

# SEAN D. COX

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## EDUCATION AND EMPLOYMENT

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- **Assistant Professor**, Virginia Commonwealth University, Department of Mathematics and Applied Mathematics (Fall 2012 to present).
- **Fields Postdoctoral Fellow** for the *Thematic Program on Forcing and its Applications* (Fields Institute, July-December 2012).
- **Akademischer Rat auf Zeit** (postdoctoral position), Institute for Mathematical Logic and Basic Research, University of Münster, Germany (November 2009 to May 2012). *Supervisor*: Dr. Ralf Schindler.
- **Ph.D. in Mathematics**, University of California, Irvine (2009). *Dissertation*: “Covering theorems for the core model, with applications.” *Advisor*: Dr. Martin Zeman. Received the department’s *Kovalevsky Outstanding PhD Thesis Award*.
- **Economist**, Regional Economic Research, San Diego, CA (2001–2002) and Triangle Economic Research, Durham, NC (1999–2001).
- **B.A. in Economics**, North Carolina State University (1999).

## GRANTS, AWARDS, AND FELLOWSHIPS

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- VCU Presidential Research Quest Fund (PI), 7/1/16-12/31/17, \$40,000. Project title: *Open problems in the foundations of mathematics*. Co-PIs: Brent Cody and Monroe Eskew.
- Simons Foundation Collaboration Grant for Mathematicians (PI), 2014–2019, \$35,000. Project title: *Forcing and the nonstationary ideal*.
- Fields Postdoctoral Fellow for the *Thematic Program on Forcing and its Applications* (July-December 2012).
- Obtained grant from the European Science Foundation (ESF) to visit and collaborate with Dr. Matteo Viale in Torino, Italy (November 2011).
- Obtained grant from ESF to attend Third European Set Theory Conference (July 2011).
- *Kovalevsky Outstanding PhD Thesis Award 2008-2009*, UC-Irvine Mathematics Department.
- Obtained grant to attend the 2009 Young Set Theorist Workshop in Barcelona, Spain.
- Obtained NSF/ASL grant to attend the 2009 annual meeting of Association for Symbolic Logic.
- *Von Neumann Award for Outstanding Performance as a Graduate Student 2006-2007*, UC-Irvine Mathematics Department.
- UC-Irvine mathematics department fellowships (Winter 2007, Summer 2007, Spring 2008).

## SUBMITTED PAPERS CURRENTLY UNDER REVIEW

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- *On the universality of the nonstationary ideal*, submitted April 2017.
- (with Monroe Eskew) *Strongly proper forcing and some problems of Foreman*, submitted December 2016.
- (with John Krueger) *Namba forcing, weak approximation, and guessing*, submitted October 2016.
- *Chang’s Conjecture and semiproperness of nonreasonable posets*, submitted May 2016.

## REFEREED PUBLICATIONS

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- (with John Krueger) *Indestructible guessing models and the continuum*, to appear in *Fundamenta Mathematicae*.
- *Layered posets and Kunen's universal collapse*, to appear in *Notre Dame Journal of Formal Logic*.
- (with Philipp Lücke) *Characterizing large cardinals in terms of layered posets*, *Annals of Pure and Applied Logic*, Volume 168 (2017), Issue 5, pages 1112–1131.
- (with Dominik Adolf and Philip Welch) *Lower consistency bounds for mutual stationarity with divergent uncountable cofinalities*, to appear in *Israel Journal of Mathematics*.
- (with John Krueger) *Quotients of strongly proper forcings and guessing models*, *J. Symb. Log.* 81 (2016), no. 1, 264–283.
- (with Brent Cody) *Indestructibility of generically strong cardinals*, *Fundamenta Mathematicae* 232 (2016), no. 2, 131–149.
- *Prevalence of Generic Laver Diamond*, *Proceedings of the American Mathematical Society*, Volume 143, Number 9, September 2015, pages 4045–4058.
- (with Martin Zeman) *Ideal projections and forcing projections*, *The Journal of Symbolic Logic*, Volume 79, Issue 04, December 2014, pp 1247–1285.
- (with Matteo Viale) *Martin's Maximum and Tower Forcing*, *Israel Journal of Mathematics* 197 (2013), Issue 1, pp 347–376.
- *The Diagonal Reflection Principle*, *Proceedings of the American Mathematical Society* 140 (2012), no. 8, 2893–2902.
- *PFA and ideals on  $\omega_2$  whose associated forcings are proper*, *Notre Dame Journal of Formal Logic* 53 (2012), no. 3, 397–412.
- *Consistency strength of higher Chang's Conjecture, without CH*, *Archive for Mathematical Logic* 50 (2011), no. 7, 759–775.
- *Nonregular ultrafilters on  $\omega_2$* , *J. Symbolic Logic* 76 (2011), no. 3, 827–845.
- *Covering theorems for the core model, and an application to stationary set reflection*, *Ann. Pure Appl. Logic* 161 (2009), no. 1, 66–93.

## PRESENTATIONS

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### Invited talks:

- *Strong Chang's Conjecture and semiproperness of nonreasonable posets*, Rutgers Logic Seminar (May 2017).
- *Layered posets, weak compactness, and Kunen's universal collapse*, Set Theory special session, North American Annual Meeting of the Association of Symbolic Logic (May 2016).
- *Layered posets, weak compactness, and Kunen's universal collapse*, U. of Turin Logic Seminar (March 2016).
- *Indestructible guessing models*, U. of Illinois Chicago Logic Seminar (February 2016).
- *Guessing models*, UC-Irvine Logic Seminar (January 2016).
- *Layered partial orders*, CUNY Set Theory Seminar (October 2015).
- *Quotients of strongly proper posets, and related topics*, Forcing and its Applications Retrospective Workshop, Fields Institute (March 2015).
- *Lifting behavior and antichain structure of ideal quotients*, Millican Colloquium, University of North Texas (April 2014).
- *Is there a Truth Calculator for all of mathematics?* Colloquium talk to the mathematics department at Washington and Lee University (November 2013)(expository talk).
- *Forcing Axioms and the Baire Category Theorem*, Seminar in Operator Theory and Operator Algebras, University of Virginia (November 2013).

- *Presaturation and bounding by canonical functions on NS restricted to  $S_1^2$* , Fall 2013 Sectional Meeting of the American Mathematical Society, Special Session on Set Theory and Its Applications, Louisville, Kentucky (October 2013)
- *Some consistency results about saturated ideals*, special session on Set Theory at the 2013 North American annual meeting of the Association of Symbolic Logic, Waterloo, Canada (May 2013).
- *Generalized Laver Diamond*, Spring 2013 Southeastern Sectional Meeting of the American Mathematical Society, Special Session on Set Theory and Its Applications, Oxford, Mississippi (February 2013).
- *Coding reals by clubs in  $[\omega_2]^\omega$* , UC-Irvine Logic Seminar (October 2012).
- *Some topics related to bounding by canonical functions*, Young Set Theory Workshop, Luminy, France (May 2012).
- *Ideal projections as forcing projections*, Canadian Mathematical Society Winter Meeting (December 2011).
- *Ideal projections as forcing projections*, Logic seminar, University of Torino, Italy (November 2011).
- *Compactness and tower forcing*, UC-Irvine Logic Seminar (October 2011).
- *The Diagonal Reflection Principle and well-determined generic ultrapowers*, UC-Irvine Logic Seminar (two 2-hour sessions, September/October 2011).
- *Martin's Maximum and limitations on presaturated towers*, University of Colorado Boulder logic seminar (September 2011).
- *The tree property and elementary embeddings*, Graduate Colloquium, University of Denver math department (September 2011).
- *Forcing axioms and generic ultrapowers with critical point  $\omega_2$* , Carnegie Mellon Logic Seminar (March 2011).
- *Diagonal Stationary Reflection and Generic Ultrapowers*, Cornell University Logic Seminar (February 2011).
- *Diagonal Stationary Reflection and Generic Ultrapowers*, 2011 Mid Atlantic Mathematical Logic Seminar at Harvard University (February 2011).
- *The Diagonal Reflection Principle*, Torino set theory workshop, Italy (November 2010).
- *Natural ideals under PFA*, Special Session on Large Cardinals and the Continuum, 2010 Fall Western Section Meeting of the AMS, UCLA (October 2010).
- *Catching slender functions*, UC-Irvine Logic Seminar (two 2-hour sessions, October 2010).
- *Nonregularity*, Amsterdam Workshop in Set Theory (June 2010).
- *The Chang Ideal*, Universität Bonn Oberseminar (April 2010).
- *Reflection of stationary sets at small cofinalities*. Workshop on Fine Structure and Inner Model Theory, Oberwolfach, Germany (November 2009).
- *Consistency Strength of Combinatorial Properties at Small Regular Cardinals*, UCLA Logic Colloquium (January 2009).
- *A covering theorem for the core model, with applications*. Special session on set theory, annual meeting of the Association for Symbolic Logic, Irvine, CA (March 2008).

#### **Extended workshop presentations:**

- *Graduate summer school in set theory: large cardinals, inner models, and fine structure*, Irvine (five 1.5 hour lectures, June 25-29, 2012).

#### **Other talks (contributed talks, talks at home institution, etc.):**

- *The universality of the nonstationary ideal*. VCU Analysis, Logic, and Physics Seminar (March 2017).
- *Filters, ultrafilters, and applications*. VCU Analysis, Logic, and Physics Seminar (November 2016).
- *What do ultrafilters have to do with finite graphs?* VCU Discrete Math Seminar (September 2016).
- *Elementary submodels: the next best thing to circular reasoning*, VCU Analysis, Logic, and Physics Seminar (January 2016).

- *Is there a truth calculator for mathematics?*, VCU Honors College Berglund Seminar Series (September 2015).
- *Saturated ideals and regular embeddings of Boolean Algebras*, VCU Analysis, Logic, and Physics Seminar (September 2013).
- *Forcing Axioms and the Baire Category Theorem*, VCU Analysis, Logic, and Physics Seminar (September 2013).
- *Undecidable problems in mathematics*, VCU Honors College Berglund Seminar Series (April 2013).
- *Random Graphs, zero-one laws, and model theory*, VCU Discrete Math Seminar (March 2013).
- *Suslin's Problem*, VCU Analysis, Logic, and Physics Seminar (2 sessions, January 2013).
- *Antichain catching at  $\omega_1$  versus antichain catching at  $\omega_2$* , Toronto Set Theory Seminar (December 2012).
- *Coding reals by clubs in  $[\omega_2]^\omega$* , Oberseminar in Logic, University of Münster (April 2012).
- *Compactness properties of the 2nd uncountable cardinal*, MAA Contributed talk session, Joint Mathematics Meetings, Boston (January 2012).
- *Martin's Maximum and Tower Forcing*, ASL Contributed talk session, Joint Mathematics Meetings, Boston (January 2012).
- *Ideal projections as forcing projections*, Oberseminar in Logic, University of Münster (October 2011).
- *Martin's Maximum and Tower Forcing*, Oberseminar in Logic, University of Münster (June 2011).
- *Some current research in Set Theory*, joint presentation at the Münster SFB Conference (July 2011).
- *Forcing axioms and correct models*, Oberseminar in Logic, University of Münster (four 2-hour sessions, December 2010 and January 2011).
- *The tree property*, Fall 2010 SoCal-Nev Section Meeting of the MAA, UC-Irvine (October 2010).
- *Forcing Axioms and ideals on  $\omega_2$* , Colloquium Logicum 2010, Münster, Germany (September 2010).
- *Moore's Map Reflection Principle*, Oberseminar in Logic, University of Münster (four 2-hour sessions, May 2010).
- *Stationary set reflection, square, and covering theorems*. Oberseminar in Logic, University of Münster (four 2-hour sessions, November 2009 to January 2010).
- *The mathematical uses and philosophical aspects of downward reflection*, MathFest 2009 (Portland, OR).
- *The Löwenheim-Skolem Theorem and countable models*. UC-Irvine Undergraduate Colloquium (May 2009).
- *Strong ideal properties which yield extenders in the core model*. Annual meeting of the Association for Symbolic Logic, Notre Dame IN (May 2009).
- *Consistency strength of variants of Chang's Conjecture*. UC-Irvine Logic Seminar (six sessions, Winter and Spring 2009).
- *Covering properties of the core model*. V.I.G. conference at UCLA (February 2008).
- *Weakly normal ultrafilters*. UC-Irvine Logic Seminar (six 2-hour sessions, Fall 2007 and Spring 2008).
- *Relative Consistency in Set Theory*. UC-Irvine Math Graduate Student Colloquium (March 2007).

## COURSES TAUGHT

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- Math 602 Abstract algebra. Spring 2015.
- Math 601 Abstract algebra. Fall 2014.
- Math 591 Topics course: Logic and Mathematical Structures. Spring 2014 (jointly with Brent Cody).
- Math 591 Topics course: Filters, ultrafilters, and applications. Spring 2017 (jointly with Brent Cody and Monroe Eskew as part of PERQ grant).
- Math 509 Topology. Fall 2015.
- Math 492 Independent Studies. Summer 2013; Fall 2014; Spring 2015.

- Math 490 Mathematical Expositions. Spring 2014 (jointly with Brent Cody), Spring 2017.
- Math 407 Advanced Calculus. Fall 2016.
- Math 310 Linear Algebra. Spring 2016.
- Math 307 Multivariate Calculus. Fall 2013, Fall 2015.
- Math 300 Intro to mathematical reasoning. Spring 2013 (2 sections), Fall 2013, Spring 2014, Spring 2015, Spring 2016.

## PROFESSIONAL SERVICE

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- Organizer for *IdealFest* workshop to be held at VCU in May 2017.
- Co-organizer for *Mid-Atlantic Mathematical Logic Seminar*, held at Virginia Commonwealth University on April 1-2, 2017.
- Local organizer for *Appalachian Set Theory Workshop*, held at Virginia Commonwealth University on April 9, 2016.
- Organizer and facilitator for *Graduate Summer School in Set Theory 2015*, held at UC-Irvine from July 6-17, 2015.
- Regularly serve as referee for various mathematics journals.
- Reviewer for *MathSciNet* (the review database of the American Mathematical Society). See “Reviews Authored” section for complete list.
- Program Committee member for 2011 and 2013 Young Set Theory Workshops.
- Wrote the official report of the Workshop on Fine Structure and Inner Model Theory, Oberwolfach (2009).
- Reviewer of conference notes from Appalachian Set Theory meeting (2010).
- Panel member for 2009 TA Professional Development Program at University of California, Irvine.

## REVIEWS AUTHORED

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- “Three papers related to the Mitchell order,” to appear in the *Bulletin of Symbolic Logic*.
- *MathSciNet* review of Foreman’s “Ideals and generic elementary embeddings” (chapter in the *Handbook of Set Theory*) (MR2768692)
- *MathSciNet* review of Friedman-Lücke “Large cardinals and definable well-orders, without the GCH” (MR3292806)
- *MathSciNet* review of Hamkins-Johnstone “Resurrection axioms and uplifting cardinals” (MR3194674)
- Review of the *Fields Institute Distinguished Lecture Series* given by Matthew Foreman (*Fields Notes*, Winter 2013, Volume 12:3)
- *MathSciNet* review of Yasuo Yoshinobu “Operations, climbability and the proper forcing axiom” (MR3037549)
- *MathSciNet* review of Philipp Lücke “ $\Sigma_1^1$ -definability at uncountable regular cardinals” (MR2987148)
- *MathSciNet* review of Spencer Unger “Fragility and indestructibility of the tree property” (MR2945572)
- *MathSciNet* review of Sy-David Friedman “BPFA and inner models” (MR2857735).
- *MathSciNet* review of Andrew Brooke-Taylor “Indestructibility of Vopěnka’s Principle” (MR2805294).
- *MathSciNet* review of Thilo Weinert “The Bounded Axiom A Forcing Axiom” (MR2560728).
- *MathSciNet* review of Sy-David Friedman “Forcings which preserve large cardinals” (MR2752958).
- *MathSciNet* review of Arthur Apter “Indestructibility, instances of strong compactness, and level by level inequivalence” (MR2726733).

## SERVICE TO DEPARTMENT AND UNIVERSITY

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- Department Undergraduate Affairs Committee: 2014-2015, 2015-2016 (chair), 2016-2017 (Credentials Subcommittee).
- Department Assessment Committee (2016-2017).
- Department Colloquium Committee: 2014-2015.
- Department Majors' Capstone Committee: 2014-2015.
- Hiring Committee for department chair, Department of Mathematics and Applied Mathematics: 2013-2014.
- College of Humanities and Sciences Undergraduate Academic Committee: 2013-2014.
- Co-organizer, Analysis, Logic, and Physics Seminar: Spring 2013 to present.
- Department Undergraduate Curriculum Committee: 2012-2013.
- Department Undergraduate Credentials Committee: 2012-2013.

## **THESIS COMMITTEES**

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- Master's Thesis committee member for Alexander Bradford (VCU, August 2016)
- PhD Thesis committee for Giorgio Audrito (U. of Turin, Italy, March 2016)
- Master's Thesis committee member for Alexi Hoeft (VCU, May 2013)
- Master's Thesis committee member for Owen Puffenberger (VCU, April 2013)