

John Matthew Sullivan

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Born in Princeton, New Jersey on 25 February 1963

Education

Princeton University *Ph.D.* in Mathematics, 1990
University of Cambridge Certificate of Advanced Study in Math., with honors, 1986
Harvard University *A.B. summa cum laude*, Mathematics, fourth in class, 1985

Academic Positions

2003–, Professor (C4), Technische Universität Berlin.
Professor and Council member, DFG Research Center MATHEON, 2003–.
Executive Board member, Berlin Mathematical School, 2006–.

2003–2004, Research Professor, Mathematical Sciences Research Institute.
2004–2005, Professor, Department of Mathematics, University of Illinois (Urbana).
2000–2004, Associate Professor, Department of Mathematics, University of Illinois (Urbana).
Faculty Fellow, Department of Theoretical & Applied Mechanics, 2000–2005.
Faculty Fellow, National Center for Supercomputing Applications, 2000–2001.
Acting Director, Center for Process Simulation and Design, May–Dec 2000.

1997–2000, Assistant Professor, Department of Mathematics, University of Illinois (Urbana).
Aug–Dec 1996, Visiting Assistant Professor, University of Illinois (Urbana).
Jan–Aug 1995, Visiting Assistant Professor, Center for GANG, University of Massachusetts (Amherst).
1991–1997, Assistant Professor, School of Mathematics, University of Minnesota.

Honors and Fellowships

1997–1999, Arnold O. Beckman Research Award, University of Illinois.
1993–1994, Mathematical Sciences Research Institute Postdoctoral Fellowship.
1990–1993, Geometry Computing Group Postdoctoral Fellowship.
1989–1990, Alfred P. Sloan Doctoral Dissertation Fellowship.
1986–1989, National Science Foundation Graduate Fellowship.
1985–1986, Henry Fellowship for study at King's College, Cambridge.

Published Videos

The Borromean Rings: A new logo for the IMU,
with Charles Gunn, in *MathFilm Festival 2008*, Springer, 2008, 5-min. video.

The Optiverse,
with George Francis and Stuart Levy, in *VideoMath Festival at ICM '98*, Springer, 1998, 7-min. video.
Reprinted in *Video and Multimedia at 3ecm*, Springer, 2000.

Knot Energies, in *VideoMath Festival at ICM '98*, Springer, 1998, 3-min. video.
Reprinted in *Video and Multimedia at 3ecm*, Springer, 2000.

Using Max-Flow/Min-Cut to Find Area-Minimizing Surfaces,
in *Computational Crystal Growers Workshop*, AMS Sel. Lect. Math., 1992, pp 107–110 plus video.

Crystalline Approximation: Computing Minimum Surfaces via Maximum Flows,
in *Computing Optimal Geometries*, AMS Selected Lectures in Math., 1991, pp 59–62 plus video.

Computing Soap Films and Crystals,
with Fred Almgren, Ken Brakke, Jean Taylor, in *Computing Optimal Geometries*, 1991, 14-min. video.

Refereed Research Publications

- Coplanar k -unduloids are nondegenerate*,
with Karsten Große-Brauckmann, Nick Korevaar, Rob Kusner and Jesse Ratzkin,
Intl. Math. Res. Not., 2009, to appear.
- The Distortion of a Knotted Curve*,
with Elizabeth Denne, *Proc. A.M.S.* **137**, 2009, pp 1139–1148.
- Coplanar Constant Mean Curvature Surfaces*,
with Karsten Große-Brauckmann and Rob Kusner, *Comm. Anal. Geom.* **15:5**, 2008, pp 985–1023.
- Criticality for the Gehring Link Problem*,
with Jason Cantarella, Joe Fu, Rob Kusner and Nancy Wrinkle,
Geometry and Topology, **10**, 2006, pp 2055–2115.
- Quadriseccants Give New Lower Bounds for the Ropelength of a Knot*,
with Elizabeth Denne and Yuanan Diao, *Geometry and Topology*, **10**, 2006, pp 1–26.
- Some Ropelength-Critical Clasps*, with Nancy Wrinkle,
in *Physical and Numerical Models in Knot Theory*, World Sci., 2005, pp 565–580.
- The structure of foam cells: Isotropic Plateau polyhedra*,
with Sascha Hilgenfeldt, Andrew M. Kraynik and Douglas A. Reinelt,
Europhys. Lett., **67:3**, 2004, pp 484–490.
- Pressures in Periodic Foams*, with Denis Weaire, Norbert Kern, Simon J. Cox and Frank Morgan,
Proc. Royal Soc. London A **460**, 2004, pp 569–579.
- Tiling space and slabs with acute tetrahedra*, with David Eppstein and Alper Üngör,
Comput. Geom. Theory Appl. **27:3**, 2004, pp 237–255.
- Triunduloids: Embedded Constant Mean Curvature Surfaces with Three Ends and Genus Zero*,
with Karsten Große-Brauckmann and Rob Kusner,
Crelle's J. reine angew. Math. **564**, 2003, pp 35–61.
- The Second Hull of a Knotted Curve*,
with Jason Cantarella, Greg Kuperberg and Rob Kusner, *Amer. J. Math.* **125:6**, 2003, pp 1335–1348.
- The Tight Clasp*, *Electronic Geometry Model* www.eg-models.de/2001.11.001, May 2003.
- Cubic Polyhedra*, with Chaim Goodman-Strauss,
in *Discrete Geometry* (Kuperberg festschrift), Marcel Dekker, 2003, pp 305–330.
- On the Minimum Ropelength of Knots and Links*,
with Jason Cantarella and Rob Kusner, *Inventiones Mathematicae* **150:2**, 2002, pp 257–286.
- Building Spacetime Meshes over Arbitrary Spatial Domains*,
with Jeff Erickson, Damrong Guoy and Alper Üngör,
Engineering with Computers **20:4**, 2005, pp 342–353.
- Approximating Ropelength by Energy Functions*,
in *Physical Knotting* (Las Vegas 2001), AMS Contemp. Math. **304**, 2002, pp 181–186.
- Dynamic Skin Triangulation*, with Ho-Lun Cheng, Tamal Dey and Herbert Edelsbrunner,
Discrete and Comput. Geometry **25**, 2001, pp 525–568.
- Constant Mean Curvature Surfaces with Three Ends*, with Karsten Große-Brauckmann and Rob Kusner,
Proc. Nat'l Acad. Sci., **97:26**, 2000, pp 14067–14068.
- Tomographic Imaging of Foam*,
with Fetterman, Tan, Ying, Stack, Marks, Feller, Cull, Munson, Thoroddsen and Brady,
Optics Express **7:5**, 2000, pp 186–197.
- New Tetrahedrally Close-Packed Structures*, in *Proc. Eurofoam 2000 (Delft)*, pp 111–119.
- The β -Sn Dual Structure: A 4-Connected Net Based on a Packing of Simple Polyhedra with 18 Faces*,
with Michael O'Keeffe, *Z. Kristallographie* **213**, 1998, pp 374–376.
- Tight Knot Values Deviate from Linear Relations*,
with Jason Cantarella and Rob Kusner, *Nature* **392:6673**, 1998, pp 237–238.

- Constant Mean Curvature Surfaces with Cylindrical Ends*,
with Karsten Große-Brauckmann and Rob Kusner,
in *Mathematical Visualization*, Springer, 1998, pp 107–116.
- The Minimax Sphere Eversion*,
with George Francis *et al*, in *Visualization and Mathematics*, Springer, 1997, pp 3–20.
- Using Symmetry Features of the Surface Evolver to Study Foams*,
with Ken Brakke, in *Visualization and Mathematics*, Springer, 1997, pp 95–117.
- Möbius Energies for Knots and Links, Surfaces and Submanifolds*,
with Rob Kusner, in *Geometric Topology*, International Press, 1996, pp 570–604.
- Sphere Packings Give an Explicit Bound for the Besicovitch Covering Theorem*,
J. Geometric Analysis 4:2, 1994, pp 219–231.
- Monotonicity Theorems for Two-Phase Solids*,
with Frank Morgan, Francis Larché, *Arch. Rat. Mech. Anal.* 124:4, 1994, pp 329–353.
- Computing Hypersurfaces Which Minimize Surface Energy Plus Bulk Energy*,
in *Motion by Mean Curvature and Related Topics*, de Gruyter, 1994, pp 186–197.
- Minimizing the Squared Mean Curvature Integral for Surfaces in Space Forms*,
with Lucas Hsu and Rob Kusner, *Experimental Math.* 1:3, 1992, pp 191–207.
- Some Results on the Phase Behavior in Coherent Equilibria*,
with Frank Morgan, Francis Larché, *Scripta Metallurgica* 24:3, 1990, pp 491–493.

Books Edited

- Discrete Differential Geometry*,
editor, with Alexander I. Bobenko, Peter Schröder and Günter M. Ziegler,
x+341 pp, Birkhäuser, 2008.
- Elliptic and Parabolic Methods in Geometry*,
editor, with Ben Chow, Bob Gulliver and Silvio Levy, viii+203 pp, AK Peters, 1996.

Other Research Publications

- Discrete Differential Geometry*,
organizer, with Alexander I. Bobenko, Richard W. Kenyon and Günter M. Ziegler,
Oberwolfach Reports 3:1, 2006, pp 653–727.
- Distortion of Knotted Curves*, *Oberwolfach Reports* 1:4, 2004, pp 2538–2491.
- Spherical Duals and Minkowski Sums*, *Proc. Bridges 2006*, London, 2006, pp 117–122.
- Spacetime meshing with adaptive refinement and coarsening*,
with Abedi, Chung, Erickson, Fan, Garland, Guoy, Haber, Thite and Zhou,
Proc. 20th ACM Symp. Comput. Geom., 2004, pp 300–309.
- Building space-time meshes over arbitrary spatial domains*,
with Jeff Erickson, Damrong Guoy and Alper Üngör,
in *Proc. 11th Intl. Meshing Roundtable*, Sandia, September 2002, pp 391–402.
- Dynamic Skin Triangulation*,
with Ho-Lun Cheng, Tamal Dey and Herbert Edelsbrunner,
in *Proc. 12th Ann. ACM-SIAM Sympos. Discrete Alg.*, January 2001, pp 47–56.
- Foam Evolution: Experiments and Simulations*,
in *Proc. NASA 5th Microgravity Fluid Physics Conference*, 2000, pp 99–100.
- Open Problems in Soap-Bubble Geometry*,
editor, with Frank Morgan, *International J. Math.* 7:6, 1996, pp 833–842.
- LATERNA matheMAGICA*,
with George Francis *et al*, in *Virtual Environments and Distributed Computing at SC '95*, p 45.
- A Crystalline Approximation Theorem for Hypersurfaces*,
Princeton *Ph.D.* thesis, 1990, issued as Geometry Center report GCG 22.

Invited Contributions to Books and Special Issues

- Curvatures of discrete curves and surfaces*,
in *Géométrie discrète*, Société Mathématique de France, Journée Annuelle, 2009, pp 45–58.
- Curvatures of smooth and discrete surfaces*,
in *Discrete Differential Geometry*, Birkhäuser, 2008, pp 175–188.
- Convergence and isotopy type for graphs of finite total curvature*,
with Elizabeth Denne, in *Discrete Differential Geometry*, Birkhäuser, 2008, pp 163–174.
- Curves of finite total curvature*,
in *Discrete Differential Geometry*, Birkhäuser, 2008, pp 137–161.
- Visualizing a Sphere Eversion*, with George Francis,
IEEE Trans. Visual. Comput. Graphics, **10**:5, 2004, pp 509–515.
- The Aesthetic Value of Optimal Geometry*, in *The Visual Mind II*, MIT Press, 2005, pp 547–563.
- Making the Optiverse: A Mathematician’s Guide to AVN, a Real-Time Interactive Computer Animator*,
with George Francis and Stuart Levy,
in *Mathematics, Art, Technology, Cinema*, Springer, 2003, pp 39–52.
- Sphere Eversions: from Smale through “The Optiverse”*,
in *Mathematics and Art* (Maubeuge 2000), Springer, 2002, pp 201–212 and 311–313.
- The Optiverse: una guida ai matematici per AVN, programma interattivo di animazione*,
with George Francis and Stuart Levy,
in *Matematica, arte, tecnologia, cinema*, Springer, 2002, pp 37–51.
- Rescalable Real-Time Interactive Computer Animations*,
in *Multimedia Tools for Communicating Mathematics*, Springer, 2002, pp 311–314.
- Foams and Bubbles: Geometry and Simulation*, *Intl. J. Shape Modeling*, **5**:1, 1999, pp 101–114.
- “The Optiverse” and Other Sphere Eversions*, in *ISAMA ’99 Proceedings*, 1999, pp 471–479.
Reprinted in *Bridges 1999 Proceedings*, 1999, pp 265–274.
Reprinted in *Visual Mathematics* (ISIS), **1**:3, September 1999.
- The Geometry of Bubbles and Foams*, in *Foams and Emulsions*, Kluwer (NATO ASI), 1999, pp 379–402.
- Möbius-Invariant Knot Energies*, with Rob Kusner, in *Ideal Knots*, World Scientific, 1998, pp 315–352.
- Computing Sphere Eversions*,
with George Francis and Chris Hartman, in *Mathematical Visualization*, Springer, 1998, pp 237–255.
- On the Distortion and Thickness of Knots*, with Rob Kusner,
in *Topology and Geometry in Polymer Science* (IMA 103), Springer, 1998, pp 67–78.
- Comparing the Weaire-Phelan Equal-Volume Foam to Kelvin’s Foam*,
with Rob Kusner, *Forma* **11**:3, 1996 (special issue edited by Denis Weaire), pp 233–242.
Reprinted in *The Kelvin Problem*, Taylor & Francis, 1996, pp 71–80.
- Visualization of soap bubble geometries*,
with Fred Almgren, *Leonardo* **24**:3/4, 1992, pp 267–271.
Reprinted in *The Visual Mind*, MIT Press, 1993, pp 79–83.

Expository Publications

- The Borromean Rings: A video about the new IMU logo*,
with Charles Gunn, *Proc. Bridges 2008*, Leeuwarden, 2008, pp 63–70.
- When Soap Bubbles Collide*,
with Colin Adams and Frank Morgan, *Amer. Math. Monthly*, April 2007, pp 329–337.
- A Complete Family of CMC Surfaces*,
in *Integrable Systems, Geometry and Visualization*, 2005, pp 237–245.
- Optimal Geometry as Art*,
Symmetry: Art and Science **2004**:1–4, 2004, pp 234–237.
- Turning a Snowball Inside Out: Mathematical Visualization at the 12-foot Scale*,
with Alex Kozłowski, Dan Schwalbe, Carlo Séquin and Stan Wagon,
Proc. Bridges 2004, Southw. Coll., Kansas, 2004, pp 27–36.
- Optimal Geometry as Art*, in *Proceedings of ISAMA/Bridges 2003*, Granada, 2003, pp 529–532.
- ALICE on the Eightfold Way: Exploring Curved Spaces in an Enclosed Virtual Reality Theater*,
with George Francis, Camille Goudeseune, Hank Kaczmarski and Ben Schaeffer,
in *Visualization and Mathematics III*, Springer, 2003, pp 305–315 and 429.
- In Memoriam Frederick J. Almgren Jr., 1933–1997: On Being a Student of Almgren's*,
with Frank Morgan, *Experimental Math.* **6**:1, 1997, pp 8–10.
- Generating and Rendering Four-Dimensional Polytopes*,
The Mathematica Journal **1**:3, 1991, pp 76–85.
- Animating the Heat Equation: A Case Study in Mathematica Optimization*,
with Matt Thomas, *The Mathematica Journal* **1**:1, 1990, pp 80–84.

Conferences Organized

- Discrete Differential Geometry*, with Alexander Bobenko, Richard Kenyon, Günter Ziegler,
Oberwolfach Workshop, January 2009.
- Discrete Differential Geometry*, with Alexander Bobenko, Richard Kenyon, Günter Ziegler,
Oberwolfach Workshop, March 2006.
- Discrete Differential Geometry*, with Alexander Bobenko, Peter Schröder, Günter Ziegler,
Oberwolfach Seminar, June 2004.
- Math and the Arts*, with Nat Friedman, Ann Robertson, Reza Sarhangi,
MAA Joint Meetings, Phoenix, January 2004.
- Mathematical Connections in Art, Music, and Science*, with Reza Sarhangi, Doug Norton,
MAA Joint Meetings, Baltimore, January 2003.
- Optimal Geometry of Curves and Surfaces*, with Jason Cantarella,
AMS Special Session, Madison, October 2002.
- Minisymposium: Computational Differential Geometry*,
SIAM Geometric Design, Sacramento, November 2001.
- Optimal Geometry*, with Rob Kusner,
AMS Special Session, Urbana, March 1999.
- Elliptic and Parabolic Methods in Geometry*, with Ben Chow, Bob Gulliver,
Geometry Center, Minneapolis, May 1994.

Invited Short Lectures at AMS/MAA Special Sessions

- AMS Sec. Meeting, Bowling Green: *Knot Theory and Applications*, March 2005,
“Essential arcs of knots”.
- AMS/MAA Joint Math. Meeting, Special Session: *Riemannian Geometry*, January 2005,
“Ropelength and Distortion of Knots using Essential Secants”.
- AMS Sect. Meeting, Tallahassee: *Knot Theory and Applications*, March 2004,
“The tight Borromean rings”.
- AMS Sect. Meeting, San Francisco: *Numerical Methods . . . in Knot Theory*, May 2003,
“Simulations of tight links”.
- AMS Sect. Meeting, Bloomington: *Differential Geometry*, April 2003, “The tight clasp”.
- AMS/MAA Joint Math. Meeting, Special Session: *Computational Topology*, January 2002,
“Optimal geometry in topology”.
- AMS Sect. Meeting, Chattanooga: *Variational Methods for Free Surface Interfaces*, October 2001,
“Complete embedded CMC surfaces with coplanar ends”.
- MAA MathFest, Madison: *Soap Bubble Geometry*, August 2001, “Spherical bubble clusters”.
- AMS Sect. Meeting, Hoboken: *Surface Geometry and Shape Perception*, April 2001,
“Curvature measures for discrete surfaces”.
- AMS Sect. Meeting, Las Vegas: *Physical Knotting and Unknotting*, April 2001,
“The second hull of a knotted curve”.
- AMS Sect. Meeting, Charlotte: *Knot Theory and its Applications*, October 1999, “The thickness of knots”.
- AMS Sect. Meeting, Austin: *Free Surface Interfaces and PDEs*, October 1999,
“Triunduloids: embedded CMC surfaces with three ends”.
- AMS Sect. Meeting, Urbana: *Elementary Geometry*, March 1999, “A Generalization of Post’s Theorem”.
- AMS Winter Meeting, Special Session: *Recent Developments in Differential Geometry*, January 1999,
“Triunduloids: embedded constant-mean-curvature surfaces with three ends”.
- AMS Sect. Meeting, Maryland: *Partial Differential Equations*, April 1997,
“Triunduloids: Embedded CMC surfaces with three ends”.
- AMS Sect. Meeting, Iowa: *Physical Knot Theory*, March 1996,
“Discretizations of Möbius knot energies”
and “Knot energy minimization in the Evolver”.
- AMS Mathfest, Sp. Sess.: *Soap Bubble Geometry*, August 1995, “TCP structures as equal-volume foams”.
- AMS Mathfest, Sp. Sess.: *Computer Graphics as a Research Tool in Geom. & Topol.*, August 1994,
“Using the Evolver for geometric optimization problems”.
- AMS/DMV Joint Meeting, Special Session: *Geometry and Computer Visualization*, October 1993,
“Real-time viewing of conformally invariant problems”
and “Conformal knot energy and a higher-dimensional generalization”.
- AMS/MAA Joint Math. Meeting, Special Session: *Computing Optimal Geometries*, January 1991,
“Crystalline approximation: Computing minimum surfaces via maximum flows”.

Invited Lectures at Conferences on Art and Mathematics

- Inst. H. Poincaré, Paris, February 2005, Math/Art Seminar: “Optimal Geometry as Art”.
- Tihany, Hungary: *ISIS Symmetry*, October 2004,
“Optimal Geometry as Art”.
- Granada, Spain: *ISAMA/Bridges 2003*, July 2003, “Optimal Geometry as Art”.
- Southwestern College, Kansas: *Bridges Workshop*, July 2001, “Mathematical computer graphics”.
- Lisbon, Portugal: *Multimedia Tools for Communicating Mathematics*, November 2000,
“Rescalable real-time interactive computer animations”.
- Bologna, Italy: *Mathematics, Art and Culture*, October 2000, “Photo-realistic rendering of soap films”.
- Maubeuge, France: *Colloquium on Mathematics and Art*, September 2000,
“*The Optiverse* and other eversion videos”.
- Southwestern College, Kansas: *Bridges Workshop*, July 2000, “Real-time interactive computer animation”.
- Southwestern College, Kansas: *Bridges Conference*, July 2000, “Equal-tempered musical scales with few notes”.
- SUNY, Albany: *ISAMA (Art & Math)*, June 2000, “Photo-realistic rendering of soap films”.
- Southwestern College, Kansas: *Bridges Conference*, July 1999, “*The Optiverse* and earlier eversion videos”.
- San Seabastián, Spain: *ISAMA (Art & Math)*, June 1999, “*The Optiverse* and earlier eversion videos”.

Invited Lectures for Undergraduates, Industrial Labs, and Physics/Engineering Departments

Smith College, March 2009, Math Lunch Talk: “Minimal Stick Number for Knotted Tori”.

Potsdam, March 2008, Exploratorium: “Seifenblasen und Polyeder”.

Urania Theater, Berlin, January 2008, Math Inside Lecture: “Seifenblasen und Polyeder”.

Matheon, November 2006, MATHEredaktiON: “Feste Knoten”.

Ochanomizu Univ., Tokyo, February 2006, Physics Seminar: “Geometric Knot Theory”.

Arizona State Univ., August 2005,
Chemistry Seminar: “Bilayer Membranes Minimizing Surface Bending Energies”.

Urania Theater, Berlin, November 2004, Math Inside Lecture: “Seifenblasen und Polyeder”.

Techn. Univ. Berlin, October 2004, Erstsemestertag: “Mars und Mathematik”.

Northwestern Univ., June 2002,
Mechanical Engineering Seminar: “Using the Evolver for Area-Minimization Problems”.

Univ. of Connecticut, April 2002,
Computer Science and Engineering Colloquium: “Using bending energy to drive a sphere eversion”.

Union Coll., Schenectady, May 2001,
Student Seminar: “Soap-film singularities and deltahedra”,
Faculty Colloquium: “The second hull of a knotted curve”.

ICTM State Math Finals, Urbana, April 2001, Public Lecture: “Soap-bubble singularities and deltahedra”.

St. Mary’s Coll., Maryland, March 2001,
Natural Science Colloquium: “The geometry of foams”,
Mathematics Seminar: “The second hull of a knotted curve”.

Beckman Institute, UIUC, November 2000,
ITG Forum: “Mathematical Imitations of Brent Collins’ Sculpture”.

Physics Dept., Notre Dame, September 2000, Condensed Matter Seminar: “The geometry of foams”.

Williams Coll., June 2000, Math Colloquium: “The second hull of a knotted curve”.

Southwestern College, Kansas, April 2000, College Convocation: “A new vision and the arts”.

Univ. of Illinois, Urbana, November 1999, Physics Society: “Soap-film singularities and polyhedra”.

Univ. of Illinois, Urbana, September 1999, Theor. & Appl. Mechanics Seminar: “The Geometry of Foams”.

Mass. Inst. of Technology, September 1999, Mechanics and Materials Seminar: “The Geometry of Foams”.

Williams Coll., August 1999, Math Colloquium: “The minimax sphere eversion”.

Microsoft Research, May 1999,
Theory Group Seminar: “Computer Simulation of Optimization Problems in Geometry”.

Northern Illinois Univ., October 1997, Pi Mu Epsilon Lecture: “Bubble clusters and polyhedra”.

Carleton Coll., February 1997, Math Colloquium: “Soap-bubble singularities as duals of deltahedra”.

Wabash Coll., December 1996, Math Colloquium: “Soap-bubble singularities as duals of deltahedra”.

Center for Communications Research, Princeton, November 1996,
Colloquium: “The configuration space of k points on sphere”.

DIMACS REI: *Software and Mathematical Visualization*, June 1996,
“Using the Evolver for geometric optimization and graphics”
and “Stereographic projection in real life and on the web”.

Macalester Coll., Feb 1996, Math Colloquium: “Soap-bubble singularities as duals of polyhedra”.

Williams Coll., July 1995, Math Colloquium: “Soap-bubble singularities as duals of deltahedra”.

Gustavus Adolphus Coll., November 1994, Math Colloquium: “The structure of soap-bubble clusters”.

Microsoft, March 1994, Research Seminar: “Symmetry and curvature: Computer graphics in curved spaces”.

NSF Regional Geometry Institute (Five Colleges): *Discrete Geometry*, July 1993,
“Regular polytopes as bubble clusters”.

Williams Coll., June 1993, Math Colloquium: “Conformal knot energy and its extension to surfaces”.

Williams Coll., July 1991, Math Colloquium: “Spherical soap bubbles”.

Bell Labs: *Research Seminars*, December 1989, “Minimizers in two-phase solids”
and “Computing Soap Films and Crystals”.

Lectures Selected for Presentation at Engineering Conferences

WIAS, Berlin: *Tetrahedron*, October 2005, “Combinatorics and Curvature of Tetrahedral Meshes”.
Marne-la-Vallée, France: *Euroconference on Foams*, July 2004, “Monohedral and Isohedral Foams”.
Aspen Institute: *Geometry and Materials Physics*, June 2004, “Bending Energy and Sphere Eversions”.
Seattle: *SIAM Geometric Design*, November 2003, “Thick knots and the medial axis”.
Manchester: *Eurofoams 2002*, July 2002, “Foam evolution: Experiments and simulations”.
St. Malo: *Curves and Surfaces 2002*, June 2002, “Curvature measures for discrete surfaces”.
Berlin: *Visualization and Mathematics '02*, May 2002, “ALICE on the eightfold way”.
TU Delft, Netherlands: *Euroconference on Foams*, June 2000, “New TCP structures”.

Lectures at Funding Review Workshops

Arlington, VA: *Final OPAAL Review Workshop*, January 2002,
“Overview of the Center for Process Simulation and Design”.
Seattle, WA: *NSF/DARPA OPAAL Review Workshop*, May 2001, “Overview of CPSD”.
San Diego, CA: *NSF/DARPA OPAAL Review Workshop*, October 2000,
“Recent Progress in the Center for Process Simulation and Design”.
Cleveland, Ohio: *NASA Microgravity Fluid Physics*, August 2000,
“Foam Evolution: Experiments and Simulations”.
Chicago, IL: *NSF/DARPA OPAAL Review Workshop*, May 2000,
“Recent Activities in the Center for Process Simulation and Design”.

Invited Addresses at Conferences

Erlangen: *DMV Jahrestagung*, September 2008, “Combinatorics and Curvature”.
Séminaire Borel, Les Diablerets: *Nouvelles approches de la courbure*, August 2008,
“Discretizations of Curvature”.
Venice: *Knots and Macromolecules II*, March 2008, “Minimal Stick Number for Knotted Tori”.
IPAM, Los Angeles: *Graph Cuts and Related Problems*, February 2008,
“From Continuous to Discrete: The Example of Minimal Surfaces”.
Chinese Academy of Sciences, Beijing: *Topology and Physics*, July 2007,
“Two connections between combinatorial and differential geometry”.
Chern Institute, Tianjin: *Topology and Physics*, July 2007,
“Ropelength and Distortion of Knots using Essential Secants”.
Berlin: *Discrete Differential Geometry*, July 2007,
“Two connections between combinatorial and differential geometry”.
3rd Russian-German Geometry Meeting: *St. Petersburg*, June 2007,
“Two connections between combinatorial and differential geometry”.
Berlin: *ACS General Workshop*, May 2007,
“Two connections between combinatorial and differential geometry”.
Brussels: *PADGE 2007*, April 2007, “Geometry, Curvature and Combinatorics on the Torus”.
London: *Bridges*, August 2006, “Spherical duals and Minkowski sums”.
Potsdam: *EUFoam 2006*, July 2006, “Foams with small faces”.
Venice: *Knots and Macromolecules*, March 2006,
“Ropelength and Distortion of Knots via Essential Secants”.
International Mathematica Symposium: *Avignon, France*, June 2006,
“Visualization of Optimal Geometry”.
Integrable Systems, Geometry and Visualization: *Ōsaka, Japan*, January 2006,
“Geometric Knot Theory”.
AIM, Stanford: *Spaces of Knots*, January 2006, “Geometric Knot Theory”.
MRCC, Bedlewo: *Differential Geometry*, September 2005,
“Nondegeneracy of CMC Surfaces”.
FoCM'05, Santander, Spain: *Computational Topology*, July 2005,
“Geometric Knot Theory”.
Banff Int'l Res. Sta.: *Densest Packings of Spheres*, May 2005,
“Sphere packings for the working mathematician”.

Univ. Calgary: *Calgary Workshop in Discrete Geomtry*, May 2005,
 “Combinatorial manifolds with low valence”.

Lubbock, Texas: *Texas Geometry and Topology Conference*, February 2005,
 “Geometric Knot Theory”.

Fukuoka, Japan: *Integrable Systems, Geometry and Visualization*, November 2004,
 “A Complete Family of CMC Surfaces”.

Heidelberg: *DMV Jahrestagung*, September 2004, “Coplanar CMC Surfaces”.

Oberwolfach meeting: *Geometrie*, September 2004, “Distortion of Knotted Curves”.

Oberwolfach seminar: *Discrete Differential Geometry*, June 2004,
 “Curvatures of Curves; Discrete Vector Bundles; Discrete Minimal Surfaces”.

MSRI Workshop: *Discrete and Computational Geometry*, November 2003,
 “Discrete minimal surfaces in the cubic lattice”.

Erbach, Germany: *Geometric Modeling and Differential Geometry*, October 2003,
 “Thick knots and the medial axis”.

MSRI Summer Graduate Program, Reed College: *Mathematical graphics*, July 2003,
 “Optimal Geometry as Art”.

Les Diablerets, Switzerland: *Knots, random walks and biomolecules*, July 2003, “Ropelength of knots”.

University of Georgia: *Georgia Topology Conference*, June 2003, “The ropelength of knots and links”.

Illinois College, Jacksonville: *Illinois Section MAA Annual Meeting*, March 2003,
 “Soap-bubble singularities and deltahedra”.

Oberwolfach meeting: *Mathematische Methoden der Geometrischen Datenverarbeitung*, October 2002,
 “Curvature measures for discrete surfaces”.

AMS Sect. Meeting, Madison: *Plenary Lecture*, October 2002, “Optimal geometry in topology”.

Oberwolfach meeting: *Geometrie*, October 2002, “Ropelength criticality”.

Newton Institute, Cambridge: *Foams and Minimal Surfaces*, August 2002, “Six five-minute talks”.

Newton Institute, Cambridge: *Foams and Minimal Surfaces*, August 2002, “Open problems in foam geometry”.

Newton Institute, Cambridge: *Surface Evolver Extravaganza*, July 2002,
 “Computing optimal geometry with the evolver”.

Dresden: *Topology in Condensed Matter Physics*, July 2002,
 “Simulations of tight knots and links”.

Tallahassee, FL: *Discrete Geometry with Applications to Science and Medicine*, May 2002,
 “Curvature measures for discrete surfaces”.

Univ. of Georgia: *Southeast Geometry Conference*, April 2002, “Simulations of tight links”.

Indiana Univ.: *Bloomington Geometry Workshop*, April 2002, “The ropelength of knots and links”.

SIAM Geometric Design '01 Minisymposium: *Computational Differential Geometry*, November 2001,
 “Curvature measures for discrete surfaces”.

MAA MathFest, Madison: *Project NExT, Issues in Math Ed*, August 2001,
 “Hands-on teaching of nonEuclidean geometry”.

ISMAA Annual Meeting, Urbana: *Minicourse*, March 2001, “Mathematics in the CAVE”.

Columbia, SC: *Twelfth Annual Southeast Geometry Conference*, March 2001,
 “The second hull of a knotted curve”.

Oberwolfach meeting: *Geometrie*, October 2000, “The second hull of a knotted curve”.

SIAM Geometric Design '99 Minisymposium: *CAD and Creativity*, November 1999,
 “Use of mathematics to create optimal designs”.

MSRI Workshop: *The Mathematical Foundations of CAD*, June 1999,
 “Discrete Differential Geometry of Curves and Surfaces”.

Eastern Illinois Univ.: *Differential Geometry Day*, October 1998,
 “Conformal Knot Energies and Their Generalizations”.

SIGGRAPH '98: *Electronic Theater*, July 1998, “The Optiverse”.

SIAM Geometric Design '97 Minisymposium: *Computational Geometry and Topology*, November 1997,
 “Minimization of mathematical energies for surfaces”.

Berlin: *Visualization and Mathematics '97*, September 1997,
 “Minimax sphere eversions and other optimal geometry”.

NATO Advanced Study Institute: *Foams, Emulsions and Cellular Materials*, May 1997,
 “Mathematics of soap films (short course)”.

MSRI Workshop: *Computational and Algorithmic Methods in 3-Dimensional Topology*, March 1997, “Energies and ropelengths for knots and links”.

Oberwolfach meeting: *Geometrie*, October 1996, “The minimax sphere eversion”.

IMPA: *International Conf. on Differential Geometry*, July 1996, “The minimax sphere eversion”.

IMA Workshop: *Topology and Geometry in Polymer Science*, June 1996, “Studying knot energies with the Evolver”.

Northwestern Univ.: *Midwest PDE Seminar*, November 1995, “Existence and bounds for Kelvin’s foam”.

Washington Univ.: *Midwest Geometry Conf.*, June 1995, “Soap-bubble singularities in higher dimensions”.

ZIB/SFB288 workshop: *Visualization and Mathematics*, June 1995, “Geometric optimization with the Evolver”.

Oberwolfach meeting: *Geometrie*, October 1994, “Deltatopes and soap-film singularities in higher dimensions”.

ITCS Workshop (U Kansas): *Discretization and Geometric Visualization*, September 1993, “Möbius energy of knots and links, surfaces and submanifolds”.

MSRI Workshop: *Visualization of Geometric Structures*, October 1992, “Self-similar solutions for the curve-shortening flow”.

Geometry Center: *Computational Crystal Growers Workshop*, March 1992, “Using max-flow/min-cut to find area-minimizing surfaces”.

GADGET Workshop (Granada): *Minimal Surfaces*, September 1991, “Crystalline approximation: Computing minimum surfaces via maximum flows”.

NSF Regional Geometry Institute (Five Colleges): *Optimization in Geometry*, July 1991, “Crystalline approximation: Computing minimum surfaces via maximum flows”.

Invited Lectures at Mathematics Departments

Smith College, March 2009, Connecticut Valley Mathematics Colloquium: “Combinatorics and Curvature”.

Imperial College, London, January 2008, Applied Math. Colloquium: “Tight Knots”.

Univ. of Illinois, Urbana, August 2007, Mathematics Collouquium: “Two connections between combinatorial and differential geometry”.

UC San Diego, May 2007, Geometric Analysis Seminar: “Two connections between combinatorial and differential geometry”.

Columbia Univ., April 2006, Low-Dimensional Topology Seminar: “Ropelength and Distortion of Knots using Essential Secants”.

Uni. Tübingen, November 2006, CMC Seminar: “Der Satz von Alexandrov”.

Harvard Univ., December 2006, Gauge Theory and Topology Seminar: “Ropelength criticality for knots and links”.

UC Louvain, December 2006, Colloquium: “Geometric Knot Theory”.

Berlin Math. School, October 2006, BMS Friday Colloquium: “Geometric Knot Theory”.

Georgia Tech., February 2006, General Colloquium: “Visualization of Optimal Geometry”.

Tokyo Metropolitan Univ., February 2006, Geometry Day: “Nondegeneracy of CMC Surfaces”.

Humboldt Univ. Berlin, November 2005, Forschungsseminar Differentialgeometrie: “Embedded Surfaces of Constant Mean Curvature”.

Univ. of Connecticut, March 2005, Geometry Seminar: “Ropelength and Distortion of Knots using Essential Secants”.

Univ. of Massachusetts, Amherst, March 2005, Math Colloquium: “Geometric Knot Theory”.

Univ. of Illinois, Urbana, March 2005, Differential Geometry Seminar: “Nondegeneracy of CMC Surfaces”.

Univ. of Illinois, Urbana, March 2005, Geometric Potpourri: “Curves of Finite Total Curvature”.

ETH Zürich, December 2004, Zürich Math Colloquium: “Geometric Knot Theory”.

Tokyo Metropolitan Univ., November 2004, Geometry and Visualization: “Geometric Knot Theory”.

Kobe Univ., Japan, November 2004, Geometry and Visualization: “The Optiverse”.

Univ. of Illinois, Urbana, October 2004, Geometric Potpourri: “The Distortion of Knotted Curves”.

Humboldt Univ. Berlin, June 2004, Finite-Element Methods Seminar: “Space-time meshing with a cone constraint”.

Techn. Univ. Berlin, May 2004, 125-Jahr-Feier: “Geometrie und Visualisierung”.

Freie Univ. Berlin, May 2004, Oberseminar Analysis, Geometrie und Physik: “Ropelength Criticality for Knots and Links”.

Univ. of Illinois, Urbana, March 2004, Geometric Potpourri: “Geometric Knot Theory”.
 Univ. of Georgia, Athens, March 2004, Geometry Seminar: “Geometric Knot Theory”.
 UC Berkeley, March 2004, MSRI/Evans Lecture: “Geometric Knot Theory”.
 Techn. Univ. Berlin, January 2004, Inaugural Lecture: “Visualization of Optimal Geometry”.
 MSRI, Berkeley: *Differential Geometry*, October 2003, “Ropelength criticality for knots and links”.
 MSRI, Berkeley: *Discrete Geometry*, October 2003, “The second hull of a knotted curve”.
 Techn. Univ. Berlin, February 2003, Geometry Seminar: “The second hull of a knotted curve”.
 Techn. Univ. Berlin, October 2002, Special Colloquium: “Optimal geometry in topology”.
 Univ. of Wisconsin, Madison, September 2002, Math Colloquium: “The ropelength of knots and links”.
 Univ. of Massachusetts, Amherst, April 2002, Special Colloquium: “The ropelength of knots and links”.
 Univ. of Pittsburgh, February 2002, Math Colloquium: “The second hull of a knotted curve”.
 Texas Tech. Univ., January 2002,
 Math Colloquium: “The second hull of a knotted curve”,
 Geometry Seminar: “Triunduloids: Embedded three-ended surfaces of constant mean curvature”.
 Univ. of Pittsburgh, November 2001, Special Colloquium: “Using bending energy to drive a sphere eversion”.
 Univ. of Georgia, Athens, March 2001, Math Colloquium: “The geometry of foams”.
 Univ. of Massachusetts, Amherst, June 2000, GANG Seminar: “The second hull of a knotted curve”.
 Georgia Tech, March 2000, Geometry Seminar: “The ropelength of knots and links”.
 Indiana Univ., February 2000,
 Geometry Seminar: “The ropelength of knots and links”,
 Math Colloquium: “Using bending energy to drive a sphere eversion”.
 Washington Univ., St. Louis, December 1999,
 Math Colloquium: “Triunduloids: Embedded CMC surfaces with three ends”.
 Stanford Univ., June 1999, Geometric Analysis Seminar: “Using bending energy to drive a sphere eversion”.
 Univ. of Texas, Austin, May 1999,
 Differential Geometry Seminar: “Minimax Sphere Eversions and *The Optiverse*”.
 Univ. of Maryland, February 1999, Geometry Seminar: “Using bending energy to drive a sphere eversion”.
 Univ. of Illinois, Urbana, December 1998, Mathematics in Science and Society: “The Geometry of Foams”.
 Univ. of Massachusetts, Amherst, July 1998, GANG Seminar: “Minimax Sphere Eversions and *The Optiverse*”.
 U.C. Davis, June 1998, Topology Seminar: “The Minimax Sphere Eversion”.
 Univ. of Arkansas, March 1998,
 Math Colloquium: “Triunduloids”,
 Geometry Seminar: “The Minimax Sphere Eversion”.
 Univ. of Minnesota, March 1998, Geometric Analysis Seminar: “Existence of CMC surfaces with three ends”.
 Univ. of Massachusetts, Amherst, July 1997, GANG Seminar: “Thick knots”.
 Univ. of Pennsylvania, April 1997, Topology Seminar: “Thickness of space curves”.
 Univ. of Iowa, February 1997, Math Colloquium: “Optimal geometries” and Topology Seminar: “Thick knots”.
 Univ. of Illinois, Urbana, January 1997, Special Seminar: “Thick knots and other optimal geometries”.
 Beckman Inst., Univ. of Illinois, Urbana, November 1996,
 Complex Systems Colloquium: “Dynamic Optimization of Geometric Energies in the Evolver”.
 Univ. of Illinois, Chicago, November 1996, Quantum Topology Seminar: “The minimax sphere eversion”.
 Univ. of Massachusetts, Amherst, October 1996,
 Math Colloquium: “The configuration space of k points on a sphere”,
 GANG Seminar: “Triunduloids: Embedded CMC surfaces with three ends”.
 Univ. of Illinois, Urbana, October 1996, Math Colloquium: “Conformal energies for knots”.
 Northwestern Univ., November 1995, Math Colloquium: “Deltatopes and soap-film singularities”.
 Univ. of Wisconsin, Madison, May 1995,
 PDE Seminar: “Soap-bubble singularities in higher dimensions and the classification of deltatopes”,
 Computational Geometry Seminar: “TCP structures as clusters of equal-volume bubbles”.
 Florida State Univ., February 1995,
 Math Colloquium: “Geometric optimization on the computer”,
 Computation Seminar: “Conformal knot energies and a higher-dimensional generalization”.
 Univ. of Minnesota, October 1994, Math Colloquium: “Conformal energies for knots”.

Univ. of Massachusetts, Amherst, September 1994,
GANG Seminar: “Knot energies in the Evolver”,
Math Colloquium: “Deltatopes and soap-film singularities in higher dimensions”,
Valley Geometry Seminar: “Curvature evolution of space curves”.

Northern Illinois Univ., September 1994, Math Colloquium: “Conformal energies for knots”.

Univ. of Wisconsin, Madison, April 1994,
Math Colloquium: “Möbius energies for knots and submanifolds”,
Geometry and Topology Seminar: “A zoo of self-similar solutions to extrinsic curvature flows”,
Computational Geometry Seminar: “Symmetry and curvature: Computer graphics in curved spaces”.

Univ. of Washington, March 1994, Geometry Seminar: “Möbius energies for knots and other submanifolds”.

U.C. San Diego, December 1993, Topology Seminar: “Möbius energies for knots and submanifolds”.

SFB 256, Universität Bonn, October 1993,
Seminar Experimentelle Mathematik: “Computing Willmore surfaces”.

Australian National Univ., March 1992,
CMA Colloquium: “Computing Willmore surfaces at the Geometry Center”,
Numerical Analysis Seminar: “Finding minimum surfaces via maximum flows”.

Stanford Univ., January 1991,
Geometry Seminar: “Crystalline approximation: Computing minimum surfaces via maximum flows”.

Univ. of Massachusetts, November 1988,
GANG seminar: “Using Voronoi diagrams to compute soap bubbles”.