

# ANTON BETTEN

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## Address

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## Education

2000: Ph.D. (Dr. rer. nat.), University of Bayreuth, Germany.

1995: MS (Diploma), University of Bayreuth, Germany.

## Research Interests

Algebraic Combinatorics, Group Actions, Coding Theory, Finite Geometry, Applications. Mathematical Algorithms and Software. Parallel computing.

## Employment

since 2008: Associate Professor at Colorado State University.

since 2002: Assistant Professor at Colorado State University.

2001 – 2002: Research fellow at the University of Western Australia, Perth, Australia

1996 – 2001: Research fellow and Assistant, University of Bayreuth

## Visiting Positions

2010: The University of Western Australia, Perth, Australia (1 semester)

2010: Osaka Prefecture University, Osaka, Japan (3 weeks)

2011: Osaka Prefecture University, Osaka, Japan (3 weeks)

## Grants

NSF grant: “Rocky Mountain Algebraic Combinatorics Seminar and Miniconferences” (award number 1415511) March 15, 2014 – February 28, 2017. \$37,459.00

## Publications

### Books

1. A. Betten, H. Friepertinger, A. Kerber, A. Wassermann, K.-H. Zimmermann. Codierungstheorie, Konstruktion und Anwendung Linearer Codes Springer Verlag 1998.
2. Anton Betten, A. Kohnert, R. Laue, A. Wassermann (eds). Algebraic Combinatorics and Applications *Proceedings of the Euroconference Algebraic Combinatorics and Applications (ALCOMA) held in Goessweinstein, Germany, September 12-19, 1999*. Springer Verlag 2000, 347+XI.
3. Anton Betten, Michael Braun, Harald Friepertinger, Adalbert Kerber, Axel Kohnert, Alfred Wassermann. Error-Correcting Linear Codes, Classification by Isometry and Applications, Algorithms and Computation in Mathematics 18, Springer Berlin Heidelberg New York 2006. ISSN 1431-1550. ISBN-10 3-540-28371-4. ISBN-13 978-3-540-28371-3.

### Book Chapters

1. Anton Betten. Partially Balanced Designs as Linear Spaces. In: *Handbook of Combinatorial Designs*. Second Edition. Charlie Colbourn and Jeff Dinitz (eds.), CRC Press, Boca Raton, 2006. pp. 266-270

### Papers etc.

1. A. Betten, A. Kerber, R. Laue, A. Wassermann. Es gibt 7-Designs mit kleinen Parametern! *Bayreuther Mathematische Schriften* 49 (1995), p. 213.
2. A. Betten, A. Kerber, A. Kohnert, R. Laue, A. Wassermann. Discovery of Simple 7-Designs with Automorphism Group  $P\Gamma L(2, 32)$ , *Springer LNCS* 948 (1995), 131-145.
3. Anton Betten. Parallel Construction of Finite Solvable Groups, *Proceedings EuroPVM'96*, TU Munich, Springer Lecture Notes in Computer Science 1156 (1996), 126-133.
4. A. Betten, A. Wassermann.  $\{0, 1\}$ -Solutions of Integer Linear Equation Systems *Proceedings EuroPVM'96*, TU Munich, Springer Lecture Notes in Computer Science 1156 (1996), 311-314.
5. Anton Betten, Dieter Betten. Regular Linear Spaces, *Beiträge zur Algebra und Geometrie* 38 (1997), 111-124.

6. A. Betten, R. Laue, A. Wassermann. Some simple 7-designs, In: Geometry, Combinatorial Designs and Related Structures, Proceedings of the First Pythagorean Conference, J. W. P. Hirschfeld, S. S. Magliveras, M. J. de Resmini (eds.) Cambridge University Press, *LMS Lecture Notes* 245 (1997), 15-25.
7. A. Betten, R. Laue, A. Wassermann. Simple 6- and 7-designs on 19 to 33 points, *Congressus Numerantium* 123 (1997), 149-160.
8. A. Betten, M. Klin, R. Laue, C. Pech. A computer approach to the enumeration of block designs which are invariant with respect to a prescribed permutation group, Universität Dresden, preprint MATH-AL-13-1997, November 1997, 74 pages.
9. Anton Betten, Reinhard Laue, Adalbert Kerber, Alfred Wassermann. Simple 8-Designs with Small Parameters, *Designs, Codes, Cryptography* 15 (1998), 5-27.
10. Anton Betten, Reinhard Laue, Alfred Wassermann. Simple 7-Designs With Small Parameters, *Journal of Combinatorial Designs* 7 (1999), 79-94.
11. Anton Betten, Dieter Betten. Linear spaces with at most 12 points, *Journal of Combinatorial Designs* 7 (1999), 119-145.
12. A. Betten, R. Laue, A. Wassermann. New  $t$ -designs and large sets of  $t$ -designs, *Discrete Mathematics* 197/198 (1999), 111-121.
13. A. Betten, M.C. Klin, R. Laue, A. Wassermann. Graphical  $t$ -Designs via Polynomial Kramer-Mesner Matrices, *Discrete Mathematics* 197/198 (1999), 83-109.
14. Anton Betten, Dieter Betten. Proper Linear Spaces on 17 Points, *Discrete Applied Mathematics* 95 (1999), 83-108.
15. A. Betten, R. Laue, A. Wassermann. Simple 8-(40,11,1440) Designs, *Discrete Applied Mathematics* 95 (1999), 109-114.
16. A. Betten, R. Laue, A. Wassermann. A Steiner 5-Design on 36 Points, *Designs, Codes and Cryptography* 17 (1999), 181-186.
17. Anton Betten, Dieter Betten. Tactical decompositions and some configurations v4, *Journal of Geometry* 66 (1999), 27-41.
18. Anton Betten, Gunnar Brinkmann, Thomasz Pisanski. Counting symmetric configurations v3, *Discrete Applied Mathematics* 99 (2000), 331-338.
19. A. Betten, C. Alejandro, A. Niemeyer. Orderly Generation of Half-Regular Symmetric Designs via Rahilly Families of Pre-Difference Sets, *Journal of Geometry* 67 (2000), 2-22.
20. A. Betten, R. Laue, S. Molodtsov, A. Wassermann. Steiner Systems with Automorphism Groups  $PSL(2,71)$ ,  $PSL(2,83)$  and  $P\Omega L(2,3^5)$ , *Journal of Geometry* 67 (2000), 35-41.
21. Anton Betten, Schnitzzahlen von Designs, Thesis, University of Bayreuth. *Bayreuther Mathematische Schriften* 58 (2000), x:1-131.

22. Anton Betten, Dieter Betten. Note on the Proper Linear Spaces on 18 Points, *Proceedings of ALCOMA 1999*, Springer Verlag 2000, 40-54.
23. Evi Haberberger, Anton Betten, Reinhard Laue. Isomorphism Classification of  $t$ -Designs with Grouptheoretical Localisation Techniques Applied to some Steiner Quadrupel Systems on 20 Points, *Congressus Numerantium* 142 (2000), 75-96.
24. Reinhard Laue, Anton Betten, Evi Haberberger. A New Smallest Simple 6-Design With Automorphism Group  $A_4$ , *Congressus Numerantium* 150 (2001), 145-153.
25. Anton Betten, Dieter Betten, Vladimir Tonchev. Unitals and Codes, *Discrete Mathematics* 267 (2003) 23-33.
26. Anton Betten, Reinhard Laue, Alfred Wassermann. DISCRETA, a tool for constructing  $t$ -designs In: *Computer Algebra Handbook*, Edited by Johannes Grabmeier, Erich Kaltofen, Volker Weispfennig, Springer 2003, pp 372-375.
27. Anton Betten, Anne Delandtsheer, Alice C. Niemeyer, Cheryl E. Praeger. On a theorem of Wielandt for finite primitive permutation groups, *Journal of Group Theory* 6 (2003), 415-420.
28. Anton Betten. Genealogy of  $t$ -designs, *The Australasian Journal of Combinatorics* 29 (2004) 3-34.
29. Anton Betten, Dieter Betten. More on Regular Linear Spaces, *Journal of Combinatorial Designs* 13 (2005) 441-461.
30. Anton Betten, Gregory Cresp, Alice C. Niemeyer, Cheryl E. Praeger. A search algorithm for line-transitive, point-imprimitive linear spaces, *Bayreuther Mathematische Schriften* 74 (2005) 42-57.
31. Anton Betten. Geometric Codes and Hyperovals, *Bayreuther Mathematische Schriften* 74 (2005) 19-41.
32. Anton Betten, Computing Linear Codes and Orbits on Sets. Workshop: Computational Group Theory, Organized by Gerhard Hiss, Derek Holt, Mike Newman. July 2 - July 8 2006. *Oberwolfach Report* 30/2006, 12-14.
33. A. Betten, R. J. Kingan, S. R. Kingan. A Note on  $GF(5)$ -Representable Matroids, *MATCH Commun. Math. Comput. Chem.* 58 (2007) 511-521.
34. Anton Betten, Greg Cresp, Cheryl E. Praeger. Line-transitive point-imprimitive linear spaces: the grid case, *Innovations in Incidence Geometry* 8 (2008) 117-135.
35. Anton Betten, Twisted Tensor Product Codes. *Designs, Codes and Cryptography* 47 (2008), no 1-3, 191-219.
36. John Bamberg, Anton Betten, Philippe Cara, Jan De Beule, Michel Lavrauw, Maska Law, Max Neunhoeffler, Michael Pauley, Sven Reichard. GAP 4 Package FinInG for Finite Incidence Geometry, Version 1.01, March 2009.

37. Anton Betten, Anne Delandtsheer, Maska Law, Alice C. Niemeyer, Cheryl E. Praeger, Shenglin Zhou. Finite line-transitive linear spaces: theory and search strategies, *Acta Mathematica Sinica, English Series*, Sep., 2009, Vol. 25, No. 9, pp. 1399-1436.
38. Anton Betten, Dieter Betten. There is no Drake / Larson linear space on 30 points, *Journal of Combinatorial Designs*, 18: 48-70, 2010.
39. Anton Betten. A class of transitive BLT-sets. *Note di Matematica* 28 (2010), 2-10.
40. Abdullah Al-Azemi, Anton Betten. Classification of Triangle-Free  $22_3$ -Configurations. *International Journal of Combinatorics*, Volume 2010 (2010), Article Id 767361, 17 Pages.
41. Anton Betten, Eun Ju Cheon, Seon Jeong Kim, Tatsuya Maruta. The Classification of  $(42, 6)_8$  Arcs. *Advances in Mathematics of Communication* 5 (2011), 209-223.
42. Anton Betten, Eun Ju Cheon, Seon Jeong Kim, Tatsuya Maruta. Three Families of Multiple Blocking Sets in Desarguesian Projective Planes of Even Order. *Designs, Codes, Cryptography* 68 (2013), no. 1-3, 49-59.
43. Anton Betten. Rainbow Cliques and the Classification of Small BLT-Sets. ISSAC' 13, June 26-29, 2013, Boston, Massachusetts. Ed. Manuel Kauers. 53-60.
44. Abdullah Al-Azemi, Anton Betten, Dieter Betten. Unital Designs with Blocking Set. *Discrete Applied Mathematics* 163 (2014), no 1, 102-112
45. John Bamberg, Anton Betten, Cheryl Praeger, Alfred Wassermann. Unitals in the Desarguesian Projective Plane of Order Sixteen. *Journal of Statistical Planning and Inference* 144 (2014), no 1, 110-122.
46. Anton Betten. Classifying Discrete Objects with *Orbiter*. ACM Communications in Computer Algebra 01/2014; 47(3/4):183-186. DOI:10.1145/2576802.2576832
47. Anton Betten. The packings of  $PG(3, 3)$ . *Des. Codes Cryptogr.* 79 (2016), no. 3, 583–595.
48. Anton Betten, Alfred Wassermann. Spreads of  $PG(3, 8)$  and  $PG(3, 9)$  containing a regulus. *Congressus Numerantium* 226 (2016), 289-299.
49. Anton Betten, Ulrich Dempwolff, Alfred Wassermann. On Dual Hyperovals of Rank 4 Over  $\mathbb{F}_2$ . *Journal of Geometry* 108 (2017), no. 1, 75–98.
50. Anton Betten, James W. P. Hirschfeld, Fatma Karaoglu. Classification of cubic surfaces with twenty-seven lines over the finite field of order thirteen. *Eur. J. Math.* 4 (2018), no. 1, 37-50.
51. Abdullah Al-Azemi, Anton Betten, and Sajeeb Roy Chowdhury. A rainbow-clique search algorithm for BLT-sets. In *ICMS 2018—Proceedings of the International Congress on Mathematical Software; James H. Davenport, Manuel Kauers, George Labahn, Josef Urban (ed.)*, pages 71–79. Springer, 2018.
52. Anton Betten. Classifying cubic surfaces over finite fields using orbiter. In *ICMS 2018—Proceedings of the International Congress on Mathematical Software; James H. Davenport, Manuel Kauers, George Labahn, Josef Urban (ed.)*, pages 55–61. Springer, 2018.

53. Anton Betten. How fast can we compute orbits of groups? In *ICMS 2018—Proceedings of the International Congress on Mathematical Software; James H. Davenport, Manuel Kauers, George Labahn, Josef Urban (ed.)*, pages 62–70. Springer, 2018.
54. Anton Betten, Svetlana Topalova, and Stela Zhelezova. Parallelisms of  $PG(3, 4)$  invariant under a Baer involution. Sixteenth International Workshop on Algebraic and Combinatorial Coding Theory ACCT XVI. September 2-8, 2018. Svertlogorsk near Kaliningrad. [acct2018.skoltech.ru](http://acct2018.skoltech.ru).
55. Anton Betten, Fatma Karaoglu. Cubic Surfaces Over Small Finite Fields Submitted to Designs, Codes, Cryptography.

## International Visits

December 1997 – January 1998: University of Western Australia, Perth, Australia.

July 2006 – August 2006: University of Western Australia, Perth, Australia.

May 2008: Kyongsang National University, Korea, and Busan National University, Korea.

August 2010 – January 2011: University of Western Australia, Perth, Australia.

October 2010: Osaka Prefecture University, Osaka, Japan.

July 2011: University of Bayreuth, Bayreuth, Germany.

November 2011: Osaka Prefecture University, Osaka, Japan.

March 2012: Kuwait University, Kuwait City, Kuwait.

June 2014: University of Vicenza, Italy.

June 2014: University of Perugia, Italy.

August 2015: NIMS, South Korea.

November 2015: Universidad del Norte, Barranquilla, Colombia.

May-June 2016: Universitat Autònoma de Barcelona, Spain.

August 2016: Sobolev Institute of Mathematics and Novosibirsk State University, Novosibirsk, Russia.

Fall 2017: University of Sussex, UK.

## Service

Co-Director of the *Calculus Center* at Colorado State University (2015-2017).

Coordinator for MATH161, Calculus II (2012-2017).

Chair of the hiring committee for an associate director of the calculus center (2015-2016).

Member of the hiring committee for a department chair (2015-2016).

Editor for *Journal of Geometry* (since 2014).

College representative at large to Faculty Council (since 2016).  
Chair of the Committee on Teaching and Learning (2015-2016).  
Member of the Committee on Teaching and Learning (2013-2015).  
Member of the Classroom Review Board (2014-2016).  
Coordinator of MathDay (High School outreach) in 2011, 2012, 2015 and 2016.  
Co-Organizer of the Rocky Mountain Algebraic Combinatorics Seminar (since 2014).  
Chair of the task force to redesign the course survey (2015-2016).  
Member of PASS – Provost advisory committee on student success (2015-2016).  
Member of the GAP committee devoted to closing the achievement gap (2015-2016).  
Member of the Unizin committee (2015-17).  
Referee for numerous international journals as well as some grant agencies.  
Member, GAP council (GAP is a program system for computational algebra)

## Teaching

Course development and redesign:

- (a) MATH 161 Calculus II for physical scientists,
- (b) MATH 501/2 Combinatorics I and II,
- (c) MATH 601/2 Advanced Combinatorics I and II,
- (d) MATH 360 Mathematics of Information Security,
- (e) MATH 460 Information and Coding Theory.

Development of new courses:

- (a) MATH 151/2 Mathematical Algorithms in Matlab / Maple,
- (b) MATH 235 Introduction to Mathematical Reasoning.
- (c) Coordination of Calculus II (since Spring 2012).

Other teaching:

- (a) MATH 261 Calculus III,
- (b) MATH 301 Combinatorics,
- (c) MATH 366 Groups, Rings and Fields,
- (d) MATH 369 Linear Algebra.

## Conferences Organized

October 2016 – AMS Sectional Meeting, Special session on Algebraic Combinatorics (with Jason Williford and Bangteng Xu)

July 2015: CoCoA15 – Combinatorics and Computer Algebra 2015 (40 participants over 5 days), Colorado State University.

November 2011: Robert Liebler Memorial Conference (three days), Colorado State University.

August 2010: Coding Theory and Geometry (25 participants over two days), Colorado State University.

July 2007: Rocky Mountain Discrete Mathematics Days (35 participants over two days), Colorado State University.

April 2000: Computer Algebra in Research and Education, Thurnau, Germany, (60 participants over three days)

September 1999: ALCOMA 99 – Algebraic Combinatorics and Applications, Goessweinstein, Germany (80 participants over 5 days)

February 1998: Computer Algebra in Research and Education, Thurnau, Germany, (30 participants) (three days)

October 1996: Groups in Action, Thurnau, Germany (30 participants over 5 days)

## Awards

Nominated for a Best Teacher Award by the Colorado State University Alumni Association in 2008.

## Graduate Students Advised

Tom Edgar, MS 2004

Cayla McBee, MS 2007

Bader Al-Shamarey, Ph.D. 2007

Abdullah Al-Azemi, Ph.D. 2007

## Undergraduate Students Advised

Andreea Erciulescu (Honors 2008)

## Talks and Presentations

I have given over 120 scientific presentations in almost all parts of the world.



## **Memberships in Professional Organizations**

Fellow of the Institute of Combinatorics and its Applications (ICA).