

Curriculum Vita

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Education

B.S. March 1978, Summa Cum Laude, University of Georgia, Athens, Georgia, Mathematics Major.

Ph.D. in Mathematics, May 1982, Yale University, New Haven, Connecticut, Dissertation: "Surgery on Immersions: a Geometric Approach to Stable Homotopy," Advisor Prof. Ronnie Lee.

Positions Held

Jan 2003 - Present: Chair, University of South Alabama, Department of Mathematics and Statistics, Mobile, Alabama.

May 2002 - Dec 2002: Interim Chair, University of South Alabama, Department of Mathematics and Statistics, Mobile, Alabama.

Sept 1996 - May 2002: Professor, University of South Alabama, Department of Mathematics and Statistics, Mobile, Alabama.

1989 - 1996: Assistant Professor, University of South Alabama, Department of Mathematics and Statistics, Mobile, Alabama.

1988 - 1989: Lecturer, Wayne State University, Department of Mathematics, Detroit, Michigan.

1987 - 1988: Lecturer, University of Texas, Austin, Texas.

1985 - 1987: Assistant Professor, Department of Mathematics and Computer Studies, Lake Forest College, Lake Forest, Illinois.

1982 - 1985: Instructor, Mathematics Department, University of Texas, Austin, Texas.

1978 - 1982: Teaching Assistant, Mathematics Department, Yale University, New Haven, Connecticut.

Publications

Journal Articles

1. *Surgery Theory of Immersions*, Proc. Northwestern Homotopy Theory Conf. (Miller and Priddy, eds.), AMS Contemp. Math Series 19 (1983), 23-37.
2. *Surgery on Codimension One Immersions in $(n+1)$ -space: Removing n -tuple Points*, Trans. of the AMS 289, No. 1, (1986), 83-102.
3. *On Generalizing Boy's Surface: Constructing a Generator of the Third Stable Stem*, Trans. of the AMS 289, No. 1 (1986), 103-121.
4. *A Further Generalization of Boy's Surface*, Houston Journal of Mathematics 12, No. 1 (1986), 11-31.
5. *Simplifying the Self Intersection Sets of Codimension One Immersions in $(n+1)$ -space*, Houston Journal of Mathematics 13, No. 3, 353-366.
6. *Surgery on the Equatorial Immersion I*, Illinois Journal of Mathematics 32, No. 4, Winter 1988, 703-715.
7. *Surgery on the Equatorial Immersion in Low Dimensions*, Differential Topology Proceedings, Siegen 1987, Springer LMN 1350, U. Koschorke, ed.
8. *Triple Points of Immersed Surfaces in Three Dimensional Manifolds*, (with Ki Hyoung Ko), Topology and Its Applications 32, (1989), 149-159.
9. *Immersed Codimension One Projective Spaces in Spherical Space Forms*, Proc. of the AMS 105, No. 1, January 1989, 254-257.
10. *Immersed Projective Planes in Lens Spaces*, Proc. of the AMS 106, No. 1 (May 1989), 251-260.
11. *Classifying Immersed Curves*, Proc. of the AMS 111, No.1 (Jan. 1991), 281-287.
12. *Extending Immersed Curves to Proper Immersions of Surface*, Topology and its Applications 40 (1991), 287-306.
13. *Closed Curves that Never Extend to Proper Maps of Disks*, Proc. of the AMS 113, No. 3 (Nov 1991), 879-888.
14. *Canceling Branch Points on Projections of Surfaces in 4-Space*, (with Masahico Saito), Proc. of the AMS. 116, No 1. (Sept 1992), 229-237.
15. *Extending Immersed Circles in the Sphere to Immersed disks in the Ball*, Comm. Math. Helv. 67 (1992), 337-348.

16. *Syzygies among Elementary String Interactions in Dimension 2+1*, (with Masahico Saito), Letters in Mathematical Physics 23 (1991), 287-300.
17. *Planar Generalizations of the Yang Baxter Equation and Their Skeins*, (with Masahico Saito), Journal of Knot Theory and its Ramifications Vol 1, No. 2 (1992), 207-217.
18. *A Diagrammatic Theory of Knotted Surfaces*, (with Masahico Saito), in "Quantum Topology," ed. Randy Baadhio and Louis Kauffman, World Science Publishing (Singapore 1993), 91-115.
19. *Reidemeister Moves for Surface Isotopies and Their Interpretations As Moves to Movies*, (with Masahico Saito), Journal of Knot Theory and its Ramifications Vol 2, No 3 (1993), 251-284.
20. *Knotted Surfaces, Braid Movies, and Beyond*, (with Masahico Saito), in "Quantum Gravity," ed. John Baez, Oxford University Press (1994), 191-229.
21. *New Solutions to the Permutohedron Equation*, (with Masahico Saito), in "Quantum Topology Kansas 1993," ed. David Yetter, World Science Publishing Company, (1994), 51-65,
22. *Knot Diagrams and Braid Theories in Dimension 4*, (with Masahico Saito), in "Real and Complex Singularities," ed. W. L Marar, Pitman Research Notes in Mathematics, Longman Publishing (1995).
23. *A Seifert Algorithm for Knotted Surfaces*, (with Masahico Saito), Topology, Vol 36, No. 1 (1996), 179-201.
24. *Braid and Movies*, (with Masahico Saito), Journal of Knot Theory and Its Ramifications, Vol 5, No. 5 (1996), 589-608.
25. *On Formulations and Solutions of Simplex Equations*, (with Masahico Saito), International Journal of Modern Physics A, Vol 11, No 24, (1996), 4453-4463.
26. *Normal Euler Classes of Knotted Surfaces and Triple Points on Their Projections*, (with Masahico Saito), Proc. Amer. Math. Soc., 125 (1997), no. 2, 617-623.
27. *A Combinatorial Description of Knotted Surfaces and Their Isotopies*, (with Joachim Rieger and Masahico Saito), Advances in Mathematics, 127, No. 1, April 15 (1997), 1-51.
28. *Surfaces in 3-Space that Do Not Lift to Embeddings in 4-Space*, (with Masahico Saito), Knot theory (Warsaw, 1995), 29-47, Banach Center Publ., 42, Polish Acad. Sci., Warsaw, 1998.

29. *Diagrammatics, Singularities, and Their Algebraic Interpretations*, (with Louis H. Kauffman and Masahico Saito), 10th Brazilian Topology Meeting (So Carlos, 1996). *Mat. Contemp.* 13 (1997), 21–115.
30. *Singularities of the Projections of Surfaces in 4-Space*, (with Vera Carrara and Masahico Saito), Singularities of the projections of surfaces in 4-space. *Pacific J. Math.* 199 (2001), no. 1, 21–40.
31. *Thin-G theory and local moves for gems*, (with S3t6enes Lins), *Adv. Math.* 143 (1999), no. 2, 251–283.
32. *Alexander numbering of knotted surface diagrams*, (with Seiichi Kamada and Masahico Saito), *Proc. Amer. Math. Soc.*, 128 (2000), 3761-3771.
33. *Structures and Diagrammatics of 4-Dimensional Topological Lattice Field Theories*, (with Louis Kauffman and Masahico Saito), *Advances in Math.*, 146, 39-100 (1999).
34. *State-sum invariants of knotted curves and surfaces from quandle cohomology*, (with Daniel Jelsovsky, Seiichi Kamada, Laurel Langford, and Masahico Saito), *Electron. Res. Announc. Amer. Math. Soc.* 5 (1999), 146-156.
35. *Quandle Homology Groups, Their Betti Numbers, and Virtual Knots*, (with Daniel Jelsovsky, Seiichi Kamada, and Masahico Saito), *J. Pure Appl. Algebra* 157 (2001), no. 2-3, 135–155.
36. *Computations of quandle cocycle invariants of knotted curves and surfaces*, (with Daniel Jelsovsky, Seiichi Kamada, and Masahico Saito), *Adv. Math.* 157 (2001), no. 1, 36–94.
37. *Geometric Interpretations of Quandle Homology*, (with Seiichi Kamada, and Masahico Saito) *J. Knot Theory Ramifications* 10 (2001), no. 3, 345–386.
38. *Shifting Homomorphisms in Quandle Cohomology and Skeins of Cocycle Knot Invariants*, (with Daniel Jelsovsky, Seiichi Kamada, and Masahico Saito), *Journal of Knot Theory and its Ramifications*, Vol 10 (2001), no 4, 579-596.
39. *A Theorem of Sanderson on Link Bordisms in Dimension 4*, (with Seiichi Kamada, Shin Satoh, and Masahico Saito) *Algebraic and Geometric Topology* 1 (2001), paper no. 14, 299-310.
40. *Diagrammatic Computations for Quandles and Cocycle Knot Invariants*, (with Seiichi Kamada and Masahico Saito), *AMS Contemporary Math Series*, ed. Lou Kauffman, David Radford, and Fernando Sousa.

41. *Stable Equivalence of Knots on Surfaces and Virtual Knot Cobordisms*, (with Seiichi Kamada and Masahico Saito), Journal of Knot Theory and its Ramifications, Vol 11, No 3 (May 2002), 311-322.
42. *Twisted Quandle Homology Theory and Cocycle Knot Invariants*,(with Mohammed Elhamdadi, and Masahico Saito), Algebr. Geom. Topol. 2 (2002) 95-135.
43. *Bordism of Unoriented Surfaces in 4-Space*, (with Seiichi Kamada, Shin Satoh, and Masahico Saito) Michigan Math. J. 50 (2002), no. 3, 575–591.
44. *Quandle cohomology and state-sum invariants of knotted curves and surfaces*, (with Daniel Jelsovsky, Seiichi Kamada, Laurel Langford, and Masahico Saito), Trans. Amer. Math. Soc. 355 (2003), no. 10, 3947–3989.
45. *Quandle Homology Theory and Cocycle Knot Invariants*, (with Masahico Saito), Proceedings of Symposia in Pure Mathematics Vol 71 (2003), 249-268, ed. Mattic, et al.
46. *Cocycle Knot Invariants, Quandle Extensions, and Alexander Matrices*, (with Angela Harris, Marina Nikiforou, and Masahico Saito), in Low Dimensional Topology of the 21st Century, ed. Hitoshi Murakami, RIMS Kokyuroku 1272 (Kyoto 2002), also available at math.GT/0204113
47. *Extensions of Quandles and Cocycle Knot Invariants* (with Mohamed Elhamdadi, Marina Appiou Nikiforou, and Masahico Saito), J. Knot Theory Ramifications 12 (2003), no. 6, 725–738, also available at math.GT/0107021
48. *Generalizations of Quandle Cocycle Invariants and Alexander Modules from Quandle Modules* (with Masahico Saito) Intelligence of Low Dimensional Topology, Shodo-Shima, JAPAN (Decemeber 2003), 77-90.
49. *Homology theory for the set-theoretic Yang-Baxter equation and knot invariants from generalizations of quandles*, (with Mohamed Elhamdadi and Masahico Saito), Fund. Math. 184 (2004), 31–54.
50. *Cocycle knot invariants from quandle modules and generalized quandle homology*, (with Matias Graña, Mohamed Elhamdadi and Masahico Saito) Osaka J. Math. 42 (2005), no. 3, 499–541.
51. *Ribbon concordance of surface-knots via quandle cocycle invariants*, (with Masahico Saito and Shin Satoh) J. Aust. Math. Soc. 80 (2006), no. 1, 131–147.
52. *Ribbon-moves for 2-knots with 1-handles attached and Khovanov-Jacobsson numbers*, Proc. Amer. Math. Soc. 134 (2006), no. 9, 2779–2783.

53. *A lower bound for the number of Reidemeister moves of type III*, (with Mohamed Elhamdadi, Masahico Saito, and Shin Satoh) *Topology and its Applications*, 153 (15), 2788-2794.
54. *Categories for Knotted Curves and Surfaces and Quandles*, In Sica, Giandomenico, ed. "What is Category Theory? Advanced Studies in Mathematics and Logic." Polimet-rica, Publisher, Italy, 17-44.
55. *Set Theoretic Yang-Baxter Solutions via Fox Calculus*, (with Masahico Saito), *J. Knot Theory Ramifications* 15 (2006), no. 8, 949–956, preprint at math.GT/0503166.
56. *Cohomology of the adjoint of Hopf algebras*, *Journal of Generalized Lie Theory and Applications*, Vol 2, No. 1, March 2008, 19-34.
57. *Cohomology of Categorical Self-Distributivity*, (with Alissa Crans, Mohamed Elhamdadi, Masahico Saito), *Journal of Homotopy and Related Structures*, Vol 3, No. 1, 13-63, preprint at math.GT060717.
58. *A geometric method to compute some elementary integrals*, (with Abhijit Champanerkar) at math.HO/0608722.
59. *Cohomology of Frobenius Algebras and the Yang-Baxter Equation*, (with Alissa Crans, Mohamed Elhamdadi, Enver Karadayi, and Masahico Saito), to appear in *Communications of Contemporary Mathematics* Vol. 10 (2008), suppl. 1, 791–814. pre-published version at arxiv.org/abs/0705.3231.
60. *Virtual Knot Invariants from Group Biquandles and Their Cocycles*, (with Mohamed Elhamadadi, Masahico Saito, Daniel Silver, and Susan Williams), *J. Knot Theory and Its Ramifications* Vol 18(7) (July 2009) 957-972, pre-published version at arxiv.org/abs/math/0206255.
61. *Frobenius Modules and Essential Surface Cobordisms* (with Masahico Saito), pre-published version at <http://arxiv.org/pdf/0905.4475>.
62. *Symmetric Extensions of Dihedral Quandles and Triple Points of Non-orientable Surfaces* (with Kanako Oshiro and Masahico Saito), pre-published version at <http://arxiv.org/pdf/0905.3374>.

Books

"How Surfaces Intersect in Space: an Introduction to Topology," World Scientific Publishing (1st edition Feb. 1993), (2nd edition 1995).

"The Classical and Quantum $6j$ -symbols," Princeton University Press (1995) (with Daniel E. Flath and Masahico Saito).

“Knotted Surfaces and Their Diagrams,” American Mathematical Society Surveys and Monographs Series, Vol 55, (1997) (with Masahico Saito).

“Knotted Surfaces in 4-dimensional Spaces,” (with Seiichi Kamada and Masahico Saito), Encyclopaedia of Mathematics, 142, series in Low Dimensional Topology 111, Springer (Berlin 2004).

“Intelligence of Low Dimensional Topology, 2006,” Ed. Carter, Kamada, Kauffman, Kawachi, and Kohno, World Science (Singapore, 2007).

“Turning a Sphere from Red to Blue,” completed manuscript posted at

http://www.southalabama.edu/mathstat/personal_pages/carter/talks.html

In Preparation

1. “Fractals in Higher Dimensions.”
2. *Strictly Categorized Quandles: Strict 2-Quandles*, with Alissa Crans, Mohamed Elhamdadi, and Masahico Saito.
3. *Algebraic Structures Derived from Foams*, with Masahico Saito.
4. *Quandle Methods in Topology*, a survey article with Masahico Saito.

Professional Memberships

Member American Mathematical Society

Managing Editor Journal of Knot Theory and Its Ramifications

$\Phi K \Phi$ Honor Society.

Recent Honor

$\Phi K \Phi$ scholar of the year, 2006.

Administrative Experience

Chair, Department of Mathematics and Statistics University of South Alabama Jan 2003-Present.

Interim Chair, Department of Mathematics and Statistics University of South Alabama May 2002-Jan 2003.

Chair, Arts and Sciences Ad Hoc Faculty Workload Committee, 2001.

Chair, Arts and Sciences Support and Development Committee, 2000-2001.

Chair Faculty Senate, 1992-1993

Significant Achievements as Chair

12 new faculty members hired, 5 of whom are tenure track, and 5 of whom have earned tenure.

The department experimented with an on-line/lab component to precalculus courses.

Implemented a mandatory mathematics placement exam.

Building renovations occurred to revamp a disfunctional HVAC system; at this time all departments, furniture, and belongings had to be evacuated for 3 months.

Typically the department teaches over 2900 students in each of fall and spring semesters.

Mathematics and Statistics generates more than a third of the College of Arts and Sciences summer revenues.

Recent Grants Awarded

1996, National Security Agency, “Generalizations of the Temperley-Lieb Algebra and Applications,” # MDA904-96-10071.

2000, National Science Foundation, “Cohomology State-Sum Invariants in Dimensions 3 and 4.” # DMS-9988107.

2003, National Science Foundation, “Collaborative Research: Cocycle Invariants of Low-Dimensional Knots and Manifolds,” # DMS-0301095.

2006, National Science Foundation, “Collaborative Research: Algebraic Structures and Cohomology Theories Associated to Knottings,” # DMS-0603926.

Hobbies: dixieland jazz rhythm guitar, garage band electric guitar, computer drawing, higher dimensional visualizations, swimming, walking, bicycling, some racketball.