

# ANTON BETTEN, PH.D.

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## Address

Department of Mathematics

Colorado State University

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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, Design Theory, 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

- (a) NSF grant: “Rocky Mountain Algebraic Combinatorics Seminar and Miniconferences” (award number 1415511) March 15, 2014 – February 28, 2017. \$37,459.00
- (b) NSF grant: *CC\* Integration-Small: Error Free File Transfer for Big Science*. Co-PI. PI: Craig Partridge. Co-Pi: Susmit Shannigrahi. \$470,384.

## 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  $P\Sigma L(2,3^5)$ , *Journal of Geometry* 67 (2000), 35-41.

21. Anton Betten, Schnittzahlen 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. 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.

37. Anton Betten, Dieter Betten. There is no Drake / Larson linear space on 30 points, *Journal of Combinatorial Designs*, 18: 48-70, 2010.
38. Anton Betten. A class of transitive BLT-sets. *Note di Matematica* 28 (2010), 2-10.
39. Abdullah Al-Azemi, Anton Betten. Classification of Triangle-Free  $22_3$ -Configurations. *International Journal of Combinatorics*, Volume 2010 (2010), Article Id 767361, 17 Pages.
40. 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.
41. 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.
42. Anton Betten. Rainbow Cliques and the Classification of Small BLT-Sets. ISSAC' 13, June 26-29, 2013, Boston, Massachusetts. Ed. Manuel Kauers. 53-60.
43. Abdullah Al-Azemi, Anton Betten, Dieter Betten. Unital Designs with Blocking Set. *Discrete Applied Mathematics* 163 (2014), no 1, 102-112
44. John Bamberg, Anton Betten, Cheryl Praeger, Alfred Wassermann. Unitals in the Desarguesian Projective Plane of Order 16. *Journal of Statistical Planning and Inference* 144 (2014), no 1, 110-122.
45. Anton Betten. Classifying Discrete Objects with *Orbiter*. ACM Communications in Computer Algebra 01/2014; 47(3/4):183-186. DOI:10.1145/2576802.2576832
46. Anton Betten. The packings of  $PG(3, 3)$ . Des. Codes Cryptogr. 79 (2016), no. 3, 583–595.
47. Anton Betten, Alfred Wassermann. Spreads of  $PG(3, 8)$  and  $PG(3, 9)$  containing a regulus. *Congressus Numerantium* 226 (2016), 289-299.
48. 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.
49. 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.
50. 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.
51. 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.
52. 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.

53. 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).
54. Anton Betten, Fatma Karaoglu. Cubic Surfaces Over Small Finite Fields. *Des. Codes Cryptogr.* (2019) 87: 931-953.
55. Anton Betten, Svetlana Topalova, and Stela Zhelezova. Parallelisms of  $PG(3, 4)$  invariant under cyclic groups of order four. M. Čirić et al. (Eds.): CAI 2019, Springer LNCS 11545, pp. 88–99, 2019.
56. Anton Betten, Awss Al-ogaidi. Large Arcs in Small Planes, *Congressus Numerantium* 232 (2019), 119–136
57. Anton Betten. The Orbiter Ecosystem for Combinatorial Data. ISSAC 2020 – Proceedings of the 45th International Symposium on Symbolic and Algebraic Computation, 30–37, 2020.
58. Anton Betten, Tarun Mukthineni. Classifying Simplicial Dissections of Convex Polyhedra with Symmetry, Mathematical software–ICMS 2020, Lecture Notes in Comput. Sci. 12097, 143–152, Springer, Cham, 2020.
59. A. Betten, S. Topalova, and S. Zhelezova. New Uniform Subregular Parallelisms of  $PG(3, 4)$  Invariant Under an Automorphism of Order 2. Cybernetics and Information Technologies, 20 (6), 18-27, Sofia, 2020. [http://www.cit.iit.bas.bg/CIT-2020/v-20-6/10341-Volume20\\_Issue\\_6-03\\_paper.pdf](http://www.cit.iit.bas.bg/CIT-2020/v-20-6/10341-Volume20_Issue_6-03_paper.pdf)
60. Fatma Karaoglu, Anton Betten. The Number of Cubic Surfaces with 27 Lines Over a Finite Field. To appear in *Journal of Algebraic Combinatorics*.
61. Anton Betten, Fatma Karaoglu. Cubic Surfaces with 13 Eckardt Points. Submitted to *Advances in Geometry*.
62. Anton Betten, Fatma Karaoglu. Cubic Surfaces over Finite Fields of Characteristic Two. Submitted to *Designs, Codes, Cryptography*.
63. Anton Betten, Fatma Karaoglu. Cubic Surfaces and Associated Arcs. Submitted to *ISSAC 2021*, Saint-Petersburg, Russia.

## Talks and Presentations

Over 130 scientific presentations:

1. September 1994 “Gruppenaktion auf Verbänden und die Konstruktion von Designs” Meeting of the German Mathematical Society, Ulm, Germany
2. February 1995 “Gruppenoperation auf Verbänden und die Konstruktion von Designs” Workshop “Geometry and Discrete Mathematics”, Giessen, Germany

3. September 1995 Meeting of the German Mathematical Society, Jena, Germany
4. November 1995 “Konstruktion von 7-designs” Kolloquium on Combinatorics, Braunschweig, Germany
5. October 1996 “Parallel construction of solvable groups” EuroPVM: meeting of the European PVM user’s group, Munich, Germany
6. May 1997 Computational Methods for Permutation and Matrix Groups, Dagstuhl, Germany
7. June 1997 “Construction of solvable groups” Computational Group Theory, Oberwolfach, Germany
8. July 1997 “The linear spaces on at most 12 points” Linear Spaces II, Rauscholzhäusen, Germany
9. July 1997 “Plesken rings and intersection numbers of designs” British Combinatorial Conference, London
10. November 1997 “Symmetric configurations  $v_3$  and their automorphism groups” Kolloquium on Combinatorics, Braunschweig, Germany
11. March 1998 “Intersection numbers of designs” Combinatorics, Graph Theory and Computing 29, Florida Atlantic University, Boca Raton, Florida
12. May 1999 “Intersection numbers of designs” Second Pythagorean Conference, Samos, Greece
13. June 1999 “Intersection numbers of designs” Groups and Computation, Ohio State University, Columbus, Ohio
14. September 18, 1999 “Construction of Incidence Structures with DISCRETA” ALCOMA, Goessweinstein, Germany.
15. November 24, 1999 “Block Designs mit vorgeschriebener Automorphismengruppe”, Kolloquium, Universität Stuttgart, Stuttgart, Germany.
16. March 2000 “Intersection Numbers of Designs II” Combinatorics, Graph Theory and Computing 31, Florida Atlantic University, Boca Raton, Florida
17. May 20, 2000 “Schnittzahlen von Designs” Kolloquium, Universität Kassel, Kassel, Germany.
18. September 2000 ALCCAL, Varna, Bulgaria: Algebraic Combinatorics and Applications
19. January 26, 2001 “Isometrieklassen Linearer Codes” Kolloquium, Freie Universität Berlin, Berlin, Germany
20. March 16, 2001 “Plesken rings and intersection numbers of designs” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins, Co
21. July 2001 “Genealogy of  $t$ -designs” 26th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing, Perth, Australia,

22. September 27, 2002 “Searching for line-transitive linear spaces preserving a grid structure on points” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins, Colorado,
23. December 6, 2002 “Coding theory and the geometry connection” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins, Colorado,
24. March 2003 “Computing linear codes” Groups and Computation, Ohio State University, Columbus, Ohio
25. August 4-5, 2003 “Orbit Computation and Applications in Finite Geometry” the 7th Rocky Mountain Discrete Math Day, University of Colorado at Denver, Denver, Colorado,
26. October 2003 “Orbit Computation and Applications to Finite Geometry” AMS special session on Finite Geometry in Boulder, Colorado.
27. October 2003 “Combinatorial Optimization and Bridge Tournaments” Talk at the Math Club, CSU.
28. March 5, 2004 “Computing Optimal Linear Codes” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins, Colorado,
29. August 2, 2004 “Distance Regular Graphs in Coding Theory” Rocky Mountain Discrete Math Day, Colorado Springs, Colorado.
30. September 6, 2004 “Hyperovals and Geometric Codes” Conference at Pingree Park, Colorado.
31. October 23, 2004 “Constructing Optimal Linear Codes” AMS meeting Evanston, Northwestern.
32. November 30, 2004 “Geometric Codes” Seminar, CU Denver.
33. December 3, 2004 “Geometric Codes” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
34. April 3, 2005 “A Classification of Optimal Linear Codes” AMS meeting, University of Delaware.
35. April 5, 2005 “Geometric Codes and Hyperovals” ALCOMA 2005, Thurnau near Bayreuth, Germany.
36. July 8, 2005 “Designs, Codes und Gruppen” Colloquium, Universität Kiel, Germany, honoring the retirement of Dieter Betten.
37. July 19, 2005 “Geometrische Codes und Hyperovale” Seminar talk, Universität Kaiserslautern, Germany.
38. August 2005 “Geometric Codes and Hyperovals” Conference on Algebraic and Geometric Combinatorics, Oisterwijk, The Netherlands.
39. September 30 2005 “How to Construct a Hyperoval” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
40. July 2006 “Computing Linear Codes and Orbits on Sets” Oberwolfach, Germany.



41. August 2006 “Computing Linear Codes and Orbits on Sets” University of Western Australia, Perth, Western Australia.
42. September 11, 2006 “A Classification of Optimal Linear Codes and Other Topics” 2nd Irsee Conference on Finite Geometry, Kloster Irsee (near Kaufbeuren), Germany.
43. October 20, 2006 “Twisted Tensor Product Codes and a Review of BLT Sets” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
44. October 27, 2006 “Twisted Tensor Product Codes and a Review of BLT Sets” Combinatorics Seminar, University of Delaware, Newark, Delaware.
45. November 17, 2006 “More on Twisted Tensor Product Codes” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
46. April 27, 2007 “Network Algorithms” Networks in Ecology and Beyond April 26-27, Colorado State University, Fort Collins.
47. August 3, 2007 “Some Remarks on Optimal Codes” Rocky Mountain Discrete Mathematics Days, Colorado State University, Fort Collins.
48. October 6, 2007 “Twisted Tensor Product Codes” AMS-Meeting, DePaul University, Chicago.
49. November 9, 2007 “Algorithms for Orthogonal Polar Spaces” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
50. January 6, 2008 “Introduction to Mathematical Reasoning: A Case Study” Joint AMS/MAA meetings, San Diego.
51. March 26, 2008 “Experimental Course: Introduction to Mathematical Reasoning – A Review” Colloquium, Colorado State University, Fort Collins.
52. May 22, 2008 “Twisted Tensor Product Codes” Seminar, Busan National University, Busan, South Korea.
53. May 27, 2008 “Twisted Tensor Product Codes” Seminar, Kyongsang National University, Jinju, South Korea.
54. July 17, 2008 “Large Scale Computations in Discrete Mathematics” IsTeC and Department of Computer Science Workshop on Engineering Software for Scientific Applications, Colorado State University, Fort Collins.
55. August 22, 2008 “An Introduction to Latex” Colorado State University
56. September 13, 2008 “There is no Drake/Larson Linear Space on 30 points” Rocky Mountain Discrete Mathematics Days 2008, The University of Wyoming, Laramie, Wyoming.
57. October 2008 “Grid Computing in Discrete Mathematics” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
58. February 2009 “A Class of Transitive BLT-Sets” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.

59. March 2009 “A Class of Transitive BLT-Sets” Norm Johnson’s 70-th birthday conference, University of Texas at San Antonio.
60. June 2009 “A Hybrid Algorithm to Classify BLT-Sets” Rocky Mountain Discrete Mathematics Days 2009, University of Colorado at Denver.
61. February 2010 “The Classification of  $(42, 6)_8$  Arcs” Algebraic Combinatorics Seminar, Colorado State University, Fort Collins.
62. April 2010 “The Classification of  $(42, 6)_8$  Arcs” Algebraic Combinatorics and its Applications (ALCOMA 10), Thurnau near Bayreuth, Germany.
63. July 2010 “Domino Portraits” MathCircles 2010, Colorado State University.
64. August 6, 2010 “The Classification of  $(42, 6)_8$  Arcs” Workshop Codes and Geometry, Colorado State University.
65. September 2010 “Four Problems in Finite Geometry” The University of Western Australia, Perth, Australia.
66. October 2010 “An Introduction to Finite Geometry” Osaka Prefecture University, Osaka, Japan
67. May 2011 “Tactical Decompositions and Unitals in  $PG(2, 16)$ ” International Conference on Design of Experiments (ICODOE 2011), Memphis.
68. June 2011 “Two families of multiple blocking sets in desarguesian projective planes of even order” 3rd International Conference on Finite Geometries, Irsee, Germany
69. July 2011 “Experimental Computer Algebra” Colloquium, University of Bayreuth, Germany.
70. September 2011 “Combinatorial Cousins of Hermitean Curves” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
71. October 2011 “Graph Theoretic Methods for Computational Finite Geometry” Rocky Mountain Discrete Mathematics Days 2011, University of Wyoming.
72. November 2011 “Rainbow Cliques, Translation Planes and BLT Sets” Bob Liebler Memorial Conference, Colorado State University.
73. November 2011 “Experimental Computer Algebra” Colloquium, Osaka Prefecture University, Osaka.
74. March 2012 “Rainbow Cliques and BLT-Sets” Colloquium, Kuwait University, Kuwait.
75. May 2012 “Line Spreads in  $PG(3, q)$  Containing a Regulus” Rocky Mountain Discrete Mathematics Days 2012, Colorado State University.
76. September 2012 “Rainbow Cliques and BLT-Sets” MIGHTY LIII, conference on graph theory, Ames, Iowa.

77. September 2012 “Symmetry: from Wallpaper to Instant Insanity” one hour lecture for MATH191 (Freshman seminar), Colorado State University.
78. November 2012 “From Translation Planes to Dual Hyperovals” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
79. January 2013 “Breaking Symmetry in the Computer Age” Joint MAA/AMS/SIAM Mathematics Meetings, San Diego.
80. January 2013 “Collaborative Curiosity: How one Working Group Inspired Each Other to Try New Technologies” (one of 6 speakers) Professional Development Institute, Colorado State University.
81. March 2013 “Spreads and Packings in  $PG(3, q)$ ” The Forty-Fourth Southeastern International Conference on Combinatorics, Graph Theory, and Computing, Florida Atlantic University, Boca Raton, Florida.
82. April 2013 “Spreads and Packings in  $PG(3, q)$ ” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
83. April 2013 “Spreads and Packings in  $PG(3, q)$ ” AMS Conference, Ames, Iowa.
84. April 2013 “Spreads and Packings in  $PG(3, q)$ ” Colloquium, The University of Wyoming, Laramie, Wyoming.
85. May 2013 “Calculus Report” Faculty Retreat, Colorado State University.
86. June 2013 “Rainbow Cliques and the Classification of Small BLT-Sets” ISSAC13, Boston, Massachusetts.
87. June 2013 “Classifying Discrete Objects with Orbiter” Software Presentation, ISSAC13, Boston, Massachusetts.
88. July 2013 “Regular Packings” The University of Bayreuth, Bayreuth, Germany.
89. November 2013 “Classifying Spreads and Packings in Projective Three-Space” Colloquium, Michigan Technological University, Houghton, Michigan.
90. April 2014 “Calculus – Are we teaching the right things and in the right way?” Presentation at the Master Teacher Initiative (together with Patrick Shipman and Mary Pilgrim), Colorado State University.
91. February 2014 “Classifying Semifields via Semilattices” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
92. June 2014 “Group Actions on Posets and Cartesian Products” talk at “Modern Trends in Algebraic Graph Theory” Villanova University.
93. June 2014 “Classifying finite semifields” talk at “Groups, Computation, and Geometry” Pingree Park.
94. June 2014 “Group actions on semilattices” talk at “GASCom14” in Bertinoro, Italy.

95. June 2014 “Classifying combinatorial objects” Colloquium, Perugia University, Italy.
96. July 2014 “Zur Klassifikation Endlicher Halbkörper” Colloquium, University of Bayreuth.
97. July 2014 “Classifying linear sets” talk at “Rocky Mountain Graphs, Geometry and Combinatorics Conference” University of Colorado at Denver.
98. September 2014 “The Exact Cover Problem in Finite Geometry” Fourth Irsee Conference on Finite Geometry. Irsee, Germany.
99. September 2014 “The Exact Cover Problem in Finite Geometry” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
100. February 2015 “Graphs with Integral Spectrum” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
101. April 2015 “Graphs with Integral Spectrum” Math Club, The University of Northern Colorado.
102. August 2015 “The Grassmann Graph” SIAM conference on Applied Algebraic Geometry (AG15). Daejeon, Korea.
103. October 2015 “Buy One Get One Free – Classifying Good Codes and Computing their Automorphism Groups” presentation for the MathClub at Colorado State University.
104. November 2015 “Classification of Codes and Combinatorial Structures” Invited talk at the First Colombian Conference on Coding Theory. Universidad del Norte. Barranquilla, Colombia.
105. November 2015 “Classification of Codes and Combinatorial Structures” Seminar talk, Department of Mathematics, Florida Atlantic University.
106. February 2016 “The Exact Cover Problem and the Clique Finding Problem in Combinatorics” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
107. February 2016 “The Exact Cover Problem and the Clique Finding Problem in Combinatorics” Combinatorics Seminar, University of Colorado at Denver.
108. March 2016 “Regular Packings in  $PG(3, 5)$ ” The Forty-Seventh Southeastern International Conference on Combinatorics, Graph Theory, and Computing, Florida Atlantic University, Boca Raton, Florida.
109. June 2016 “Spreads and Packings – An Update” Combinatorics 2016, Maratea, Italy.
110. August 2016 “Graphs with Integral Spectrum” Invited talk at the conference *G2S2 – Groups and Graphs, Symmetry and Spectra*, Novosibirsk State University, Novosibirsk, Russia.
111. March 2017 “Classifying Cubic Surfaces Over a Finite Field” *The 48th Southeastern International Conference on Combinatorics, Graph Theory and Computing*, Florida Atlantic University, Boca Raton, Florida.

112. March 2017 “Classifying Cubic Surfaces Over a Finite Field” Rocky Mountain Algebraic Combinatorics Seminar, Colorado State University.
113. April 2017 “Visual Math” Talk at the Math Club, Department of Mathematics, University of Northern Colorado, Greeley.
114. April 2017 “Visual Math” Talk at the Math Club, Department of Mathematics, Colorado State University, Greeley.
115. June 2017 “Computational Methods in Finite Geometry” Four lectures (invited) at the summer school on Finite Geometry at Sussex University in the UK.
116. October 2017 “Cubic Surfaces Over Small Finite Fields” Seminar talk at the Department of Mathematics, Sabanci University, Istanbul, Turkey.
117. October 2017 “Classifying Cubic Surfaces Over Small Finite Fields” Seminar talk at the University of Veliko-Tarnovo, Veliko-Tarnovo, Bulgaria.
118. October 2017 “Classifying Cubic Surfaces Over Small Finite Fields” Talk at the conference UNiTech 2017. Gabrovo, Bulgaria.
119. September 2017 “Classifying Cubic Surfaces Over Small Finite Fields” Presentation at the 5th Irsee conference on Finite Geometry in Irsee in Germany.
120. December 2017 “Studying and Working in the US” Presentation at the Engineering Week, University of Applied Science, Schmalkalden, Germany.
121. April 2018 “The Clesch map from a combinatorial perspective” Seminar talk at the Department of Mathematics, Colorado State University, Fort Collins, CO, USA.
122. May 2018 “Investigating Cremona Groups in the plane” Antalya Algebra Days, Nesin Math Village, Izmir, Turkey.
123. July 2018 “A rainbow clique search algorithm for BLT-sets” Talk at *ICMS – International Conference for Mathematical Software*. South Bend, Indiana, USA. Collaborators: Abdullah AlAzemi and Sajeeb Chowdhury.
124. July 2018 “Classifying cubic surfaces over finite fields” Talk at *ICMS – International Conference for Mathematical Software*. South Bend, Indiana, USA.
125. July 2018 “How fast can we compute orbits of groups?” Talk at *ICMS – International Conference for Mathematical Software*. South Bend, Indiana, USA.
126. December 2018 “The Hilbert, Cohn-Vossen cubic surface” Seminar talk at the Department of Mathematics, Sabanci University, Istanbul, Turkey.
127. January 2019 “Classifying cubic surfaces over finite fields” Seminar talk at Department of Mathematics, Namik Kemal University, Tekirdag, Turkey.
128. March 2019 “New Families of Cubic Surfaces in Characteristic 2” *The 50th Southeastern International Conference on Combinatorics, Graph Theory and Computing*, Florida Atlantic University, Boca Raton, Florida.

129. June 2019 “Finite Semifields and Projective Planes” Seminar talk at Department of Mathematics, Namik Kemal University, Tekirdag, Turkey.
130. June 2019 “Cubic Surfaces over Small Finite Fields” Invited talk at *The 17th International Geometry Symposium*, Erzincan, Turkey.
131. July 2019 “Codes from surfaces” Invited talk at the conference *The 6th Korea Sino International Conference on Coding Theory and Its Related Topics*, KIAS, Seoul, South-Korea.
132. July 2019 “Classifying Arcs with Orbiter” Seminar talk at the Department of Mathematics, Gyeongsang National University, Jinju, South-Korea.
133. September 2019 “Two new families of cubic surfaces in characteristic two” Seminar talk at the Department of Mathematics, Michigan Technological University, Houghton, Michigan.
134. September 2019 “The power of algebraic computing” Colloquium talk at the Department of Mathematics, Michigan Technological University, Houghton, Michigan.

## 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) Applied Cryptography.
- (b) MATH 235 Introduction to Mathematical Reasoning.
- (c) MATH 151/2 Mathematical Algorithms in Matlab / Maple,

Other teaching:

- (a) MATH 317 Real Analysis,
- (b) MATH 261 Calculus III,
- (c) MATH 301 Combinatorics,
- (d) MATH 366 Groups, Rings and Fields,
- (e) MATH 369 Linear Algebra.

## Conferences and Sessions Organized

July 2020: “The Classification Problem in Geometry” at *International Congress on Mathematical Software*, Braunschweig, July 13-16, 2020.

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.

## PostDoc Advising

Michael Epstein (since 2019)

Fatma Karaoglu (2020-2021)

## Graduate Students Advised

Tom Edgar, MS 2004

Cayla McBee, MS 2007

Bader Al-Shamarey, Ph.D. 2007

Abdullah Al-Azemi, Ph.D. 2007

Tarun Mukthineni, MS (ongoing)

Aaron Lear, MS (ongoing)

Diptendu Kan (Ph.D., CS), ongoing.

## Undergraduate Students Advised

Andreea Erciulescu (Honors 2008)

Alexandra Taylor, honors thesis, 2019.

Garrett Figueroa, Marlena Giannone, Joel Barraza-Nova. Murals poster presentations in 2019.

Sajeeb Roy Chowdhury, joint paper in 2018.

Brendan Looi, ZiYao Cheng, Joel Barraza-Nova, Alissa Brown. Undergraduate research (2020-ongoing)

Haodong Yang, Comap, undergraduate math modeling contest.

## Service

Software Package *Orbiter* for the classification of combinatorial objects. Open Source. GitHub.

College representative at large to Faculty Council (since 2016).

RMACC: Rocky Mountain Advance computing consortium. Committe for the High Performance Computer *Summit*.

RMAC: Rocky Mountain Algebraic Combinatorics Seminar (since 2014).

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).

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.

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)

Member of the hiring committee for a search in combinatorics and number theory (2018).

Member of the graduate committee (since 2018).

Reviewer for Math Reviews (MR).

Reviewer for Mathematical Journals.



## Memberships in Professional Organizations

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

## International Visits

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

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

May 2008: Gyongsang 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.

June 2017, September 2017: University of Sussex, UK.

November 2017: Bulgarian Academy of Science, Veliko Tarnovo, Bulgaria.

November 2017: Sabanci University, Istanbul, Turkey.

June 2018: Nesin Math Village, Izmir, Turkey.

December 2018 - January 2019: Namik Kemal University, Tekirdag, Turkey.

June 2019: Erzincan University, Turkey.

July 2019: KIAS in Seoul, South Korea; and Gyongsang National University in Jinju, South Korea.

## Outreach

- (a) Video “Introduction to Cubic Surfaces” semi-finalist in the NSF sponsored “We-are-mathematics” competition.
- (b) YouTube channel to visualize Mathematics:  
[https://www.youtube.com/channel/UC8kjEz91tKnQn2aKx8ouVtQ?view\\_as=subscriber](https://www.youtube.com/channel/UC8kjEz91tKnQn2aKx8ouVtQ?view_as=subscriber)
- (c) Orbiter, a C++ software package for solving classification problems in Combinatorics:  
<https://github.com/abetten/orbiter>. Documentation is included in the distribution.
- (d) Iphone app “Clebsch” to visualize cubic surfaces.
- (e) Domino Show: demonstration of an optimization problem at: Little Shop of Physics, February 2020.
- (f) Computation of Mandelbrot sets. In collaboration with Dave Fashenpour, Florida. Dave is a retired engineer with Boeing.
- (g) Lines on Cubic Surfaces. In collaboration with Jonathan Chertok. Jonathan is an Architect based in Austin, Texas.