Robert B. Kusner
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University of Massachusetts at Amherst
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Publications

There are many more projects underway, but those listed here are ordered by when the project came into substantial form with specific methods and results outlined in a draft preprint. This order reveals a feature of doing mathematics research that is unfortunately lost in more public-facing lists (like the Selected Publications list on Rob Kusner's Department/CNS homepage): some projects take considerably longer to cultivate and curate — to draft, to polish, to post, to revise, to submit, to publish — than others. Since a variety of other orderings, including those based on auto-updated citation records, are offered by Google Scholar and by the American Mathematical Society's *MathSciNet*, the reviewer is invited to peruse those too (as of early 2021, for example, Google Scholar records over 2700 citations to Rob's professional publications, with well over 100 citations per year for each of the past 7 years).

64. On the Canham Problem [in preparation] (with P. McGrath).

63. Gordian Unlinks [in preparation] (with W. Kusner).

62. On the Willmore Problem for surfaces with symmetry, arXiv:2103.09432 (with P. Wang).

61. On Steklov Eigenspaces for Free Boundary Minimal Surfaces in the Unit Ball [submitted] (with P. McGrath).

60. The geometry of complete minimal surfaces at infinity and the Willmore Morse index of their inversions [in preparation] (with J. Hirsch & Elena Mäder-Baumdicker).

59. On Free Boundary Minimal Annuli Embedded in the Unit Ball [submitted], arXiv:2011.06884 (with P. McGrath).

58. Lower bounds on the areas of Lawson's surfaces [in preparation] (with P. Wang).

57. Symmetric minimal surfaces in S^3 as conformally-constrained Willmore minimizers in S^n [in preparation] (with P. Wang).

56. On the index of minimal 2-tori in the 4-sphere, arXiv:1803.01615 (with P. Wang).

55. On Willmore stability of minimal surfaces in S^n [in preparation] (with P. Wang).

54. The Mathematics of Richard Schoen, *Notices Amer. Math. Soc.* **65**:11 (2018) 1349-1376 (with H. Bray, M. Eichmair, Ailana Fraser, L.H. Huang, F.C. Marques, Chika Mese, W. Minicozzi, Karen Uhlenbeck & S.T. Yau).

53. Morse decompositions for some configuration spaces of unlinks [in preparation] (with R. Koytcheff).

52. A Gordian Pair of Links, arXiv:1908.05610 [submitted] (with W. Kusner).

51. Willmore Bending Energy on the Space of Surfaces, MSRI *Emissary*, Spring (2016) 1 & 5-8 (with A. Mondino & F. Schulze).

50. Configuration Spaces of Equal Spheres Touching a Given Sphere: the Twelve Spheres Problem. *New trends in intuitive geometry, Bolyai Soc. Math. Stud.* **27**, Janos Bolyai Math. Soc., Budapest (2018) 219-277 (with W. Kusner, J. C. Lagarias, & S. Shlosman).

49. Numerical Methods for Biomembranes: conforming subdivision methods versus non-conforming PL methods. *Math. Comp.* **90** (2021), no. 328, 471-516 (with P. Brogan, J. Chen, Y. Yang, T. Yu & A. Zigerelli).

48. Critical unlinks [in preparation] (with J. Sullivan).

47. Chirality for Crooked Curves, arXiv:2004.10338 [submitted] (with G. Dietler, W. Kusner, E. Rawdon, & P. Szymczak).

46. The Expected Total Curvature of Random Polygons, *Amer. J. Math* **137** (2015) 411-438 (with J. Cantarella, A. Grosberg & C. Shonkwiler).

45. Moduli spaces of complex projective structures and CMC surfaces [preprint under revision] (with K.G. Brauckmann, N. Korevaar & J. Sullivan).

44. Knots and links as bands [preprint under revision] (with Y. Diao).

43. Conjugate Plateau problems in homogeneous 3-manifolds [preprint under revision] (with K.G. Brauckmann).

42. Ropelength Criticality, *Geometry & Topology* **18** (2014) 1973-2043 (with J. Cantarella, J. Fu & J. Sullivan).

41. Topological colloids, *Nature* **493** (2013) 200-205 (with B. Senyuk, Q. Liu, S. He, R.D. Kamien, T.C. Lubensky & I. Smalyukh).

40. There is no triangulation of the torus with vertex degrees 5, 6, . . . , 6, 7 and related results: Geometric proofs for combinatorial theorems, *Geometriae Dedicata* **166** (2013) 15-29 (with I. Ismestiev, G. Rote, B. Springborn & J. Sullivan).

39. Coplanar k-unduloids are nondegenerate, *Int. Math. Res. Notices* (2009) 3391-3416 [arXiv:0712.1865] (with K.G. Brauckmann, N. Korevaar, J. Ratzkin & J. Sullivan).

38. Some knotty ideas in geometry: pearl-number, ropelength, bandwidth and packing-density [preprint under revision] (with W. Kusner).

37. Coplanar Constant Mean Curvature Surfaces. *Comm. Anal. Geom.* **15** (2007) 985-1023 (with K.G. Brauckmann & J. Sullivan).

36. On the nondegeneracy of constant mean curvature surfaces. *Geom. and Funct. Analysis* **16.4** (2006) 891-923 (with N. Korevaar & J. Ratzkin).

35. Criticality for the Gehring Link Problem, *Geometry & Topology* **10** (2006) 2045-2105 (with J. Cantarella, J. Fu, J. Sullivan & Nancy Wrinkle).

34. The Average Crossing Number of Equilateral Random Polygons, *J. Physics A* **36** (2003) 11561-11574 (with Y. Diao, A. Dobay, K. Millett & A. Stasiak).

33. Three-Manifolds According to Grisha Perelman, *Sugaku Seminar* **42/10** (2003) 4-6 (in Japanese, with S. Okada & E. Cooper).

32. Triunduloids: Embedded CMC Surfaces of genus zero and three ends, *J. Reine Angew. Math.* **564** (2003) 35-61 (with K.G. Brauckmann & J. Sullivan).

31. The Second Hull of a Knotted Curve, *Amer. J. Math* **125** (2003) 1335-1348 (with J. Cantarella, G. Kuperperg & J. Sullivan).

30. Topology, Geometry and Conformal Structure of Properly Embedded Minimal Surfaces, *J. Diff. Geom.* **67** (2004) 377-393 (with P. Collin, W. Meeks & H. Rosenberg).

29. On the Minimum Ropelength of Knots and Links, *Inventiones Math.* **150** (2002) 257-286 (with J. Cantarella & J. Sullivan).

28. Conformal Structures and Necksizes of Embedded Constant Mean Curvature Surfaces, *Clay Mathematics Proceedings: Summer School on the Global Theory of Minimal Surfaces* **3** (2005) 585-596.

27. On Thickness and Packing Density for Knots and Links, *Contemporary Math.* **304** (2002) 175–180 [edited by J. Calvo, K. Millett & E. Rawdon].

26. Quantization of Energy and Writhe in Self-Repelling Knots, *New J. Phys.* **4** (2002) 1-11 (with Phoebe Hoidn & A. Stasiak).

25. Constant Mean Curvature Surfaces with Three Ends, *Proc. Nat. Acad. Sci. (USA)* **97** (2000) 14067-14068 (with K.G. Brauckmann & J. Sullivan).

24. Embedded Constant Mean Curvature Surfaces with Special Symmetry, *Man. Math.* **99** 135-150 (1999) (with K.G. Brauckmann).

23. Tight knot values deviate from linear relations, *Nature* **392** (1998) 237-238 (with J. Cantarella & J. Sullivan).

22. Möbius-invariant knot energies, *Ideal Knots*, L. Kauffman, A. Stasiak & V. Katrich, eds. World Scientific, Singapore, 1998 (with J. Sullivan).

21. Constant mean curvature surfaces with cylindrical ends, *Mathematical Visualization*, C. Hege and K. Polthier, eds. Springer, Berlin, 1998, 107-116 & 371 (with K.G. Brauckmann & J. Sullivan).

20. On Distortion and Thickness of Knots, *Topology and Geometry in Polymer Science*, T. Lodge, D. Sumners and S. Whittington, eds. IMA Volumes in Math. and its Applications **103** (1997) 67-78 (with J. Sullivan).

19. In Memoriam, F. J. Almgren, Jr. *Experimental Math.* **6** (1997) 1-12 (with D. Epstein, E. Lieb, A. Marden & alii)

18. The Minimax Sphere Eversion, *Visualization and Mathematics*, C. Hege and K. Polthier, eds. Springer, Berlin, 1997, 3-20 & 359-360 (with K. Brakke, G. Francis and J. Sullivan).

17. The Spinor Representation of Surfaces in Space, arXiv dg-ga/9610005 (1996) and dg-ga/9512003 (1995) (with N. Schmitt).

16. Estimates for the Biharmonic Energy on Unbounded Planar Domains, and the Existence of Surfaces Minimizing the Squared Mean Curvature Integral, *Elliptic and Parabolic Methods in Geometry*, B. Chow, R. Gulliver & alii, eds. A.K. Peters, 1996, 67-72.

15. The Moduli Space of Complete Embedded Constant Mean Curvature Surfaces, *Geom. and Funct. Analysis* **6** (1996) 120-137 (with R. Mazzeo & D. Pollack).

14. Comparing the Weaire-Phelan Equal-volume Foam to Kelvin's Foam, *Forma* **11:3** (1996) 233-242 (with J. Sullivan). [Reprinted in: *The Kelvin problem*, Denis Weaire, editor. Taylor and Francis, London, 1997.]

13. New Surface Allotropes of Carbon, *Chem. Phys. Letters* **241** (1995) 522-527 (with P. Lahti & P. Lillya).

12. Möbius Energies for Knots and Links, Surfaces and Submanifolds, *Geometric Topology: Proceedings of the Georgia International Topology Conference*, William H. Kazez, editor. A.M.S./International Press (1997) 570-604 (with J. Sullivan).

11. The Global Structure of Constant Mean Curvature Surfaces, *Inventiones Math.* **114** (1993) 311-332 (with N. Korevaar).

10. Torus Knots Extremizing the Möbius Energy, *Experimental Math.* **2** (1993) 1-9 (with Denise Kim).

9. The Structure of Constant Mean Curvature Embeddings in Euclidean Three Space, *Proceedings of A.M.S. Symposia in Pure Math* **54,** *Differential Geometry: Partial Differential Equations on Manifolds*, R. Greene and S.T. Yau, editors. A.M.S. (1993) 291-298 (with N. Korevaar).

8. The Number of Faces in a Minimal Foam, *Proc. Royal Soc. London A* **439** (1992) 683-686.

7. Minimizing the Squared Mean Curvature Integral for Surfaces in Space Forms, *Experimental Math.* **1** (1992) 191-207 (with L. Hsu & J. Sullivan).

6. Constant Mean Curvature Surfaces in Hyperbolic Space, *Amer. J. Math.* **114** (1992) 1-43 (with N. Korevaar, W.H. Meeks & B. Solomon).

5. A Maximum Principle at Infinity and the Topology of Complete Embedded Surfaces with Constant Mean Curvature, *Springer-Verlag Lecture Notes in Mathematics* **1481**, *Proceedings, Berlin Global Differential Geometry and Global Analysis* (1991) 108-114.

4. Bubbles, Conservation Laws, and Balanced Diagrams, *Geometric Analysis and Computer Graphics. MSRI Publications* **17** (1991) 103-108.

3. Structure of Complete Embedded Surfaces with Constant Mean Curvature, *J. Differential Geom.* **30** (1989) 465-503 (with N. Korevaar & B. Solomon).

2. Comparison Surfaces for the Willmore Problem, *Pacific J. Math.* **138** (1989) 317-345.

1. Conformal Geometry and Complete Minimal Surfaces, *Bull. Amer. Math. Soc.* **17** (1987) 291-295.

0. Global Geometry of Extremal Surfaces in Three Space, *Dissertation*, University of California, Berkeley.

-1. An Olla-Podrida of Open Problems, Often Oddly Posed, *Amer. Math. Monthly* **90** (1983) 196-200 (with R. K. Guy).

Reports in general science journals

Rob Kusner's mathematical work has also been highlighted in several general science journals, including *Nature* (January 2013 and October 1998), *Science News* (October 1998), *Science* (July 1998) and *New Scientist* (Winter 1995), as well as at various blogs (ranging from Terry Tao's to Frank Morgan's at *The Huffington Post*). Rob was quoted in a *Science* news item (July 2012) praising Fernando Coda Marques's award of the Ramanujan Prize.

Degrees

University of California, Berkeley
Ph.D. Mathematics 1988
C. Phil. Mathematics 1984

Haverford College, Pennsylvania
B.A. Mathematics (High Honors) 1981
Physics (Honors) 1981

Post-Doctoral Advisor: Prof. Robert Hardt

Thesis Advisor: Prof. Richard M. Schoen

Experience

University of Massachusetts, Amherst
Professor, 1999–
Associate Professor, 1992–99
Assistant Professor, 1988–92

Institute for Advanced Study, Princeton
AMIAS Board Member 2015–
PCMI Research Program 1992, 2014
Member 1992–93, 1996–97

University of Pennsylvania
Visiting Professor 2008–

Mathematical Sciences Research Institute, Berkeley
Research Professor 2016
Member 1994, 1996–97, 2001, 2003–04

ICERM, Brown University, Providence
Member 2015, 2018

Aspen Center for Physics
Member and Workshop Organizer 2004, 2008, 2017

Irwin Schroedinger Institute, Vienna, Austria
Member 2014, 2017

Isaac Newton Institute, Cambridge U, England
Member and Visiting Fellow 2002, 2012, 2013, 2015

Centre de Recerca Matematica, Barcelona, Catalunya, Spain
Visiting Member 2013

Universidad del Granada, Spain
Visitor in Geometria 1996, 2008, 2012, 2013

University of Utah
    Visiting Professor 2004–2012

Kavli Institute for Theoretical Physics, U C Santa Barbara
    Member and Program Organizer 2012

Centro di Ricerca Matematica Ennio De Giorgi, SNS Pisa
    Visiting Member 2011

Institute for Mathematics and its Applications, Minneapolis
    Member 1996, 2008

Universite' de Tours, France
    Visiting Professor 2003–2008

I.M.P.A., Rio de Janeiro, Brazil
    Visiting Member 1988, 2007

University of California, Berkeley
    Visiting Professor 2003–04

Max Planck Institute for Complex Systems, Dresden, Germany
    Visiting Member 2002

Technische Universität, Berlin
    Visitor in Geometrie 1990, 1993, 2002

University of Minnesota, Minneapolis
    Visiting Professor 1996

Geometry Center, Minneapolis
    Visiting Professor 1994

Rice University
    Visiting Professor 1992

Five Colleges Geometry Institute
    Research Director 1990–91
    REU Mentor 1993

I.H.E.S., Bures sur Yvette, France
    Visiting Member 1989

University of California, Santa Barbara
    Visiting Research Assistant Professor 1988–89

Stanford University
    Instructor & Visiting Scholar 1987–88

University of California, San Diego
    Research & Teaching Associate 1985–87

University of California, Berkeley
Research & Teaching Assistant 1982-85

Haverford College, Pennsylvania
Tutor & Grader 1977-81

Thesis Students

Daria Atkinson, *Filaments, Fibers and Foliations in Frustrated Soft Materials*, Ph. D. (joint with Physics and Polymer Science) 2020.

Murray Christian, *Constant Mean Curvature $\frac{1}{2}$ Surfaces in $\mathbf{H}^2 \times \mathbf{R}$*, Ph. D. (at U. Cape Town, joint with J. Ratzkin) 2019.

Jingmin Chen, *Numerical Methods and Uniqueness for the Canham-Helfrich Model of Biomembranes*, Ph. D. (at Drexel, joint with T. Yu) 2015.

Kyle Vanderwerf, Undergraduate Senior Thesis (joint with Physics) 2014.

Dugan Hammock, M.S. 2013.

Michael Kreisel, Senior Honors Thesis (Amherst College) 2010.

Diego Belfiore, M.S. 2009.

Eli Damon [Cooper], *The Gauss-Green Form on the Moduli Space of Unduloids*, Ph.D. 2007.

Evan Innis, Undergraduate Senior Thesis 2006.

Elena Giorgi, M.S. 2000.

Huayong Yang, M.S. 1998.

James Lawrence, Undergraduate Senior Thesis 1998.

Jorgen Berglund, *Minimal and CMC Surfaces in 3-Manifolds*, Ph.D. 1997.

Nicholas Schmitt, *Minimal Surfaces with Embedded Planar Ends*, Ph.D. 1993.

Wayne Rossman, *Constant Mean Curvature Surfaces in Euclidean and Hyperbolic 3-Space*, Ph.D. 1992.

International Doctoral Panels

U. Cape Town (SOUTH AFRICA) 2019

U. Autonomadad Madrid (SPAIN) 2012 (panel president)

T. U. Darmstadt (GERMANY) 2010 (panel president)

U. Federale de Ceara (Fortaleza, BRAZIL) 2004

Postdoctoral Advisees

Rafael Montezuma (presently at UFC, Fortaleza, BRAZIL)

Peter McGrath (presently at North Carolina State University, Raleigh)

Joseph Hoisington (presently at University of Georgia, Athens)

Robin Koytcheff (presently at University of Louisiana, Lafayette)

Jeremy Leach (recently at MSRI)

Yasha Savelyev (presently at CUICBAS, MEXICO)

Hao Wu (presently at George Washington University)

Jesse Ratzkin (presently at Uni Würzburg, GERMANY)

Bernd Ammann (presently at Uni Regensburg, GERMANY)

Jason H. Cantarella (presently at University of Georgia, Athens)

Nicholas Schmitt (presently at Technische Uni, Berlin, GERMANY)

Bo Guan (presently at Ohio State U, Columbus, and Xiamen U, CHINA)

John M. Sullivan (presently at University of Illinois, Urbana, and Technische Uni, Berlin, GERMANY)

Karsten G. Brauckmann (presently at Uni Darmstadt, GERMANY)

Professional activities

Board of Trustees, Association of Members of the Institute for Advanced Study, Princeton (2015–), and its Treasurer (2018–).

Editorial Board, *Experimental Mathematics* (1995–).

Scientific Committee for Geometric Analysis Workshop, CIRM, Luminy (2019).

Organizer, Working group on packing flexible materials, Aspen Center for Physics (2017).

Co-Director of the Center for Geometry, Analysis, Numerics and Graphics (GANG), University of Massachusetts at Amherst (1993–2016).

Organizer, Semester program and workshop on Small Clusters, Polymer Vesicles and Unusual Minima, ICERM (2015).

Organizer, Miniprogram on Knotted Fields, Kavli ITP, UC Santa Barbara (2012).

Organizer, Workshop on Knots, Centro Ennio De Giorgi, SNS Pisa (2011).

Organizer, Workshop on Geometry of Condensed Matter, Aspen Center for Physics (2008).

Proposal reviewer for NSF Programs in Geometric Analysis; Topology and Foundations; Computational Mathematics; Materials Theory; Gravitation Theory.

Referee for various journals and proceedings, including: J. Differential Geometry; Annals of Mathematics; Communications in Analysis and Geometry; AMS Journals; Amer. J. Math; Pacific J. Math.; Topology and its Appl.; Proc. Royal Soc. London; Math. Zeit.; Duke Math. J.; Amer. J. Physics; Tohoku Math. J.; and several others involving analysis, geometry and topology.

Occasional reviewer for *Math Reviews* and (formerly) for *Zentralblatt.*

External reviewer for numerous tenure, promotion and other personnel cases around the world, including a recent senior "promotion-above-scale" case at the University of California.

Program Committee, Visualization and Mathematics, Berlin, (1997).

Organizer and Research Director of the Five Colleges Geometry Institute (1990–94).

Organizer of AMS Special Sessions on Low Dimensional Geometry (Philadelphia, Oct 1991), on Optimal Geometry (Urbana, Mar 1999), on Geometric Analysis (Storrs, Oct 2007), and on Knots, Links, 3-manifolds & Physics (New Orleans, Jan 2011).

Mentor for NSF Research Experiences for Undergraduates (at Five Colleges Geometry Institute, at the Geometry Center, and at GANG).

Member of NSF panels reviewing CARGO, REU/RUI, RGI.

Member: American Mathematical Society; American Physical Society; Institute of Electrical and Electronics Engineers.

Grants

Generous research support while visiting NSF-funded institutes (IMA, KITP, MSRI, Aspen Center for Physics, ICERM, IAS) and other academic institutions (CentroDeGiorgi/SNS, CRM Barcelona, INI/Cambridge, ISI/Vienna, TUBerlin, UPenn, TongjiU, XiamenU, UniDarmstadt, FIM/ETH Zürich...) around the world over the past decades.

PI, NSF Grant DMS-0076085, Variational Problems in Low-Dimensional Geometry and Topology (2000–2004).

Co-PI, NSF Grant DMS-0079536, SCREMS (2000–2003).

Sponsoring Senior Scientist, NSF Postdoctoral Research Fellowship for Jason Cantarella, at University of Massachusetts, Amherst (1999–2000).

PI, NSF Grant DMS-9704949, Variational Problems in Low-Dimensional Geometry and Topology (1997–2000).

Co-PI, NSF Grant DMS-9626804, GANG: An Interdisciplinary Teaching and Research Environment (1997–2000).

PI, DOE Grant DE-FG02-86ER25015, Computation and Graphics in Mathematical Research (1994–95).

PI, NSF Grant DMS-9404278, Variational Problems in Geometry and Topology (1994–97).

Co-PI, NSF Grant DMS-9312087, Computational Methods in the Mathematical Sciences (1993–97).

Co-PI, DOE Grant DE-FG02-86ER25015, Computation and Graphics in Mathematical Research (1992–94).

Co-PI, NSF Grant DMS-9013220 establishing the Five Colleges Geometry Institute *Geometry in the Machine Age*, one of three NSF Regional Geometry Institutes (1990–94).

PI, NSF Grant DMS-8908064, Global Geometry of Extremal Surfaces (1989–91).

Other awards and honors

Elected to IEEE Senior Membership, for career achievement, after nomination by 3 IEEE Fellows (2020)

Invited by MSRI Director to write cover article for *MSRI Emissary* (2016)

Elected to the AMIAS Board of Trustees, The Institute for Advanced Study, Princeton (2015)

International Mathematical Union logo based on Kusner's critical Borromean Rings (2006)

Shoemaker Distinguished Lecturer, University of Toledo (1999)

NSF Postdoctoral Research Fellowship (1991–94)

Boy's surface statue at — and logo of — Math Forschungsinstitut Oberwolfach based on one of Kusner's minimal surfaces (1991)

Regents Fellow, University of California, Berkeley (1985–86)

Wheeler and Goewy Fellow, University of California, Berkeley (1981–82)

Phi Beta Kappa (1980)

RPI Science Medal (1977)

Invited seminars

Plenary Addresses to: the 2020 workshop on Geometry at RIMS (Kyoto, JAPAN [rumored to be a 60th birthday conference, but postponed due to COVID19]), the 2020 annual PATCH meeting co-hosted by Penn, Temple, and other area institutions (Philadelphia, USA), the 2019 workshop on Geometric Analysis at CIRM (Luminy, FRANCE), the 65th birthday for conference for KIAS Director J. Choe in 2018 (Kyungju and Seoul, KOREA), the 60th birthday conference for F. Pedit in 2017 at UniLeibniz (Hannover, GERMANY), the 2015 annual math majors colloquium at Penn (Philadelphia, USA), the 2015 SHAPE-UP conference on Materials and Mathematics at TU Berlin (GEMANY), the 2014 workshop on Point Configurations at the Irwin Schroedinger Institut (Vienna, AUSTRIA), the 2014 FOAMS+12 workshop at Newton Institute (Cambridge, UK), the 2013 conference on the Willmore Problem (MFOberwolfach, GERMANY), the 2013 workshop on Conformal Geometry and Geometric Analysis at CRM Barcelona (Catalunia, SPAIN), the 2012 workshop on Geometric PDE at ICMAT (Madrid, SPAIN), the 2010 BIRS workshop on Semilinear PDE in Geometry and the DeGiorgi Problem (Banff, CANADA), the 2009 Arbeitsgemeinschaft: Minimal Surfaces (MFOberwolfach, GERMANY), the 2008 IMA workshop on Geometric Singularities (Minneapolis, USA), the 2007 celebration for the 60th birthdays of W. Meeks and D. Hoffman (Buzios, BRAZIL), the 2005 AIM workshop on the Global Theory of Minimal Surfaces (Palo Alto, USA), the 2005 Gordon Conference on Liquid Crystal Geometry (New London, New Hampshire, USA), the 2004 Hauptstudium Kolloquium (Darmstadt, GERMANY), the 75th Birthday Celebration of Manfredo do Carmo in 2004 (Maceio, BRAZIL), the 2003 Retirement Celebration for Jean Taylor (Rutgers, USA), the 60th Birthday Celebration of Harold Rosenberg in 2002 (Dijon, FRANCE), the Euler Math Institute (St Petersburg, RUSSIA), the 2002 Texas Geometry and Topology Festival (Lubbock, USA), the 2001 Clay/MSRI Summer School (Berkeley, USA), the 2000 Spitalfields Day (Newton Institute, Cambridge, UK), the 1999 JAMI Workshop at Johns Hopkins (Baltimore, USA), the 1997 JDG/Lehigh Geometry Festival (Bethlehem, USA), the 1993 International Topology Conference (Athens, Georgia, USA), the 1992 Texas Geometry and Topology Festival (Houston, USA), the 1991 GADGET Workshop (Granada, SPAIN), and the 60th Birthday Celebration of Manfredo do Carmo in 1988 (Rio de Janiero, BRAZIL); also well over one hundred other colloquia or research lectures at mathematics and physics institutions and professional meetings (as well as presentations at more than a dozen AMS special sessions) over the past few decades, including: Ecole Normale Superieure (Paris, FRANCE), Institute for Advanced Study (Princeton,

USA), Mathematische Institut and SFB256 (Bonn, GERMANY), KFA Nuclear Physics Center (Julich, GERMANY), Technische Universität (Berlin, GERMANY), I.H.E.S. (Bures sur Yvette, FRANCE), Mathematischeforschungsinsitut (Oberwolfach, GERMANY), Freie Universität (Berlin, GERMANY), MSRI (Berkeley, USA), Universidad del Granada (SPAIN), I.M.P.A. (Rio de Janiero, BRAZIL), Centre de Physique (Les Houches, FRANCE), Stanford University (USA), University of California (Berkeley, USA), Courant Institute (New York, USA), CUNY Graduate Center (New York, USA), University of Pennsylvania (Philadelphia, USA), University of Minnesota (Minneapolis, USA), Indiana University (Bloomington, USA), University of Texas (Austin, USA), Lehigh University (Bethlehem, USA), University of Washington (Seattle, USA), University of Iowa (Iowa City, USA), University of Connecticut (Storrs, USA), Rutgers University (New Brunswick, USA), Washington University (St. Louis, USA), University of Arizona (Tucson, USA), University of Illinois (Urbana, USA), University of Chicago (USA), Harvard University (Cambridge, USA), George Washington University (DC, USA), Northeastern University (Boston, USA), MIT (Cambridge, USA), Johns Hopkins University (Baltimore, USA), EPFL (Lausanne, SWITZERLAND), NCTS (Hsinchu, TAIWAN), Kobe University (JAPAN), Seoul National University (KOREA), University of Tennessee (Knoxville, USA), University of North Carolina (Charlotte, USA), University of Warwick (Coventry, UK), University of Wisconsin (Madison, USA), University of Utah (Salt Lake City, USA), Universite' de Paris VII (France), Universite' de Tours (FRANCE), University of California (Davis, USA), University of California (Santa Cruz, USA), BIRS (Banff, CANADA), UFC (Fortaleza, BRAZIL), UBR (Brasilia, BRAZIL), Aspen Center for Physics (Aspen, USA), Brandeis University (Waltham, USA), Dartmouth College (Hanover, USA), Hausdorff Institute (Bonn, GERMANY), University of California (Irvine, USA), ICMS (Edinburgh, UK), Imperial College (London, UK), Wills Laboratory, University of Bristol (UK), Aberystwith University (UK), Kings College (London, UK), University of Leicester (UK), McGill University (Montreal, CANADA), Erwin Schrödinger Institute (Vienna, AUSTRIA), Temple University (Philadelphia, USA), Haverford College (Pennsylvania, USA), Brown University (Providence, USA), Drexel University (Philadelphia, USA), Princeton University (New Jersey, USA), Lehigh University (Bethlehem, USA), Tongji University (Shanghai, CHINA), Xiamen University (Xiamen, CHINA) Auburn University (Auburn, USA), University of Pittsburgh (Pennsylvania, USA)....

March 23, 2021