBL Analysis and Topology*. Co-presenter for a 150 minute session with Bill Breslin, Khalid Bou-Rabee, Mort Brown, and Richard Canary. Workshop on Inquiry-Based Learning, University of Michigan, May 2011. National conference.

**Teaching outreach presentations**

*Panel: Pop culture in the classroom*. HerdCon, March 17, 2019.

**Teaching conferences and workshops attended**

Online Mastery Grading Conference, June 2021.

Webinar: Conversations on Diversity, Equity, and Inclusion. Mathematical Association of America, Three 90 minute sessions, Fall 2020.

Online Mastery Grading Conference, June 2020.

National IBL Conference. Austin TX, June 2018. Denver, June 2019.

Legacy of R.L. Moore conference. Washington DC, June 2011. Austin TX, June 2013.

Workshop on Inquiry-Based Learning, University of Michigan, May 2011.

Invited speaker.

Legacy of R.L. Moore conference, Austin TX, July 2009.

Invited member for panel of educators new to inquiry-based learning.

**Seminars, certificates and courses**

MAA Diversity, Equity, and Inclusion webinar series, August 2020.

Faculty Learning Community, “Digital Humanities”, Marshall University, 2017–2018.

Faculty Book Club, “Innovative Grading Strategies”, Coordinator, Marshall University, Fall 2016.

Faculty Learning Community, “Integrating the Humanities and STEM”, Marshall University, 2015–2016.

Inquiry-based Learning Workshop, Costa Mesa CA, June 25–29, 2007.

Course on College Teaching, PSU Schreyer Institute for Teaching Excellence, 2004.

Teaching with Technology Certificate, PSU, 2004.

Teaching Associate Certificate, PSU Math. Dept., 2004.

Graduate Student Teaching Award, PSU Math. Dept., 2002.