Southern Illinois University at Carbondale

CURRICULUM VITAE OF MICHAEL C. SULLIVAN

Department Mathematics

I. PROFESSIONAL AFFILIATION AND CONTACT INFORMATION

A. Mathematics

B. Neckers 461, siu950 (at) siu (dot) edu

II. EDUCATION

Ph.D. in Math, University of Texas, at Austin, 1992

B.S. in Math, Virginia Tech, 1983

III. PROFESSIONAL EXPERIENCE

1. The Math Box, Fairfax VA, calculator sales clerk, 1976-1977. Part time.

2. Physics Dept., VPI & SU, programmer for Prof. David Jenkins, 1978-82. Wrote software in FORTRAN and PDP-11 assembly language for intermediate energy particle physics experiments. Part time.

3. ENSCO Inc., Fairfax VA, programmer/analyst, 1983-1985. Wrote software in FORTRAN for a variety of digital signal processing applications. Also did some work in LISP and C.

4. Math Dept., U.T. Austin, teaching assistant and assistant instructor, 1986-1992. Ran calculus discussion sections, taught six sections of precalculus and a math course for prospective elementary school teachers.

5. Math Dept., U.T. Austin, lecturer, Fall 1992. Taught two large sections of a math for liberal arts students course.

6. Center for Applied Math, Cornell University, visiting scientist, 3/1/1993-4/15/1993.

7. Einstein Chair of Science, CUNY, visitor, 9/1993 - 5/1994. Taught graduate level courses.

8. Math Dept., Northwestern University, Visiting Assistant Professor, 9/1994 - 8/1996. Taught undergraduate and graduate level courses.

9. Math Dept., Southern Illinois University, Assistant Professor, 8/1996 - 7/2000.

10. Math Dept., Southern Illinois University, Associate Professor, 8/2000 - 6/2006.

11. Math Dept., University of Maryland, College Park, Visiting Associate Professor, Fall 2002.

12. Math Dept., University of North Texas, Denton, Visiting Associate Professor, Spring 2003.

13. Math Dept., Southern Illinois University, Professor, 7/2006 - 7/2021.

14. School of Mathematical and Statistical Science, Southern Illinois University, Professor, 8/2021 - 7/2025.

15. School of Mathematical and Statistical Science, Southern Illinois University, Intreim Director, 1/2025 - 6/2025.

IV. RESEARCH

A. Research Interests and Specialties: Symbolic and Topological dynamical systems, low dimensional flows, knot theory.

B. Current Research Projects:

1. I am continuing to study Smale flows in 3-manifolds.

C. Research Grants Applied for: NSF 1996, SIUC Summer Research Award, NSF 1998, NSF 1999, NSF 2003, NSA 2003 (Department forgot to submit), NSA 2004, NSF 2005, NSF 2008.

D. Research Grants Received: SIUC Summer Research Award, 1997

E. Research Honors and Awards: none

F. Papers and Presentations at Professional Meetings: (All talks are invited; minimum length is 20 minutes.)

1. "Prime Decomposition of Knotted Periodic Orbits," Midwest Dynamical Systems Conference, Northwestern U., March, 1991.

2. "Prime Decomposition of Knots in Lorenz-like Templates," Western Section AMS Meeting, UCSB, Nov. 9 & 10, 1991. (Gave two talks, one for 15 min., the other for one hour.)

3. "Composite Knots in the Figure-8 Knot Complement can have any number of Prime Factors," Dynamics Institute, Boston U., July 8, 1992.

4. "Composite Knots in the Figure-8 Knot Complement can have any number of Prime Factors," SIAM Conference, Salt Lake City, Utah, Oct 16, 1992

5. "A zeta function for positive templates," Midwestern Dynamical Systems Conference, Univ. of Mich., Nov. 6-8, 1992.

6. "A zeta function for positive templates," AMS-MAA Joint Meeting, special section on Low Dimensional Dynamical Systems, San Antonio, Texas, Jan. 14, 1993.

7. "Factoring Positive Braids," AMS Section meeting, Brooklyn College, 1994.

8. "An invariant for basic sets of Smale flows," Geometry/Topology Conference, Leigh University, June 1995.

9. "An invariant for basic sets of Smale flows," Midwest Dynamical Systems Conference, U. of Mich., April 1996.

10. "Invariants of one-dimensional basic sets of flows," International Workshop on Dynamical Systems and Geometry, P.U.C., Rio de Janeiro, Brazil, August 1996.

11. "Invariants of twist-wise flow equivalence," AMS Special Session, Atlanta, October, 1997.

12. "Invariants of twist-wise flow equivalence," Special Session, AMS Joint Meeting, Baltimore January 1998.

14. "Alexander Polynomials Multiply under Connected Sums," AMS Special Session on Knots and 3-Manifolds, Buffalo NY, April 1999.

15. "Invariants of twist-wise flow equivalence," Midwest Dynamical System Conference, April 1999.

16. "Twist-wise flow equivalence," Georgia Topology Conference, Athens GA, July 2000. One hour invited talk.

17. "Twist-wise flow equivalence," Topology 2000 Conference, Oxford OH, July 2000. 20 min. contributed talk.

18. "Linking of Minimal Sets in Flows," AMS Special Session on Shape Theory and Dynamical Systems, Montreal, May 2002.

19. "G-weighted flow equivalence," Maryland-Penn State Workshop on Dynamical Systems, Oct 2002. (40 min, invited)

20. "Twist-wise flow equivalence," Spring Topology Conference, Texas Tech, Lubbock, 2003.

21. "Linking of Strumian Minimal Sets in the Lorenz System," Dynamical Systems Workshop, UT Austin, 2003.

22. "Linking Minimal Sets," Dynamical Systems Conference, UNT, May 2003.

33. "G-weighted Flow Equivalence," July 2003, Dynamics Symposium, one hour invited talk, U of Warwick.

34. "G-weighted Flow Equivalence," March 2004, Spring Topology Conference, Birmingham AL, March.

35. "Twistwise Flow Equivalence," AIM's 5th International Conference on Dynamical Systems and Differential Equations, special session on Low Dimensional Dynamics, Pomona CA, June 2004.

36. "Equavariant Flow Equivalence," July 2004, Max Plank Institute, Bonn Germany.

37. "Twistwise Flow Equivalence," January 2005, Pan-American Advanced Studies Institute (PASI) on Differential Equations and Nonlinear Analysis, Santiago, Chile.

38. "Smale Flows" July 2005, Summer Topology Conference, Denison University, Gainsville OH. (25 min)

39. "Transverse Foliations to nonsingular Morse-Smale flows on the 3-sphere and Bott-integrable Hamiltonian systems & Contact Structures," March 2006, Spring Topology and Dynamical Systems Conference, University of North Carolina at Greensboro. (20 min)

40. "Flows," Show Me Undergraduate Math Conference, SEMO, November 4 2006. (1 hour)

41. "Transverse Foliations to nonsingular Morse-Smale flows on the 3-sphere and Bott-integrable Hamiltonian systems & Contact Structures," 22nd SUMMER CONFERENCE ON TOPOLGY AND ITS APPLICATIONS Castellen, Spain, July 2007, (20 min)

42. "Twist-wise flow equavalence and classifying matrices over a non PID ring." Special Session on Algebraic Dynamical Systems, AMS Joint Meeting, San Diego CA, January 2008. (30 min)

43. "Solenoid Attractors of Diffeomorphisms of 3-Manifolds", Spring Topology Conference, Special Session on Dynamics, Milwaukee, March 2008.

44. "Transverse Foliations to nonsingular Morse-Smale flows." A 20 special session talk at Summer Topology and Its Applications Conference in Burn Czech Republic. July 2009.

45. Recent Developments in the Theory of Smale Flows
Topology and Dynamical Systems Conference
March 2011, Tyler TX

46. Recent Developments in the Theory of Smale Flows
Topology and Dynamical Systems Conference
March 2012, Mexico City

47. Recent Developments in the Theory of Smale Flows
27^{th} Summer Topology and Its Applications Conference
July 2012, Mankato, Minnesota

48. Recent Developments in the Theory of Smale flows, The 9th East Asian School of Knots and Related Topics, University of Tokyo, January 2013.

49. Realizing full n-shifts in simple Smale flows, Spring Topology and Dynamical Systems Conference, March 2014, Richmond VA.

50. Realizing full n-shifts in simple Smale flows, 29th Summer Conference on Topology and its Applications, July 23 2014, Staten Island, NYC.

51. Periodic orbits in a chaotic attractor introduced by Clark Robinson. Joint work with Ghazwan Alhashimi. 52nd Spring Topology and Dynamical Systems Conference, Auburn, Alabama, March 2019.

F. Other:

Organizer of AMS Special Session, Atlanta Meeting, October 1997, "The Dynamics and Topology of Low Dimensional Flows".

Organizer of Summer Topology Conference Special Session on Topological Dynamics, Denison U. Gainsville OH, July 2005.

Organizer of Spring Topology and Dynamical Systems Conference Special Session on Dynamical Systems, Mississippi State University, Starkville MS, March 2010.

Talks at universities:

1. "Knots in dynamical systems," given in five (5) one and a half hour talks at Cornell's Center for Applied Math, in April and May of 1993.

2. "A counter example to Birman and Williams," CUNY - Graduate Center, Sept., 1993.

3. "Knots in dynamical systems," given in two (2) one hour talks at Columbia University, Math Dept., Oct. 1993.

4. "Knots in dynamical systems," SUNY, Stony Brook, Nov. 1993.

5. "Kuperburg's counter example to the Seifert conjecture," CUNY - Graduate Center, Dec. 1993.

6. "Knots in dynamical systems," College of the Holy Cross, MA, March 1994.

7. "A zeta function for positive templates," UI, Urbana/Campaign, IL, March 1994.

8. "A zeta function for positive templates," Texas Tech., Lubbock, TX, May 1994.

9. "Equivalence relations for templates," Northwestern U., Evanston, IL, Nov. 1994.

10. "A zeta function for positive templates," Northwestern U., Evanston, IL, Dec. 1994.

11. "Visualizing Smale flows in S^3," Northwestern U., Evanston, IL, Sept., 1995.

12. "Project NExT: Teaching Innovations," Northwestern U., Evanston, IL, Oct., 1995.

13. "Building Blocks for Flows," Southern Illinois U., Carbondale, IL, Dec., 1995.

14. "Visualizing Flows," Wisc. U., Milwaukee, IL, Feb., 1996.

15. "Symbolic Dynamics and Flows: I," SIUC, Probability Seminar, March 1997.

16. "Symbolic Dynamics and Flows: II," SIUC, Probability Seminar, March 1997.

17. "Twist-wise flow equvalence," Montana St. U., ath seminar, Bozeman MT, August 2000.

17-20. "Symbolic Dynamics and Tilings I-III," SIU seminar, September 2000,

21. "Linking of Minimal Sets in Flows," Colloquium, University of Tenn., Martin, January 2002.

22-23. "G-weighted Flow Equivalence," Parts I & II. University of Maryland, Oct 2002. (Talk for graduate students.)

24. "G-weighted Flow Equivalence," University of Maryland, Oct 2002. Dynamical systems seminar.)

25. "Linking of Minimal Sets in Flows, " University of Maryland, Dec. 2002. Dynamical systems seminar.)

26. "G-weighted Flow Equivalence," George Mason University, colloquium talk, Dec. 2002.

27-9. "G-weighted Flow Equivalence," UNT Dynamics Seminar, Feb. 2003; 3 one hour lectures.

30. "G-weighted Flow Equivalence," Northwestern University Dynamics Seminar, Nov. 2003.

31. Gave three one hour lectures at Peking University in Beijing PRC. "Smale Flows I, II, & III," May 2009.

32-33. Twistwise Flow Equivalence, given in seminars at Tokyo Tech, Feb 13, 2013 and Osaka University, Feb. 19.

34. Knotted Periodic Orbits in Flows, Harris-Stowe University, March 2018.

35. Lens Spaces, Potpourri Seminar, Math Dept., SIUC, June 15, 2020.

36. Geometric Lorenz Attractor, Potpourri Seminar, Math Dept., SIUC, Sept 14, 2023.

37. Smale Flows, St Louis University, Geometry and Topology Seminar, April 15, 2025.

V. PUBLICATIONS

A. Books:

1. Knots and Links in Three-Dimensional Flows. Lecture Notes in Mathematics, Vol. 1654. Joint with R. Ghrist & P. Holmes, Spring, 1997, 204 pages.

B. Articles in Professional Journals:

1. Prime decomposition of knots in Lorenz-like templates. *Journal of Knot Theory and its Ramifications,* Vol. 2 No. 4 (1993) 453-462.

2. Composite knots in the figure-8 knot complement can have any number of prime factors. *Topology and its Applications,* 55 (1994) 261-272.

3. The prime decomposition of knotted periodic orbits in dynamical systems. *The Journal of Knot Theory and its Ramifications,* Vol. 3 No. 1 (1994) 83-120.

4. A zeta function for flows with positive templates. *Topology and its Applications*, 66 (1995) 199-213.

5. Positive braids with a half twist are prime. *The Journal of Knot Theory and its Ramifications*, Vol. 6, No. 3 (1997) 405-415.

6. An invariant for basic sets of Smale flows. *Ergodic Theory and Dynamical Systems,* (1997), **17**, 1437–1448.

7. Positive knots and Robinson's attractor. *The Journal of Knot Theory and its Ramifications*, Vol. 7, No. 1 (1998) 115–121.

8. Invariants of twist-wise flow equivalence. *Journal of Discrete and Continuous Dynamical Systems.* Vol 4, No. 3, (1998) 475–484.

9. Visually Building Smale flows in S^3. *Topology and Its Applications*, 106 (2000) 1-19.

10. Quantum Invariants for templates, joint with Lou Kauffman and M. Saito. *Journal of Knot Theory and Its Ramifications*, Vol 12, No 5, 2003, 653–681.

11. Periodic prime knots and topologically transitive flows on 3-manifolds, with Bill Basener. Topology and It's Applications, 153 (2006), no. 8, 1236–1240.

12. The linking homomorphism of one-dimensional minimal sets. Joint with Alex Clark. Topology and Its Applications, Vol 141 (2004), pg 125–145.

13. Equivariant flow equvalence for shifts of finite type, by matrix equivalence over group rings. Joint with Mike Boyle.*Proc. of the London Math Soc.* Volume 91 Part 1 (July 2005).

14. Twistwise flow equivalence and beyond, with an appendix joint with Mike Boyle. *Proceedings of the Max Planck Institute*, Contemporary Mathematics, Vol. Vol 385, 2005, 171–186. AMS.

15. Knots on a postive template have a bounded number of prime factors. *Algebraic and Geometric Topology*, Volume 5 (2005) 536–576.

16. Factoring positive briads via branched manifolds. *Topology Procedings*, Volume 30 Number 1 (2006), pp. 403–416.

17. Factoring Families of Positive Knots on Lorenz-like Templates. *Journal of Knot Theory and Its Ramifacations,* Vol 17, No 10, October 2008, 1175–1187.

18. Transverse Foliations to nonsingular Morse-Smale flows on the 3-sphere and Bott-integrable Hamiltonian systems. *Qualitative Theory of Dynamical Systems,* Vol 7, No 2, December 2008. [Page numbers not yet available. It is 5 pages.]

19. Nonsingular Smale flows in the 3-sphere with one attractor and one repeller. Topology Proceedings, Volume 38, 2011 Pages 17–27.

20. Simple Smale Flows with a Four Band Template, with Elizabeth Haynes, Topology and It's Applications Volume 177, November 1, 2014, pages 23-33.

21. Further study of simple smale flows using four band templates, Topology Proceedings, Volume 50, 2017 Pages 21-37. Joint with Kamal M. Adhikari.

22. Realizing Full n-shifts in Simple Smale Flows, Topology and Its Applications, Volume 218 (1 March 2017).

23. More on Knots in Robinson's Attractor, Topology and Its Applications, 2021.

C. Chapters in Professional Books:

1. Flows with knotted closed orbits. Joint with J. Franks. "The Handbook of Geometric Topology", Edited by R. Davermann, Elsevier Science, 2002.

2. The Topology and Dynamics of Flows. "Open Problems in Topology 2", Edited by Elliot Pearl, Elsever Press, 2007.

3. Knots in Flows, Encyclopedia of Knot Theory, CRC Press. December 2, 2020.

D. Popular and Creative Writing:

1. Educating Dilbert, *UMTE, Trends*, March 1995.

2. Knots about Stokes' Theorem, *College Mathematics Journal,* Classroom Capsules, March 1996. (peer reviewed)

3. A Mathematician reads "Social Text", *Notices of the American Mathematical Society*, October, 1996, 1127–1131.

4. Knot Factoring. *American Mathematics Monthly*, **107** April 2000, no. 4, 297–315. (peer reviewed.)

E. Book Reviews:

1. Review of *Symbolic Dynamics and its Applications*, edited by S. Williams, in *SIAM Review*, Volume 47, Number 2 (2005) 397 – 400.

F. Other:

1. Knots in Flows. *The Concise Encyclopedia of Knot Theory*, CRC Press, 2020.

VI. TEACHING EXPERIENCE

A. Teaching Interests and Specialties: Graduate and undergraduate math courses. Topology and dynamical systems.

B. Teaching and Training Grants:

Attended Summer Faculty Instructional Institute, UIUC, May 19-23, 1997

Regional Center for Distance Learning and Multimedia Development http://galileo.math.siu.edu/ msul liva/MiniGrant/

C. Teaching Awards and Honors: Project NExT Fellow, 1993-4.

D. Current Graduate Faculty Status: Member as of Sept. 9, 1997.

E. Numbers of Master's and Ph. D. Committees served on: ? masters students, and ? Ph.D. students. (Have not tracked this.)

F. Names of Students who have completed Master's and Doctoral Dissertations under my Direction: Chris Cullop, M.S., 1998; Stacey Staples, M.S., 1999; Elizebeth Haynes, Ph.D., 2012; Barakah Almarri, Ph.D., 2014; Herath Senarathna, M.S., 2016; Ghazwan Al-Hashimi, Ph.D., 2016; Kamal Adhikari, Ph.D., 2016; Herath Senarathna, Ph.D., 2023; Anothny Sloan, Ph.D., 2024; Mohammed M. Alshamrani, Ph.D., 2025.

G. Other: See teaching evaluations.

VII. UNIVERSITY SERVICE

A. Departmental Committees: Math Field Day, Several Hiring Committees, Undergraduate Programs Committee, Graduate Programs Committee. Director of Grauate Studies (Fall 2012-Summer 2018 and Fall 2022-Summer 2024). Interim Director, 1/1/25-7/30/25.

B. College and University Committees and Councils:

(1) Faculty Association's Departmental Representatives Council, Fall 2000 - Spring 2002.

(2) Faculty Senate, May 2003 - May 2006. (Chaired Governence Committee for three semesters.)

(3) Learning Living Task Force, Spring 2004.

(4) Undergraduate Education Policy Committee, June 2006 - May 2007.

(5) College of Science Promotion Committee, Sept 2006 - Sept 2009.

C. Other:

VIII. PROFESSIONAL SERVICE

A. Professional Associations: AMS, $\Sigma\Pi\Sigma$

B. Offices and Honors Awarded in Professional Associations: none

C. Consultantships: none

D. Evaluation of Manuscripts for Journals and Book Publishers and of Grant Proposals: I have refereed papers for the *College Math Journal* and the journal *Topology and Its Applications* and for *Transactions of the AMS*.

IX. COMMUNITY SERVICE

Science Fair judge, several times. I have given three talks to high school math classes, two in May of 1995 and one in May of 1996. Helped with Math Field Day a few times.