

Matthew Kahle

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Research Interests I am broadly interested in interactions of topology and geometry with probability, statistical mechanics, and combinatorics.

Positions Professor, Ohio State University, 2018–present
Associate Professor, Ohio State University, 2015–2018
Assistant Professor, Ohio State University, 2011–2015
Member, Institute for Advanced Study, Princeton, 2010–2011
Samelson Postdoctoral Fellow, Stanford University, 2007–2010

Visiting positions ICERM, Providence, Rhode Island, Autumn 2016
CIMAT, Guanajuato, Mexico, Summer 2016
IMA, Minneapolis, Minnesota, Spring 2014
MRSI, Berkeley, California, Autumn 2006
IAS-PCMI, Park City, Utah, Summer 2003

Education University of Washington, Seattle, Washington USA
Ph.D., Mathematics, June 2007

Colorado State University, Fort Collins, Colorado USA
M.S., Mathematics, May 2001
B.S., Mathematics, May 1999

Fellowships and awards Fellow of the American Mathematical Society, Class of 2018
Alfred P. Sloan Research Fellowship, 2012–2016
Samelson Postdoctoral Fellowship, Stanford, 2007–2010
NSF-VIGRE Fellowship, 2001–2004, 2005–2006
Andrew Gavin Gaudette ARCS Foundation Fellowship 2001–2004

Grants NSF-TRIPODS+X:RES #CCF-1839358, 2018–2021, \$600,000 (PI)
NSF-TRIPODS #CCF-1740761, 2017–2020, \$1.5 million (Senior Personnel)
NSF #DMS-1613094: Conference TGDA@OSU, 2016, \$40,000 (PI)
NSF-RTG #DMS-1547357: Algebraic topology and its applications, 2016–21 \$1.73 million (PI)
NSF-CAREER #DMS-1352386: Random spaces and groups, 2013–18, \$450,000 (PI)
NSF #CCF-1017182: Higher-dimensional spanning trees, 2013–14 (PI)
DARPA #N66001-12-1-4226: Topology and geometry of random simplicial complexes, 2012–14 (PI)
NSA #H98230-10-1-0227: Random simplicial complexes, 2009–2011 (PI)

Selected publications

1. Matthew Kahle, Frank Lutz, Andrew Newman, and Kyle Parsons. Cohen–Lenstra heuristics for torsion in homology of random complexes. *Exp. Math.*, 2018. <https://doi.org/10.1080/10586458.2018.1473821>

2. Dominic Dotterrer, Larry Guth, and Matthew Kahle. 2-Complexes with Large 2-Girth. *Discrete Comput. Geom.* 59 (2018), no. 2, 383–412.
3. Omer Bobrowski, Matthew Kahle, and Primoz Skraba. Maximally persistent cycles in random geometric complexes. *Ann. Appl. Probab.* 27 (2017), no. 4, 2032–2060.
4. Christopher Hoffman, Matthew Kahle, and Elliot Paquette. The threshold for integer homology in random d-complexes. *Discrete Comput. Geom.* 57 (2017), no. 4, 810–823.
5. Michael W. Davis and Matthew Kahle. Random graph products of finite groups are rational duality groups. *J. Topol.*, 7 (2014), 589–606.
6. Matthew Kahle. Sharp vanishing thresholds for cohomology of random flag complexes. *Ann. of Math.* 179 (2014), 1085–1107.
7. Yuliy Baryshnikov, Peter Bubenik, and M. Kahle. Min-type Morse theory for configuration spaces of hard spheres. *Int. Math. Res. Notices* 9 (2014), 2577–2592.
8. Gunnar Carlsson, Jackson Gorham, Matthew Kahle, and Jeremy Mason. Computational topology for configuration spaces of hard disks. *Phys. Rev. E*, 85 (2012).
9. Matthew Kahle. Random geometric complexes. *Discrete Comput. Geom.*, 45 (2011), no. 3, 553–573.
10. Eric Babson, Christopher Hoffman, and Matthew Kahle. The fundamental group of random 2-complexes. *J. Amer. Math. Soc.* 24 (2011), no. 1, 1–28.

**Selected lectures,
public talks, and
lecture series**

Science Sundays, Ohio State University, February 2018 (public talk)
 Probabilistic methods in topology, CRM, Montreal, week of 2016-11-14 (three lectures)
 Stochastic topology and topological statistical mechanics, CIMAT, week of 2016-08-08 (four lectures)
 Cornell topology festival, weekend of 2016–05-12
 Random and statistical topology, Sendai, Japan, week of 2016-02-15 (three lectures)
 Geometry and physics of spatial random systems, Bad Herrenalb, 2015-09-09
 National Math Festival, Washington D.C., 2015-04-18 (two public talks)
 Joint Colloquium, Brandeis-Harvard-MIT-Northeastern, 2015-02-19
 Topological Data Analysis and Stochastic Topology, CIMAT, Guanajuato, week of 2015-01-19 (four lectures)
 AMS Invited address, Central Autumn Sectional Meeting, Eau Claire, 2014-09-20
 AMS Short Course on Geometry and Topology in Statistical Inference, JMM, Baltimore, week of 2014-01-14
 Dynamics and Applied Topology, Kyoto, week of 2013-06-09 (three lectures)
 Stanford symposium on Algebraic topology: applications and new directions, 2012-07-25

PhD advising

Paul Duncan (current PhD student)
 Francisco Martinez (current PhD student)
 Jimin Kim (current PhD student)
 Katherine Ritchey (current PhD student)
 Érika Roldán Roa (PhD Summer 2018, currently lecturer and researcher at Ohio State University)
 Andrew Newman (PhD Summer 2018, currently postdoc at Technische Universität Berlin)
 Kyle Parsons (PhD Summer 2017, currently data scientist at Root Insurance)
 Greg Malen (PhD Spring 2016, currently postdoc at Duke University)

Postdocs mentored

Hannah Alpert (current postdoc)
 Fedor Manin (current postdoc)
 Benjamin Schweinhart (current postdoc)
 Jeremy Mason (tenure-track at UC Davis)
 Matthew Wright (tenure-track at St. Olaf College)
 Izhar Oppenheim (tenure-track at Ben Gurion University)