
School of Mathematics
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Education

Johns Hopkins University, B.A. Mathematics, 1992
Johns Hopkins University, Ph.D. Mathematics (Advisor: Joel Spruck), 1998

Professional Experience

Visiting Assistant Professor, University of California at Santa Cruz, 1998–2000
Assistant Professor, University of South Carolina, 2000–2003
Visiting Associate Professor, Pennsylvania State University, 2003–2005
Associate Professor, Georgia Institute of Technology, 2003–2009
Professor, Georgia Institute of Technology, 2009–Present

Research Interests

Differential geometry and topology of submanifolds, especially curves and surfaces in Euclidean space and convexity problems

Awards and Grants

J. J. Sylvester Prize in Mathematics, Johns Hopkins University, 1992
Clay Mathematics Institute Summer Fellowship, MSRI, 2001
NSF Research Grant (DMS-0204190, \$97,000), 2002–2005
NSF CAREER Award (DMS-0332333, \$400,000), 2003–2009
NSF Research Grant (DMS-0806305, \$114,105), 2008–2011

Research Papers¹

1. Strictly convex submanifolds and hypersurfaces of positive curvature, *J. Differential Geom.*, **57** (2001) 239–271.
2. Gauss map, topology, and convexity of hypersurfaces with nonvanishing curvature, *Topology*, **41** (2002) 107–117.

¹Copies of all published and submitted papers are available at www.math.gatech.edu/~ghomi.

3. Shadows and convexity of surfaces, *Ann. of Math.*, **155** (2002) 281–293.
4. The problem of optimal smoothing for convex functions, *Proc. Amer. Math. Soc.*, **130** (2002) 2255–2259.
5. Solution to the shadow problem in 3-space, in Minimal Surfaces, Geometric Analysis and Symplectic Geometry, *Adv. Stud. Pure Math.*, **34** (2002) 129–142.
6. Skew loops and quadric surfaces (with B. Solomon), *Comment. Math. Helv.*, **77** (2002) 767–782.
7. Circles minimize most knot energies (with A. Abrams, J. Cantarella, J. Fu and R. Howard), *Topology*, **42** (2003) 381–394.
8. The convex hull property and topology of hypersurfaces with nonnegative curvature (with S. Alexander), *Adv. Math.*, **180** (2003), 324–354.
9. A smooth convex loop with vanishing projections, *Topology*, **43** (2004), 245.
10. Optimal smoothing for convex polytopes, *Bull. London. Math. Soc.*, **36** (2004), 483–492.
11. Shortest periodic billiard trajectories in convex bodies, *Geom. Funct. Anal.*, **14** (2004), 295–302.
12. The convex hull property of noncompact surfaces (with S. Alexander), *Amer. J. Math.*, **126** (2004), 891–897.
13. Nonexistence of skew loops on ellipsoids, *Proc. Amer. Math. Soc.*, **133** (2005), 3687–3690.
14. Tangent bundle embeddings of manifolds in Euclidean space, *Comment. Math. Helv.*, **1** (2006), 259–270.
15. Total positive curvature of hypersurfaces with convex boundary, (with J. choe and M. Ritore), *J. Differential Geom.*, **72** (2006), 129–147.
16. h -Principles for hypersurfaces with prescribed principal curvatures and directions (with M. Kossowski), *Tran. Amer. Math. Soc.*, **358** (2006), 4379–4393.
17. Relative isoperimetric inequality outside convex domains in R^n , (with J. choe and M. Ritore), *Calc. Var. Partial Differential Equations*, **29** (2007), 421–429.
18. h -principles for curves and knots of constant curvature, *Geom. Dedicata*, **127** (2007), 19–35.
19. Topology of surfaces with connected shades, *Asian J. Math.* **11** (2007), 621–634.
20. Totally skew embeddings of manifolds (with S. Tabachnikov), *Math. Z.*, **258** (2008), 499–512.
21. Topology of negatively curved real affine algebraic surfaces (with C. Connell), *J. Reine Angew. Math*, **624** (2008), 1–26.

22. Relative isometric embeddings of Riemannian manifolds (with R. Greene), to appear in *Tran. Amer. Math. Soc.*
23. Topology of Riemannian submanifolds with prescribed boundary (with S. Alexander, and J. Wong), to appear in *Duke Math. J.*
24. A Riemannian four vertex theorem for surfaces with boundary, *Submitted.*
25. Vertices of closed curves in Riemannian surfaces, *Submitted.*
26. Topology of the space of unbounded convex hypersurfaces, *In Progress.*

Expository Paper

1. Classical open problems in differential geometry.

Research Collaborators

1. Aaron Abrams (Emory University)
2. Stephanie Alexander (University of Illinois at Urbana-Champaign)
3. Jason Cantarella (University of Georgia)
4. Jaigyoung Choe (Seoul National University, Korea)
5. Chris Connell (Indiana University)
6. Joseph Fu (University of Georgia)
7. Robert Greene (UCLA)
8. Ralph Howard (University of South Carolina)
9. Marek Kossowski (University of South Carolina)
10. Manuel Ritore (University of Granada, Spain)
11. Bruce Solomon (Indiana University)
12. Serge Tabachnikov (Pennsylvania State University)
13. Jeremy Wong (University of Toronto)

Talks

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| 1. Johns Hopkins U., <i>Global Analysis Seminar</i> , | Sep. 1997 |
| 2. U. of South Carolina, <i>Colloquium</i> , | Jan. 1998 |
| 3. U. Mass. at Amherst, <i>G. A. N. G. Seminar</i> , | Feb. 1998 |
| 4. Harvard University, <i>Differential Geometry Seminar</i> , | Feb. 1998 |

5. M.S.R.I., *Geometry Seminar*, Sep. 1998
6. U.C. Santa Cruz, *Colloquium*, Jan. 1999
7. U. of Illinois at Urbana, *Differential Geometry Seminar*, Mar. 1999
8. Johns Hopkins U., *JAMI Conference on Min. Surfaces*, Mar. 1999
9. U. of Pennsylvania, *Geometry and Topology Seminar*, Mar. 1999
10. Stanford University, *Geometric Analysis Seminar*, Apr. 1999
11. U.C. Berkeley, *Geometry Seminar*, Feb. 2000
12. Indiana University, *Geometry Seminar*, Apr. 2000
13. University of Georgia, *Geometry Seminar*, Oct. 2000
14. A.M.S. Southeastern, Columbia, *Session on Curves & Surfaces*, Mar. 2001
15. M.S.R.I., *C.M.I. Conf. on Minimal Surfaces*, Jul. 2001
16. Georgia Tech, *Colloquium*, Aug. 2001
17. College of Charleston, *Colloquium*, Nov. 2001
18. A.M.S. Southeastern, Atlanta, *Session on Applied Math.*, Mar. 2002
19. College of Charleston, *Colloquium*, Apr. 2002
20. N.C. State University, *Comp. Vision Seminar, ECE Dept.*, May. 2002
21. P.I.M.S. at U. British Columbia, *Conference on Convexity*, Jul. 2002
22. A.M.S. Eastern, Boston, *Session on Convex Geometry*, Oct. 2002
23. A.M.S. Central, Wisconsin, *Session on Optimal Geometry*, Oct. 2002
24. Johns Hopkins U., *Analysis Seminar*, Nov. 2002
25. U. of Pennsylvania, *Analysis Seminar*, Nov. 2002
26. Georgia Tech, *Colloquium*, Jan. 2003
27. Indiana University, *Colloquium*, Feb. 2003
28. MIT, *Analysis/PDE Seminar*, Mar. 2003
29. College of Charleston, *Southeast Geometry Conference*, Mar. 2003
30. AMS Central, Bloomington, *Session on Differential Geometry*, Apr. 2003
31. University of Toledo, *Colloquium*, Apr. 2003
32. U. of Alabama, Birmingham, *Southeast Geometry Seminar III*, May 2003

33. U. of Georgia, *Georgia Topology Conference*, Jun 2003
34. Banff Research Center, *Conf. on Monge-Ampere Equations*, Aug. 2003
35. Penn State, *Dynamical Systems and Geometry Seminar*, Sep. 2003
36. Penn State, *MASS Colloquium*, Oct. 2003
37. Georgia Tech, *Geometry and Topology Seminar*, Nov. 2003
38. Penn State, *Topology Seminar*, Nov. 2003
39. CUNY, *Conference in honor of E. Feldman*, Feb. 2004
40. University of Pennsylvania, *Geometry-Topology Seminar*, Mar. 2004
41. U. of São Paulo, *The XIII School of Diff. Geometry, Plenary Talk*, Jul. 2004
42. IMPA, Rio de Janeiro, *Geometry Seminar*, Jun. 2004
43. Penn State, *MASSfest Conf. for REU students*, Aug. 2004
44. Penn State, *Geometry Seminar*, Sep. 2004
45. Georgia Tech, *Geometry Seminar*, Dec. 2004
46. Columbia University, *Geometry and Analysis Seminar*, Mar. 2005
47. University of Alabama at Birmingham, *Colloquium*, Oct. 2005
48. University of Georgia, *Topology and Geometry Seminar*, Nov. 2005
49. AMS National, San Antonio, *Session on Convex Geometry*, Jan. 2006
50. Indiana University, *Bloomington Geometry Workshop*, Apr. 2006
51. Canadian Math. Soc., Calgary, *Session on Discrete and Convex Geom.*, Jun. 2006
52. University of Georgia, *Geometry Seminar*, Sep. 2006
53. Emory University, *Differential Geometry/Analysis Seminar*, Oct. 2006
54. Johns Hopkins U., *Conf. on Geometric Analysis and Elliptic PDE's*, Oct. 2006
55. KIAS, Seoul, *Conference on Geometric Analysis*, Sept. 2007
56. Duke University, *Geometry Seminar*, Oct. 2007
57. University of Notre Dame, *Felix Klein Seminar*, Feb. 2008
58. University of Georgia, *Geometry Seminar*, Mar. 2008
59. University of South Carolina, *Southeast Geometry Conference*, Mar. 2008
60. George Washington University, *Geometry Seminar*, Mar. 2008

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| 61. Johns Hopkins University, <i>Analysis Seminar</i> , | May 2008 |
| 62. University of Pennsylvania, <i>Geometry-Topology Seminar</i> , | May 2008 |
| 63. XV Brazilian School of Differential Geometry, Fortaleza, Plenary Talk, | July 2008 |
| 64. Penn State U., <i>MASS Colloquium</i> , | Sep. 2008 |
| 65. Penn State U., <i>Geometry Seminar</i> , | Sep. 2008 |
| 66. AMS Western, Vancouver, <i>Session on Convex Geometry</i> , | Oct. 2008 |
| 67. Georgia Tech, Colloquium, | Oct. 2008 |
| 68. Rutgers U., Newark, <i>Conference in honor of Herman Gluck</i> , | Nov. 2008 |
| 69. University of Calgary, <i>Colloquium and Fejes Toth Lecture</i> , | Mar. 2009 |
| 70. University of Calgary, <i>Discrete Geometry Seminar</i> , | Mar. 2009 |
| 71. AMS Central, Urbana, <i>Session on Differential Geometry</i> , | Mar. 2009 |
| 72. College of Charleston, <i>Colloquium</i> , | Apr 2009 |
| 73. Indiana University, <i>Differential Geometry Seminar</i> , | Apr 2009 |
| 74. University of Minnesota, <i>Differential Geometry Seminar</i> , | May 2009 |
| 75. International Symposium on Differential Geometry, Rio de Janeiro, | Aug. 2009 |

Research Institutes Visited

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| Mathematical Sciences Research Institute (MSRI), Berkeley | Summer 2001 |
| Pacific Institute for Mathematical Sciences (PIMS), Van Couver | Summer 2002 |
| Banf International Research Station (BIRS), Banf | Summer 2003 |
| Institute for Pure and Applied Mathematics (IMPA), Rio de Janeiro | Summer 2004 |
| Korean Institute for Advanced Study (KIA), Seoul | Summer 2007 |

PhD Students

Yulia Tyurina, Pennsylvania State University, 2005 (supervised jointly with Serge Tabachnikov). Thesis: *Skew embeddings and immersions of manifolds into Euclidean spaces in codimension two.*

James Krysiak, Georgia Tech, since Fall 2006.

Postdoc Supervision

Gordanna Stojanovic, since Fall 2007.

Undergraduate Research Supervised

1. Justin Noel, UC Santa Cruz, *The Klein Bottle*, Fall 2000
2. Toan Phan, Penn State, *Rigidity of Surfaces*, Summer 2004
3. Casey Bush, Penn State, *Rigidity of Surfaces*, Summer 2004
4. Zachary MacCoy, Penn State, *Alexandrov's Conjecture*, Summer and Fall 2004
5. James Krysiak, Penn State, *Alexandrov's Conjecture*, Summer and Fall 2004
6. A.J. Friend, Georgia Tech, *Unfolding of Polytopes*, since Fall 2005
7. Bobby DeMarco, Georgia Tech, *4-vertex Theorem on Sphere*, Summer 2006
8. Brian Nakamura, Georgia Tech, *Alexandrov's Conjecture*, Summer 2006

Classes Taught

1. 110.302, *Differential Equations*, Johns Hopkins University, Summer 1994
2. 110.201, *Linear Algebra*, Johns Hopkins University, Summer 1996
3. Math100, *Introduction to Mathematical Proof*, UC Santa Cruz, Fall 1998
4. Math11B, *Calculus with Applications*, UC Santa Cruz, Fall 1998
5. Math22, *Calculus of Several Variables*, UC Santa Cruz, Spring 1999
6. Math11B, *Calculus with Applications*, UC Santa Cruz, Spring 1999
7. Math23B, *Multivariable Calculus*, UC Santa Cruz, Fall 1999
8. Math121B, *Elem. Diff. Geometry & Topology*, UC Santa Cruz, Winter 2000
9. Math19A, *Calculus for Science and Engineering*, UC Santa Cruz, Winter 2000
10. Math19B, *Calculus for Science and Engineering*, UC Santa Cruz, Spring 2000
11. Math141, *Calculus I*, U. South Carolina, Fall 2000
12. Math241, *Vector Calculus*, U. South Carolina, Fall 2000
13. Math544, *Linear Algebra*, U. South Carolina, Spring 2001
14. Math142, *Calculus II*, U. South Carolina, Fall 2001
15. Math550, *Vector Analysis*, U. South Carolina, Fall 2001
16. Math142, *Calculus II*, U. South Carolina, Spring 2002
17. Math550, *Vector Analysis*, U. South Carolina, Spring 2002
18. Math142, *Calculus II*, U. South Carolina, Fall 2002

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| 19. Math734, <i>Differential Geometry</i> , U. South Carolina, | Fall 2002 |
| 20. Math141, <i>Calculus I</i> , U. South Carolina, | Spring 2003 |
| 21. Math598E, <i>Introduction to the h-Principle</i> , Penn State, | Fall 2003 |
| 22. Math426, <i>Introduction to Modern Geometry</i> , Penn State, | Spring 2004 |
| 23. Math497C, <i>Diff. Geometry of Curves & Surfaces</i> , Penn State, | Fall 2004 |
| 24. Math528, <i>Geometry and Topology II</i> , Penn State, | Spring 2005 |
| 25. Math 6452, <i>Differential Topology</i> , Georgia Tech, | Spring 2005 |
| 26. Math 2411, <i>Honors Calculus III</i> , Georgia Tech, | Spring 2006 |
| 27. Math 6455, <i>Differential Geometry I</i> , Georgia Tech, | Fall 2006 |
| 28. Math 6456, <i>Differential Geometry II</i> , Georgia Tech, | Spring 2007 |
| 29. Math 4441, <i>Differential Geometry</i> , Georgia Tech, | Fall 2007 |
| 30. Math 1502, <i>Calculus II</i> , Georgia Tech, | Spring 2008 |
| 31. Math 2401, <i>Calculus III</i> , Georgia Tech, | Fall 2008 |

Other Educational Activities

- Advised undergraduate students during Penn State's Summer REU program in 2004, and Georgia Tech's Summer REU in 2006.
- Taught a class on differential geometry as a part of Penn State's MASS program in the Fall of 2004 (see www.math.psu.edu/mass).
- Developed *Mathematica* software packages for teaching differential geometry and vector calculus (see www.math.gatech.edu/ghomi).

Professional Service

- Co-organized a session (with Ralph Howard) on *Geometry of curves and surfaces* at the AMS southeastern section meeting, Mar. 2001.
- Co-organized a session (with Igor Belegradek) on *Riemannian Geometry* at the AMS national meeting, Jan. 2005.
- Co-organizer of the *Southeast Geometry Seminar*, since 2005 (a semiannual series of conferences which rotate between Georgia Tech, Emory, and U. Alabama at Birmingham; see www.math.uab.edu/sgs).
- Reviewed papers for *Ann. Math.*, *J. Differential Geom.*, *Topology*, *Amer. J. Math.*, *J. Knot Theory Ramifications*, *Indiana Univ. Math. J.*, *Pacific J. Math.*, *J. Comput. Appl. Math.*, *P. Roy. Soc. Edinb. A*, *Math. Zeitschrift*, *Algebr. Geom. Topol.*, *Amer. Math. Monthly*, *J. Geom. Anal.*, *Geom. Dedicata*, *Bull. London Math. Soc.*, *Discrete Comput. Geom.*, *Arch. Math.*, *Tran. Amer. Math. Soc.*, and *Mathematical Reviews*.

- Reviewed proposals for NSF.

Departmental Service

- *University of South Carolina*: Faculty Senator, Undergraduate Advisor, Member of Textbook committee, Faculty advisor to Pi-Mu-Epsilon (the Math honor society).
- *Georgia Tech*: Organizer and creator of the General Colloquium Series in the School of Math (lectures aimed at a general audience by outside speakers).

Memberships

American Mathematical Society

Mathematical Association of America

Personal Information

Born in Shiraz, Iran. Citizen of the United States. Married to Kate Hurley with a son, Reza, born in January of 2004.